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Neighbor's Kiddie Computer

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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.

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This symbol indicates the program’s placement on the Instant CoCo loader, available on cassette. See our Instant CoCo ad for details.

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O
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.”

One of the most technical pieces makes sense to the novice without sacrificing the worth of the piece to the experienced user.

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
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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.

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=ITO4: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 PEEK341,255: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 experienced 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.
There's more to OS-9 than meets the eye.

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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.

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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.

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!

TC-INVENTORY

Many insurance companies offer a discount for policy holders who 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.

TC-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.

Additional Educational Software available

for Color Computer, TDP 100, Atari *, Apple *, Commodore 64 *, and VIC 20 *.

P.O. Box 2477 Gaithersburg, Maryland 20879 (301) 963-3848
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 31-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 CS=CHR$(9) THEN DI=4
360 IF CS=CHR$(8) THEN DI=3
370 IF CS=CHR$(94) THEN DI=1
380 IF CS=CHR$(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 P=10 THEN SC=SC+1:SOUND

These changes give a little more zest to the game.

Bruce Balter
Hanover, Ontario

Ham Programs

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

Johnny E. Carr
WA4FFC
Rockport, 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.
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

Soflaw Moves to Santa Barbara

Soflaw 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:

Soflaw Corporation
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. Axford, 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.

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, GS clears the screen. It must be assigned 30 instead of 14 spaces in order for it to work properly.

James M. Zeltinger
Omaha, NE

Oops!

In my review of Basic-09 (HOT CoCo, Aug. 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 thing to program, but I have friends in Mexico, Spanish. It's probably much too complicated a

You might type a letter in English and print it out in Spanish, but evidently are far from a workable solution.

Let me type a letter in English and print it out in Spanish, but the grammar of the translated sentence would be all wrong, and the semantics and nuances would be completely lost.

HOT CoCo

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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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."

Cassette $29.95 Disc $32.95

ORDER ENTRY SYSTEM

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."

The Mark Data Products sales order processing system provides a fast, efficient means to enter orders, print shipping papers and invoices, prepare sales reports, and maintain receivables. The system automatically enhances the monitor screen to a 51 character by 24 line display. 32K of memory is required along with a 80-column printer and one or more disc drives.

The MDP Order Entry System is a family of programs which operate interactively by means of a "menu" selection scheme. Up to 900 products may be defined and a single disc system can hold over 600 transactions. When the operator selects a task to be performed, the computer loads a program designed to handle that task from the system disc. The system disc contains all of the programs required to create, update and maintain data files and prepare the necessary paperwork including shipping and invoice forms, daily sales reports, a monthly (or other period) sales report and a receivables report.

This order entry software equals or exceeds higher priced packages for other computers and includes a detailed operating manual. ONLY $99.95

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- Sorting! Yes! EASY-FILE allows you to sort up to 5 levels of data and allows you to define upper and lower limits as well. You can sort in many different ways and save the results in individual index files. These index files may be used later to determine what will appear on your printed reports.
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The Basic Beat

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 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 HOT COCO."

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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4K RAM
Color Basic
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control action, how about programming joysticks? There are two joy-
sticks, 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

---

**The Basic Beat**

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<table>
<thead>
<tr>
<th>Program Listing 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 X=0;Y=15</td>
</tr>
<tr>
<td>30 IF X=63 THEN GOTO 10</td>
</tr>
<tr>
<td>50 GOTO20</td>
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<thead>
<tr>
<th>Program Listing 2</th>
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<tbody>
<tr>
<td>10 C=3</td>
</tr>
<tr>
<td>20 X=0;Y=15</td>
</tr>
<tr>
<td>30 A=INKEYS</td>
</tr>
<tr>
<td>40 IF A&lt;0 THEN 50 ELSE 60</td>
</tr>
<tr>
<td>50 IF C&lt;3 THEN C=C+4 ELSE C=C-3</td>
</tr>
<tr>
<td>60 SET(X,Y,C)</td>
</tr>
<tr>
<td>70 IF X=63 THEN 20</td>
</tr>
<tr>
<td>80 X=X+1;GOTO 3B</td>
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<thead>
<tr>
<th>Program Listing 3</th>
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</thead>
<tbody>
<tr>
<td>10 A$=&quot;Z&quot;;B$=&quot;3&quot;</td>
</tr>
<tr>
<td>20 PRINTA$+B$</td>
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<tr>
<th>Program Listing 4</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 A=4:B=3:C=5</td>
</tr>
<tr>
<td>30 A$=&quot;HOT&quot;;B$=&quot;COCO&quot;</td>
</tr>
<tr>
<td>40 PRINTA$+C$</td>
</tr>
<tr>
<td>50 PRINTA$+B$</td>
</tr>
<tr>
<td>60 PRINT</td>
</tr>
<tr>
<td>70 FOR A=1 TO 6</td>
</tr>
<tr>
<td>80 CS=C$+A$;NEXTA</td>
</tr>
<tr>
<td>90 PRINTCS$+B$</td>
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<tr>
<th>Program Listing 5</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 PRINT&quot;TYPE&quot;</td>
</tr>
<tr>
<td>30 A$=INKEYS:IF A$=&quot;&quot; THEN 30</td>
</tr>
<tr>
<td>40 FOR A=1 TO 166</td>
</tr>
<tr>
<td>50 PRINT&quot;HA&quot;</td>
</tr>
<tr>
<td>60 NEXTA</td>
</tr>
<tr>
<td>70 GOTO10</td>
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</tbody>
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<tr>
<th>Program Listing 6</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 PRINTJOYSTK(0);</td>
</tr>
<tr>
<td>30 PRINTJOYSTK(1);</td>
</tr>
<tr>
<td>40 PRINTJOYSTK(2);</td>
</tr>
<tr>
<td>50 PRINTJOYSTK(3);</td>
</tr>
<tr>
<td>60 GOTO20</td>
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<tr>
<th>Program Listing 7</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 X=JOYSTK(0);Y=JOYSTK(1)</td>
</tr>
<tr>
<td>30 Y=Y/2</td>
</tr>
<tr>
<td>40 SET(X,Y,B);GOTO20</td>
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<tr>
<th>Program Listing 8</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 X=JOYSTK(0);Y=JOYSTK(1)</td>
</tr>
<tr>
<td>30 W=W+1</td>
</tr>
<tr>
<td>40 PRINT&quot;UP&quot;</td>
</tr>
<tr>
<td>50 PRINT&quot;LEFT A D RIGHT&quot;</td>
</tr>
<tr>
<td>60 PRINT&quot;X&quot;</td>
</tr>
<tr>
<td>70 PRINT&quot;DOWN&quot;</td>
</tr>
<tr>
<td>80 PRINT&quot;GAME ENDS WHEN YOU HIT A NY&quot;</td>
</tr>
<tr>
<td>90 PRINT&quot;COLORED AREA. GOOD LUCK!&quot;</td>
</tr>
<tr>
<td>100 FORA=1 TO 166</td>
</tr>
<tr>
<td>110 X=32:Y=16:A$=&quot;D&quot;</td>
</tr>
<tr>
<td>120 X=X+1:GOTO20</td>
</tr>
<tr>
<td>130 X=JOYSTK(1) ;Y=JOYSTK(0)</td>
</tr>
<tr>
<td>140 CLS</td>
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<tr>
<th>Program Listing 9</th>
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<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 A=JOYSTK(0);B=JOYSTK(1)</td>
</tr>
<tr>
<td>30 IF A&gt;40 THEN X=X+1:IF X&gt;63 THEN EN X=63</td>
</tr>
<tr>
<td>40 IF A&lt;40 THEN X=X-1:IF X&lt;0 THEN N X=0</td>
</tr>
<tr>
<td>50 IF B&lt;20 THEN Y=Y-1:IF Y&lt;0 THEN N Y=0</td>
</tr>
<tr>
<td>60 IF B&gt;40 THEN Y=Y+1:IF Y&gt;31 THEN EN Y=31</td>
</tr>
<tr>
<td>70 SET(X,Y,B);GOTO20</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Program Listing 10</th>
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</thead>
<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 PRINT&quot;USE THE RIGHT JOYSTICK T O &quot;</td>
</tr>
</tbody>
</table>
| 30 PRINT"CONTROL YOUR LINE'S DIRE CTION."
| 40 PRINT"GAME ENDS WHEN YOU HIT A NY" |
| 90 PRINT"COLORED AREA. GOOD LUCK!" |
| 100 FORA=1 TO 166   |
| 110 X=32:Y=16       |
| 120 X=X+1:GOTO20    |
| 130 X=JOYSTK(1) ;Y=JOYSTK(0)    |
| 140 CLS            |

<table>
<thead>
<tr>
<th>Program Listing 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 CLS</td>
</tr>
<tr>
<td>20 PRINTPEEK(65280)</td>
</tr>
<tr>
<td>30 GOTO10</td>
</tr>
</tbody>
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See List of Advertisers on page 97

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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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The Basic Beat

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Telewriter-64

**THE ORIGINAL**

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a full 51 column screen, 24 lines of text, and since hyphenation is the most frequent job of word processors, Telewriter makes absolutely sure you don't run into a hyphenation problem; in fact, more than enough on-screen space is provided. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

**FEATURES & SPECIFICATIONS:**

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Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-grapics, etc.

Dynamic [embedded] format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

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One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple. Since short lines are the reason for the large spaces often found in standard right justified text, and since Telewriter's chain printing feature means that short lines are not a problem, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

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You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

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Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

...truly a state of the art word processor... outstanding in every respect.

— The RAINBOW, Jan. 1982

**TELEWRITER-64**

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.
VIP Calc: Multi-Features, Moderate Price

This spreadsheet offers unusual features and compatibility with the rest of the VIP library.

VIP Calc
Softlaw Corp.
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$59.95 cassette or disk

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

VIP Calc, then, is a program for 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.

The program can automatically adjust these references, so it can use the same formula to carry out calculations for an entire range of cells. A variety of preprogrammed functions help you set up complex calculations and automatically recompute the entire sheet whenever you change any input data.

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 choices: 51, 64, or 85 characters on either 21 or 24 lines, drawn in high-resolution graphics. You can also choose from two different character
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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 worksheet. 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
To all our readers and customers...

...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.

Our project team spends countless hours designing, developing and testing our fine products. Well beyond the call of duty, they spend their hours eating and breathing their work. Forty hour marathon shifts not uncommon, they're undoubtedly North America's MOST gifted Color Computer team, having developed products that are precedent setting across the computer world. They are the backbone of our company, however the credit for their work could not be realized without the expertise of our sales staff. Our sales staff spends more time learning and understanding our products than they do marketing. They spend many personal hours studying our products in relation to you, the customer. They provide the link between the products and you. They were selected for their skills and friendliness to the customer. They bend over backwards to help you understand our products, and serve you in your needs.

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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 forebearance 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...

Robert Sajo
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 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.

"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."
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Tools of the Assembly Programming Trade

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 to machine-language (binary) object code.
- ZBug—a machine-language monitor, debugger, and disassembler that lets you run your object-code program, halting at 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—their source-code listing.

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 $C000-$FEEF 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 EDTASM, 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 $A42E, 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 while in Microsoft Disk Basic (not the EDTASM DOS), and save it on the EDTASM disk.

```basic
10 PCLEAR 1
20 CLEAR0, &H62FF
30 INPUT "INSERT DISK WITH BINARY FILE AND ENTER FILE NAME OR TYPE NO TO RUN ZBUG WITHOUT LOADING OTHER FILE"; AS
40 IF AS = "NO" THEN 60
50 LOADM A$;
60 INPUT "INSERT EDTASM DISK AND HIT ENTER"; J
70 LOADM"ZBUG", &H4FOO
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 mention 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.
BUT...CHECKERBOARDS ARE FOR TABLECLOTHS!

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TMS-80 is a trademark of Tandy Corporation
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 create 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.

Program Listing. QType (change all underline characters to up-arrows when typing this in).
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HOT CoCo • PO Box 975 • Farmingdale, NY 11737 34NF4
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 dispersion—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.

System Requirements
16K RAM
Extended Color Basic
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:

$$(\text{Square wave of period } X) = \sin(X) + \frac{1}{3}\sin(3X) + \frac{1}{5}\sin(5X) + \ldots$$

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.

$$f(t) = \begin{cases} 1 & \text{for } 0 \leq t \leq 100 \times 10^1(-9) \\ 0 & \text{otherwise} \end{cases}$$

and had a duration of 100 x $10^1(-9)$ 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 results 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 $1 \times 10^1(-9)$ 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 1016 where it should have been exactly one, and by a few parts in 1017 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 1017, 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-
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 $\pm 1$ 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 explanation, 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 shortend 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 output of the second pass, which reconstructs the pulse.

**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 | 3.7361344E-09 | 1.3334397E-09 |

---

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

HOT CoCo November 1984 35
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 9.20% 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 11.25% 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 invested $45,000 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) \( A = P(1 + R)^N \)
(2) \( P = A/(1 + R)^N \)
(3) \( Y = (\log A - \log P)/\log(1 + R)/T \)
(4) \( A = (P((1 + R)^N - 1))/R \)
(5) \( P = A*R/(1 + R)^N - 1) \)
(6) \( Y = (\log(A*R + P) - \log P)/\log(1 + R)/T \)
(7) \( P = A(1 - (1 + R)/N)/R \)
(8) \( A = R*P/(1 - (1/(1 + R)*N)) \)
(9) \( Y = (\log A - \log(A - R*P))/\log(1 + R)*T \)
(10) \( P = A*(1 - (1 + R)/N)/R \)
(11) \( A = R*P/(1 - (1/(1 + R)*N) \)
(12) \( Y = (\log A - \log(A - R*P))/\log(1 + R)*T \)
(13) \( R1 = [(1 + R2/T2)(A/T2/T1)] - 1)*T1 \)
(14) \( T2 = R1*(1 - TB) \)

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

Listing continued
NRI gives you ALL the training you’ll need to repair ALL microcomputers.

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But for the NRI-trained computer service technician, a down computer can mean higher earnings or even the opportunity to start a profitable business.

Fixing computers: fastest growing occupation in the U.S.

Whether the flaw is in a circuit board, a disk drive or a printer, everybody wants it fixed—fast.

The U.S. Department of Labor recently projected that the number of computer service jobs will double before 1995. Median earnings of full-time computer service technicians are $430 per week.

The trained computer technician can choose between: working for a large corporation or an independent; making office calls or staying in the shop; working for a retailer or for a specialized service firm—even starting his own computer repair business.

Total System Training from NRI.

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H 1/"T
1440 INPUT"YEAR":A
1450 P=A*(1+(1-R)*(-N))/R
1460 GOSUB238:K=N*A-P:GOSUB240
1470 PRINT"LOAN AMOUNT ";
1490 GOSUB558:PRINT"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 AND WISH TO HAVE A MONTHLY INCOME OF $988?
1500 GOSUB168:GOSUB539:GOSUB168:GOSUB240
1510 GOSUB280:GOSUB168:GOSUB168:GOSUB168
1520 GOSUB168:GOSUB168
1530 A=R*P/(1-(1/(1+R)^N))
1540 GOSUB380:GOSUB268:GOSUB380
1550 PRINT"PAYMENTS MUST BE ";
1560 B=K
1570 PRINT"EVERY 1/"T" YEAR"
1580 K=P:GOSUB240:GOSUB240:GOSUB240:GOSUB240
1590 GOSUB258:PRINT"HOW LONG WILL IT TAKE TO PAY OFF A LOAN OF $185 WITH 12% ANNUAL INTEREST RATE?"
1600 GOSUB168:GOSUB539:GOSUB168:GOSUB168
1610 GOSUB60:PRINT"PAYMENT EACH 1/"T" YEAR ";
1620 Y=(LOG(A)-(LOG(A-R*P))/LOG(1+R)):N=Y*T
1630 GOSUB238:K=N*A-P:GOSUB258:GOSUB258
1640 PRINT"TIME REQUIRED "Y" YEARS"
1650 GOSUB270:B=A:B:GOSUB380:GOTO1630
1660 GOSUB558:PRINT"WHAT PERCENT ANNUAL INTEREST RATE, COMPOUNDED 2 TIMES A YEAR, MUST YOU GET IN ORDER TO EQUAL THE INCOME OF $988 ANNUAL RATE COMPOUNDED 1.2 TIMES A YEAR?"
1670 GOSUB168:GOSUB570
1680 PRINT;INPUT"KNOWN INT. RATE (6%=.06) ";R2
1690 PRINT"HOW MANY TIMES A YEAR IS THE KNOWN INTEREST RATE COMPOUNDED?"
1700 PRINT"HOW MANY TIMES A YEAR IS THE UNKNOWN INTEREST RATE COMPOUNDED?"
1710 R1=((1+R2/2)/(2-T1)/T1)
1720 PRINT;"IT IS EQUIVALENT TO A RATE OF "R1*OR"R1*100%"
1730 PRINT;INPUT"ENTER FOR MEN U";B$;GOTO10
1740 GOSUB558:PRINT"WHAT TAX-FREE RATE IF YOU ARE IN THE 32 PERCENT INCOME TAX BRACKET?"
1750 GOSUB168:GOSUB539
1760 PRINT;"TAXABLE INCOME RATE (6%=.06) ";R1
1770 PRINT;"YOUR TAX BRACKET (27%=.27)";TB:R2=R1*(1-TB)
1780 PRINT;"PRINT THAT IS EQUAL TO A TAX-FREE RATE OF R2*OR"R2*100%*R2 
1790 GOTO1730

END
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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.
<table>
<thead>
<tr>
<th>1983 unit sales</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
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Continued from p 42

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1000 35 10 00200 PULS X  
1002 BF 1297 00210 STX SAVE  
1002 10173 00220 BEGIN JSR CLS  
1006 CE 040C 00230 LDJ #540C  
1008 EE 1240 00240 LDJ #$M0  
100C BD 1080 00250 JSR PRNT WRITE TO SCREEN  
1010 CE 054B 00260 LOU #$54AB  
1014 BD 1070 00270 JSR PRINT SCREEN ADD  
1017 CE 0588 00280 LOU #$588B  
101A BD 1180 00290 JSR PRINT WRITE TO SCREEN  
101D CE 0080 002A0 JSR WAIT WAIT FOR REPLY  
1020 C6 02 002B0 LDB #2  
1023 BD 112C 002C0 JSR DSKJ DIRECTORY  
1026 B5 138B 002D0 LDA B3  
1028 B2 15A3 002E0 CMPA #FF  
102C BD 1137 002F0 LSR LOCKED disk is locked  
102F BD 1173 00300 JSR CLS CLEAR SCREEN  
1033 CE 0040 00310 LDA B12  
1036 B0 CE 1D36 00320 LDX #PASS TXT ADD  
1039 BD 1180 00330 JSR PRNT WRITE TO SCREEN  
103C B3 0420 00340 LDX $FF  
103F B7 1297 00350 STA ECHO  
1042 BD 110E 00360 JSR INPUT stdin password  
1045 BD 118C 00370 JSR DSKJ READ GAME TABLE  
1048 BD 1123 00380 LDA #380 second dir entry  
104B BD 1180 00390 JSR PRINT ADDR DATA  
104E BD 110C 003A0 LDA B44  
1051 BD 1180 003B0 JSR PRNT WRITE TO SCREEN  
1054 BD 1180 003C0 JSR ADDR ADDR ADDR  
1057 BD 1180 003D0 JSR ADDR ADDR ADDR  
105A BD 1180 003E0 JSR ADDR ADDR ADDR  
105D BD 1180 003F0 JSR ADDR ADDR ADDR  

Listing 2 continued

For listing 2, please refer to the next page.
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--- See List of Advertisers on page 97 ---
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 Flashcards 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 coroutine must include break points where
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 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 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
```

<table>
<thead>
<tr>
<th>Condition</th>
<th>PEEK(65280)</th>
</tr>
</thead>
<tbody>
<tr>
<td>neither button pushed</td>
<td>235</td>
</tr>
<tr>
<td>right button pushed</td>
<td>254</td>
</tr>
<tr>
<td>left button pushed</td>
<td>253</td>
</tr>
<tr>
<td>both buttons pushed</td>
<td>252</td>
</tr>
</tbody>
</table>

*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 \( A$ = "YES" \). However, IF can be followed by any numeric expression. The statement \( \text{IF } X + 2 \text{ THEN 680} \) 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 \(-32768 \text{ and } 32767\) 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.
REM FLASH CARDS BY DAVID HERD IN 1983
20 BL$="STRI NG(S,2,128) Q0=0:Q1=5:Q2=0:Q3=5
M0=120:RE M0=100:RE M0=100:RE M0=100:RE M0=100:RE M0=100:RE M0=100:RE M0=100:
4:REM CHOOSE AD DITION, SUB T
12:REM CHOOSE AD DITION, SUB T
260 PRINT@O0,A0;"-";B0;:G OTO 320
240 GOTO 320
FOR RIGHT PLA YER. P0 HOLDS VA LUE
80 REM BEGIN COROU TINE FOR LEFT
190 P0=1:0 N P0 GOTO 550
L0=190:G0 T0 550
1=2:IF J2<43 THEN J2=43
230 PRINT@A0,"+";B0;
450 IF M0 <1000 THEN M0=10*M0+ L0 :
470 REM SET LEFT ANSWER NO=0 AND PUT CUR
510 I= L(0,L0) :P OKE I,P EEK(I)+6 4:
750:REM RV SITCH TO COROU TINE
80 REM ALIGNMENT OF NEW PROBLEM ON
140 PRINT@F,W $; :T IME =0
160 PRINT@F,N$(P P) ;: TIMER =0
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 into 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.

System Requirements

16K RAM
Color, Disk, or Extended Color Basic

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
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 = USRO(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
Program Listing 1

5 CLS
6 FOR I=1 TO 100: DS=DS+CHR$(144): NEXT I

10 PRINT 2811,CHR$(255)+LEFT$(DS,5)+CHR$(245)+CHR$(250):
20 PRINT 2822,CHR$(241)+CHR$(254)+LEFT$(DS,4)+CHR$(241)+CHR$(247):
30 PRINT 2864,CHR$(211)+CHR$(211)+CHR$(211)+CHR$(211):
40 PRINT 2896,CHR$(223)+CHR$(223)+CHR$(219)+CHR$(219):
50 PRINT 2914,CHR$(241)+CHR$(247)+CHR$(247)+CHR$(247):
60 PRINT 3282,CHR$(254)+CHR$(254)+CHR$(254)+CHR$(254):
70 PRINT 3621,CHR$(253)+CHR$(254)+LEFT$(DS,5):
80 PRINT 2824,CHR$(159)+CHR$(159)+CHR$(159)+CHR$(159)+CHR$(159):
90 PRINT 2824,CHR$(144)+CHR$(144)+CHR$(144)+CHR$(144)+CHR$(144):
10 PRINT 2835,CHR$(245)+LEFT$(DS,7):
11 PRINT 2846,CHR$(255)+LEFT$(DS,5)+CHR$(245)+CHR$(245)+CHR$(245):
12 PRINT 2859,CHR$(253)+CHR$(253)+CHR$(253)+CHR$(253)+CHR$(253):
13 PRINT 2869,CHR$(254)+CHR$(254)+CHR$(254)+CHR$(254)+CHR$(254):
14 PRINT 2879,CHR$(255)+CHR$(255)+CHR$(255)+CHR$(255)+CHR$(255):
15 PRINT 2889,CHR$(256)+CHR$(256)+CHR$(256)+CHR$(256)+CHR$(256):
16 PRINT 2899,CHR$(257)+CHR$(257)+CHR$(257)+CHR$(257)+CHR$(257):
17 PRINT 3212,CHR$(258)+CHR$(258)+CHR$(258)+CHR$(258)+CHR$(258):
18 PRINT 3617,CHR$(259)+CHR$(259)+CHR$(259)+CHR$(259)+CHR$(259):
19 PRINT 3812,CHR$(260)+CHR$(260)+CHR$(260)+CHR$(260)+CHR$(260):
20 PRINT 4017,CHR$(261)+CHR$(261)+CHR$(261)+CHR$(261)+CHR$(261):
21 END

Program Listing 2

4 CLEAR: FOR I=1 TO 100: DS=DS+CHR$(144): NEXT I
TA: FOR I=1 TO 100: BS=BS+CHR$(175): NEXT I
10 PRINT 2812,CHR$(245)+LEFT$(DS,7):
20 PRINT 3681,CHR$(255)+LEFT$(DS,5):
30 PRINT 2895,CHR$(255)+CHR$(242)+CHR$(255):
40 PRINT 2896,CHR$(255)+LEFT$(DS,5):
50 PRINT 2897,CHR$(255)+CHR$(242)+CHR$(255):
60 PRINT 2898,CHR$(255)+CHR$(242)+CHR$(255):
70 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
80 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
90 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
10 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
11 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
12 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
13 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
14 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
15 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
16 PRINT 2899,CHR$(255)+CHR$(242)+CHR$(255):
17 END

23CLS
24PRINT "ENTER ANOTHER SCREEN"
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.
NEW GOOD STUFF FOR EVERY COLOR COMPUTER

Turn your Color Computer into a graphic design center with the ease of a keystroke! MagiGraph makes it simple to create highly detailed figures up to and including an entire high-resolution screen. Designed for those with some experience in Basic and Assembly Language programming, MagiGraph includes lots of special features.

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By Kevin Dooley. Cassette $34.95 (16K required); Disk $39.95 (32K Extended Color BASIC required); Admisk cartridge $44.95.

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 (SOS-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. DBBUG is a machine language monitor which allows examining and altering of memory, setting breakpoints, etc.

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SOS-80C: SOFTWARE DEVELOPMENT SYSTEM—Our famous editor, assembler and monitor in Rompack. Like MACRO-80C, it allows the user to write, assemble and debug assembly language programs with no reloading, object patching or other hassles. Supports fully debugged instruction set. Complete manual included. $83.95

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- Faster to program in than Basic.
- Easier to learn than Assembly Language.
- Executes in less time than Basic.

The MICRO WORKS COLOR FORTH is a Rompack containing everything you need to run FORTH on your Color Computer. COLOR FORTH consists of the standard FORTH Interchange Group (FIG) implementation of the language plus most of FORTH-79. It has a super screen editor with split screen display. Mask storage is on cassette. COLOR FORTH also contains a decompiler and other aids for learning the inner workings of this fascinating language. It will run on 4K, 16K, and 32K computers. COLOR FORTH contains 10K of ROM, leaving your RAM for your programs; There are simple words to effectively use the Hi-Res Color Computer graphics, joysticks, and sound.

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

MIRROR 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

MIRROR ROM: The same program as above, supplied on 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 1. 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

HARDWARE

PARALLEL PRINTER INTERFACE—Serial to parallel converter allows use of all standard parallel printers. P80C plugs into the serial output port, leaving your Rompack slot free. You supply the compatible P80C: $59.95

SUPER-PRO KEYBOARD—$69.95 (For computers manufactured after Oct. 1982, add $4.95)

ROMLESS PACKS for your custom EPROMs — call or write for information.

BOOKS

6809 ASSEMBLY LANGUAGE PROGRAMMING, by Lance Leventhal. $18.95

TR-80 COLOR COMPUTER GRAPHICS, by Don Inman. $14.95

ASSEMBLY LANGUAGE GRAPHICS FOR THE TRS-80 COLOR COMPUTER, by Don Inman. $14.95

STARTING FORTH, by L. Brodie. $17.95

GAMES

ZAXXON—The real thing. Excellent. What more can we say? Cassette requires 32K. $39.95

STAR BLASTER—Blow your way through an asteroid field in this action-packed Hi-Res graphics game. Available in ROMPACK; requires 16K. $39.95

PAC ATTACK—Try your hand at this challenging game by Computerware, with fantastic graphics, sound and action! Cassette requires 16K. $24.95

HAYWIRE—Have fun zapping robots with this Hi-Res game by Mark Data Products. Cassette requires 16K. $24.95

ADVENTURE—Black Sanctum and Calixto Island by Mark Data Products. Each cassette requires 16K. $19.95 each.

CAVE HUNTER—Experience vivid colors, bizarre sounds and eerie creatures as you wind your way through a cave maze in search of gold treasures. This exciting Hi-Res game by Mark Data Products requires 16K for cassette version. $24.95

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: $64.95.
5 CLS
6 FOR A=1 TO 10: D$=CHR$(144): NEXT TA
10 PRINT A,CHR$(255)+CHR$(255)+CHR$(249)+LEFT$(10,10): D$=D$+CHR$(144): NEXT A
20 PRINT D$: PRINT "A": NEXT A
30 PRINT @2000,CHR$(144)+CHR$(255): PRINT "A": NEXT A
40 PRINT "A": NEXT A
50 IF A=10 THEN 10
60 GOTO 20
70 NEXT A

5 CLS
6 FOR A=1 TO 10: D$=CHR$(144): NEXT TA
10 PRINT A,CHR$(255)+CHR$(255)+CHR$(249)+LEFT$(10,10): D$=D$+CHR$(144): NEXT A
20 PRINT D$: PRINT "A": NEXT A
30 PRINT @2000,CHR$(144)+CHR$(255): PRINT "A": NEXT A
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20 PRINT D$: PRINT "A": NEXT A
30 PRINT @2000,CHR$(144)+CHR$(255): PRINT "A": NEXT A
40 PRINT "A": NEXT A
50 IF A=10 THEN 10
60 GOTO 20
70 NEXT A

Program Listing 9

Program Listing 10

5 CLS
6 FOR A=1 TO 10: D$=CHR$(144): NEXT TA
10 PRINT A,CHR$(255)+CHR$(255)+CHR$(249)+LEFT$(10,10): D$=D$+CHR$(144): NEXT A
20 PRINT D$: PRINT "A": NEXT A
30 PRINT @2000,CHR$(144)+CHR$(255): PRINT "A": NEXT A
40 PRINT "A": NEXT A
50 IF A=10 THEN 10
60 GOTO 20
70 NEXT A

Program Listing 11

Program Listing 12
SELECTED SOFTWARE
FOR THE COLOR COMPUTER

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Complete solders kits with easy-to-follow instructions.
4K-16K FOR ALL BOARDS $19.95
32K FOR ALL BOARDS $29.95
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NOTE: All ICs used in our kits are first quality 200nS Prime Chips and carry one year warranty.

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Program Listing 15

```plaintext
30 DATA 38,244,57
40 DATA 166,167,168,167,168
50 DATA 164,167,168,167,168
60 DATA 164,167,168,167,168
70 DATA 164,167,168,167,168
80 DATA 164,167,168,167,168
90 DATA 164,167,168,167,168
```

Program Listing 16

```plaintext
30 DATA 38,244,57
40 DATA 166,167,168,167,168
50 DATA 164,167,168,167,168
60 DATA 164,167,168,167,168
70 DATA 164,167,168,167,168
80 DATA 164,167,168,167,168
90 DATA 164,167,168,167,168
```

Program Listing 17

```plaintext
90 FOR RC=1:FORE=0:STEP=1.0:CLESE:
SOUND.1:NEXT:IF RC=3 THEN 130 ELSE:
F0R-POTE404STEP32:PRINT0,A,B:
L$:NEXT:GOTO69
100 CLS:FORA=130STEP-1:SET(A,11)
NEXT:FORA=130STEP1:SET(A,13),11
NEXT:FORA=200STEP-1:SET(A,13)
NEXT:FORA=200STEP1:SET(A,13)
```

Program Listing 18

```plaintext
10 CLEAR288,767.DEPUSR=76717:CL
50 5
60 GOTO5
70 FORA=16320T32STEP-32:S=USR(1):I:
PEEK(343)+24THENPOKE343
80 FORA=16320T32STEP-32:S=USR(1):I:
PEEK(343)+24THENPOKE343
90 FORA=16320T32STEP-32:S=USR(1):I:
PEEK(343)+24THENPOKE343
100 FORA=16320T32STEP-32:S=USR(1):I:
PEEK(343)+24THENPOKE343
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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.

Table 1. MC-10 and Color Basic Conversion

---

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, 540, 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

---

62 HOT CoCo November 1984
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 gallon conversion. With this feature, you will see the three systems on your screen at one time.

Table I lists the changes needed to make Metric Converter run under Color 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.
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 * 3.1415: 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
Fine tune your Basic programs with the TIMER function to make them run better and faster.

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

The 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
NEX

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.
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 variables. 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 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/С1. 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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FLEX trademark Technical Systems Consultants. OS/9 trademark Microware.
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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ANATOMY OF AN ASSEMBLY-LANGUAGE GAME

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:

<table>
<thead>
<tr>
<th>Part</th>
<th>Start Address</th>
<th>End Address</th>
<th>Execute Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$600</td>
<td>$1DFF</td>
<td>$600</td>
</tr>
<tr>
<td>2</td>
<td>$1E00</td>
<td>$256E</td>
<td>$1E00</td>
</tr>
<tr>
<td>3</td>
<td>$256F</td>
<td>$2B7A</td>
<td>$256F</td>
</tr>
<tr>
<td>4</td>
<td>$2B7B</td>
<td>$2E70</td>
<td>$2B7B</td>
</tr>
<tr>
<td>5</td>
<td>$2E71</td>
<td>$3579</td>
<td>$2E71</td>
</tr>
<tr>
<td>6</td>
<td>$357A</td>
<td>$3C9C</td>
<td>$357A</td>
</tr>
</tbody>
</table>

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 CSAVE "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
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.
BFROG: The data for all the frogs on white backgrounds (Part 2)
BFROG: The data for all the frogs on blue 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)
SONG2: Sound effect (Part 2)
SONG3: Sound effect (Part 2)
SONG4: Blank area for sound effects (Part 2)
SWICH1: Switch to graphics screen (Part 3)
SWICH2: Switch to score screen (Part 3)
MOV: 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)
DMOVE: Move the frog one and a half places up (Part 3)
DMOV: Move the frog one and a half places down (Part 3)
GET: 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)
BFROG: 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 3)
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

Listing 1 continued
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Above cases available in Grey or Off White.
Data connectors are gold plated.

LIBRARY CASE
By Ring King, holds 70.25 in. diskettes, key lock. 7 dividers, smoked acrylic case.

DISSER DISK BANK by Media Mate not shown, holds 50 diskettes, smoked acrylic case.

SUPER-DISK CHARGER
This software modifies RS-DOS to support double sided drives and speeds of 12 to 8ms track to track. Works with either 1.0 or 1.1 ROM. Reviewed in September HotCoco magazine, page 101.

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Listing 1 continued

```
3BFF 26 04 06810 BNE NQU10
3C0 86 05 06820 LDA #5
3C0 23 02 06830 BRA EQU
3C0 85 02 06840 NQU10 CMPA #2
3C0 27 04 06850 BNE NQU11
3C0 86 04 06860 LDA #4
3C0 20 0A 06870 BRA EQU
3C0 81 03 06880 NQU11 CMPA #3
3C0 26 04 06890 BNE NQU12
3C1 21 02 06900 LDA #2
3C1 21 02 06910 BRA EQU
3C1 86 01 06920 NQU12 LDA #4
3C1 77 3F71 06930 EQU LOOP16241
3C1 C6 08 06940 LDB #0
3C1 BE 0900 06950 LOOP100 LDX #0
3C1 F0 01 06960 LOOP10 PEA 1.X
3C2 8C 0800 06970 CMPA $8000
3C2 24 26 0F 06980 BRA LDP100
3C2 6C 09 06990 INCX
3C2 F7 03F1 07000 CMPF CMFP 16241
3C2 A 00 07010 BNE LOOP11
3C3 39 07020 RET RTS
3C4 9D FC 39A9 07030 CHECK4 LDP 16297 CHECK IF FROG
3C5 B3 0140 07040 SUBD #120 IS JUMPING ONTO
3C6 B3 0F3A 07050 BLO CMFP #1201 SET OF TURTLES
3C6 10A3 2E 07060 CMPD $X UNDERHAND AND
3C6 20 1F 07070 BHI CHECKS ACT ACCORDINGLY
3C6 33 0007 07080 ADD #7
3C6 10A3 84 07090 CMPD $X
3C6 10D5 FB3C 07260 LBLO ECCHK4
3C7 61 3F9F 07270 LDA #16263
3C7 41 08 07280 BNE CMFP #8
3C7 22 0A 07290 BRA SAFE5
3C7 8B 01 07300 CMPX JMP
3C7 A5 08 07310 BRA SAFE5
3C7 BC BD 2947 07320 JSR MOVED
3C7 5C 07F7 07330 BRA MOVED
3C8 6E 09 07340 BRA SAFE5
3C8 6E 09 07350 CMPA #9 A CAR
3C9 86 87 07360 CMPA #9 IS contains
3C9 86 81 07370 CMPF #9
3C9 86 09 07380 BNE NBF MP13 WHERE THE FROG
3C9 26 02 07390 BRA SAFE5
3C9 77 20 07420 BRA SAFE5
3C9 7 0C 07430 NSAFE INC 16263
3C9 39 07440 SAFE6 RTS
3C9 39 07450 END BGIN
```

**Program Listing 2 Disk Append**
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 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 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.

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

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With the new instant CoCo, we’ll deal you the BEST programs—plus a great deal more!
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 Coella 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 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
The DOSsier

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: Wordwrap, justification, and text insertion versus overtyping at the cursor position.

By way of comparison, WordStar 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 (A) 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 AS, AD, AE, or AX 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. AQ 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 AB commands for marking, moving, copying, and deleting blocks of text; the AK series governs justification, centering, and the setting of tabs and margins, while the APs are involved with print control. The AP 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: AR moves the cursor up by one screen, AQ-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 mailmerge, 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 word wrap 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 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...”

"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..."

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

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

by Charles H. Santee
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 CABBACA.

The program then picks each character from the string one at a time, converts the character to a numeric presentation, 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 content, 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 10 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.

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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.

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?

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. 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:

<table>
<thead>
<tr>
<th>Address Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000-001F</td>
<td>Internal RAM</td>
</tr>
<tr>
<td>0080-00FF</td>
<td>Direct page RAM</td>
</tr>
<tr>
<td>0093-4</td>
<td>Start of Basic</td>
</tr>
<tr>
<td>0095-6</td>
<td>Start of variables</td>
</tr>
<tr>
<td>009B-C</td>
<td>Top of System Stack</td>
</tr>
<tr>
<td>00A1-2</td>
<td>Top of user RAM</td>
</tr>
<tr>
<td>00AD-E</td>
<td>Next line to be executed</td>
</tr>
<tr>
<td>00E8</td>
<td>DEVNUM</td>
</tr>
<tr>
<td>00EA</td>
<td>Reset flag</td>
</tr>
<tr>
<td>0100-3FFF</td>
<td>Not used</td>
</tr>
<tr>
<td>4000-54FF</td>
<td>Basic's screen RAM</td>
</tr>
<tr>
<td>5420-54284</td>
<td>System use</td>
</tr>
<tr>
<td>4224</td>
<td>Base rate</td>
</tr>
<tr>
<td>421F-20</td>
<td>EXEC address</td>
</tr>
<tr>
<td>4280-1</td>
<td>Cursor position</td>
</tr>
<tr>
<td>4229</td>
<td>Printer width</td>
</tr>
<tr>
<td>4231-6</td>
<td>Keyboard rollover table</td>
</tr>
<tr>
<td>4282</td>
<td>Cursor character:</td>
</tr>
<tr>
<td>4285-42AE</td>
<td>Hooks</td>
</tr>
<tr>
<td>42B0-4234</td>
<td>Keyboard buffer</td>
</tr>
<tr>
<td>4346-44F9</td>
<td>Basic area</td>
</tr>
<tr>
<td>4F9A-54FF</td>
<td>System stack (4K RAM)</td>
</tr>
<tr>
<td>5000-58FF</td>
<td>16K RAM upgrade area</td>
</tr>
<tr>
<td>8000</td>
<td>VDG and sound latch</td>
</tr>
<tr>
<td>8E00-5FFF</td>
<td>Basic ROM</td>
</tr>
<tr>
<td>8FDC-5FFED</td>
<td>ROM subroutine entry addresses</td>
</tr>
<tr>
<td>5FFD-5FFF</td>
<td>Interrupt vectors</td>
</tr>
</tbody>
</table>

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?

A There are a number of ways of saving machine-language programs to tape, but of course CSAVEM is the simplest. Alternatives include embedding 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:

<table>
<thead>
<tr>
<th>Address Range</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000-001F</td>
<td>Internal RAM</td>
</tr>
<tr>
<td>0080-00FF</td>
<td>Direct page RAM</td>
</tr>
<tr>
<td>0093-4</td>
<td>Start of Basic</td>
</tr>
<tr>
<td>0095-6</td>
<td>Start of variables</td>
</tr>
<tr>
<td>009B-C</td>
<td>Top of System Stack</td>
</tr>
<tr>
<td>00A1-2</td>
<td>Top of user RAM</td>
</tr>
<tr>
<td>00AD-E</td>
<td>Next line to be executed</td>
</tr>
<tr>
<td>00E8</td>
<td>DEVNUM</td>
</tr>
<tr>
<td>00EA</td>
<td>Reset flag</td>
</tr>
<tr>
<td>0100-3FFF</td>
<td>Not used</td>
</tr>
<tr>
<td>4000-54FF</td>
<td>Basic's screen RAM</td>
</tr>
<tr>
<td>5420-54284</td>
<td>System use</td>
</tr>
<tr>
<td>4224</td>
<td>Base rate</td>
</tr>
<tr>
<td>421F-20</td>
<td>EXEC address</td>
</tr>
<tr>
<td>4280-1</td>
<td>Cursor position</td>
</tr>
<tr>
<td>4229</td>
<td>Printer width</td>
</tr>
<tr>
<td>4231-6</td>
<td>Keyboard rollover table</td>
</tr>
<tr>
<td>4282</td>
<td>Cursor character:</td>
</tr>
<tr>
<td>4285-42AE</td>
<td>Hooks</td>
</tr>
<tr>
<td>42B0-4234</td>
<td>Keyboard buffer</td>
</tr>
<tr>
<td>4346-44F9</td>
<td>Basic area</td>
</tr>
<tr>
<td>4F9A-54FF</td>
<td>System stack (4K RAM)</td>
</tr>
<tr>
<td>5000-58FF</td>
<td>16K RAM upgrade area</td>
</tr>
<tr>
<td>8000</td>
<td>VDG and sound latch</td>
</tr>
<tr>
<td>8E00-5FFF</td>
<td>Basic ROM</td>
</tr>
<tr>
<td>8FDC-5FFED</td>
<td>ROM subroutine entry addresses</td>
</tr>
<tr>
<td>5FFD-5FFF</td>
<td>Interrupt vectors</td>
</tr>
</tbody>
</table>
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?

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.

A. 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.

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

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

Q. 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 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.

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.

The RF method of obtaining video from the computer depends on the correct cable? If you're a hacker, there have been several articles in 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.

1. U29 74L.S02
2. U11 74L.S138
3. The eight memory chips
4. SAM 74LS683
5. 6809
Basic Programs on the Word Processor

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

1. Renumber the line numbers of both programs so that they flow together (Program 1, lines 100-/Program 2, lines 1000-).
2. Load the programs on tape in the ASCII version ( CSAVE "Program 1", A / CSAVE "Program 2", A).
3. Load the two programs into the cassette Color Scripsit word-processing program. The lower line numbered program should be loaded first.
4. Remove all blank lines.
5. Set the text width to a number large enough so that wraparound does not occur. (I use 132 columns.)
6. Print (#5 on menu) the contents of Color Scripsit 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.
7. Load the program into Basic (CLOAD "Program").
8. Run the program to be sure there are no errors. At this point the program can be renumbered.
9. 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 Scripsit.

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

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:

1. System clock is slowed to 895KHz in the event you previously POKE'd 65495,0.
2. 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 POKE'd into memory. (I usually start at 10.)
3. 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.)
4. Increments the numeric suffix and PEEKs it into memory (Save option only).
5. 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 FN(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 FN(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
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 ingenuity of using subscripts for er-
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 subscripting 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 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.

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T

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 manipulates 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
coupIe of times, but the documenta­
tion clearly tells you what to do when
you make an error.
Since this is a Basic program, a sim­
ple 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 particu­
larly 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-pro­
cessing program. It can produce good-
looking copy with subscripts, super­
scripts, 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 gyra­
tions of changing command modes.
However, if you do a little word pro­
cessing and produce short documents,
then the Sun Reporter, especially at its
reasonable price, might be the program
for you.

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 gen­
erate reports that tell the financial
state of the investments at any given
moment. The programs let you or­
ganize and track up to 900 trans­
actions 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 re­
quire, although the programs are ac­
ceptable 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 informa­
tion, update transactions, and display
or print out reports on any or all trans­
actions. The 32K version has a pro­
gram to produce summaries of tax in­
formation 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 pro­
cedures. The disk includes demo pro­
grams to step the first-timer through
each phase of the system.
I found that after entering my meas­
dy little investments—12 shares of
Amalgamated Buggywhip and 16
shares of the Kettledrum Fund—I
could easily update file info and pro­
duce professional-looking reports that
let me know at a glance how right Will
Rogers was, and how far from his ad­
vise I strayed.

Performance
Fundfile can tell you virtually every­
things you might want to know about
your investments. After setting up the
original accounts, you can easily up­
date 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 run­
n ing one of the specialized reporting
programs, entering the information,
and viewing the report generated, the
program ends rather abruptly, with­
out taking you back to the main menu
and allowing you the choice of enter­
ing 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, Fund­
file responds with excellent reporting.
At any time, you can call up the cur­
rent 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. Fund­
file 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 dis­
plays a histogram (bar graph) of the
relative dollar values of each security
in your account, giving an easily
grasped picture of the current hold­
ings. 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 port­
folio list, a list of transactions by se­
curity (either current or historical),
dividend or interest records, a com­
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CW Communications/Peterborough
HOT CoCo
P.O. Box 975
Farmingdale, NY 11737

Please delete my name from mailing lists sent to other companies or organizations.

name__________________________________________
address________________________________________
city________________________state______zip________

See List of Advertisers on page 97
complete 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.

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**Mul-T-Screen**

Incentive Software
P.O. Box 323
Station B
London, Ontario N6A 4W1
519-681-0133
in the U.S.: P.O. Box 7281
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 sets.

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 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 printout 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$ 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
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.
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 re-locating 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.
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 (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...

“...and program 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.

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Reviews

Things, the text contains program listings on 16K machines. Among other things, it 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.

Summary

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 gnomes 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 realtime 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.

Golden Flutes and Great Escapes
Delton T. Horn
Dilithium Press
8285 S.W. Nimbus, Suite 151
Beaverton, OR 97005
503-646-2713
$9.95 softcover, 217 pp.
$24.95 Model III/4 game disk
$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.

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Summary

In spite of its documentation, the Intronic 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 ultraviolet 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.

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by Graham Heywood

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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.
A 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 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...
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 for obvious terms, and a decimal/binary/hex conversion table. The table extends from 0-71 (decimal), by the way. I have no idea why.

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.

![Application Software](image)

### 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**

**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.
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.

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?
"Way beyond anything you have ever seen for the CoCo"

That's a strong statement, we know. But wait until you see 'TALKHEAD'! It's a dazzling creation—easily the most impressive display of CoCo graphics you can buy!

If you have a 'REAL TALKER' voice synthesizer, DO NOT deprive yourself of this absolutely incredible Talking Head simulation program. TALKHEAD uses the 'Real Talker' and extremely high speed/high resolution machine language to create an audio-visual simulation that clearly goes way, way beyond anything that you have ever seen on ANY home computer!

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TALKHEAD is available on cassette or disk (please specify) for only $29.95. The cassette version can be transferred to disk in case you ever upgrade. TALKHEAD requires 64K of memory and a Colorware 'REAL TALKER' voice pak.

PROGRAM BY TIM JENISON SPEECH PROGRAMMING BY H. PUNYON

'TALKHEAD's eyes, mouth and jaw move, realistically animating his speech. The effect is amazing!

MORE SOFTWARE FOR THE 'REAL TALKER' VOICE PAK

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If you ever had an urge to command the USS Enterprise, this talking version of 'STELLAR SEARCH' from OwlWare is for you! It uniquely combines the best aspects of 'adventure' and graphic 'action' type games and puts the 'Real Talker' voice pak to good use. You'll find graphics galore in this exciting package containing more than 86K of action adventure. Requires 32K and a 'Real Talker' voice pak. Cassette...$24.95. Disk...$26.95.

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All 3 for Only ............$24.95.
Requires 16K and a Colorware 'Real Talker' voice pak.

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The popular 'ADVENTURE STARTER' from Owl's Nest Software is now available in a speaking version for the 'Real Talker' voice synthesizer. Adventure Starter is a painless and enjoyable way to learn about computer adventure games. Included are two adventures. The first is "MYHOUSE", an easy game with plenty of help and hints. A second adventure, 'PIRATES', is more challenging. Both are great fun for the adventur e minded. This is the only way to get into CoCo adventuring! Requires 16K Extended Basic and a 'REAL TALKER' voice pak. Cassette, only $17.95.

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Making your computer talk couldn’t be any easier! 'Real Talker' is a full featured, ready to use, HARDWARE voice synthesizer system in a cartridge pak. It uses the Votrax SC-01 phoneme synthesizer chip to produce a clear, crisp voice.

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Included free with 'Real Talker' is Colorware's remarkable Text-to-Speech program. This is a truly powerful machine language utility. What it does is automatically convert plain English to speech. And it has an unlimited vocabulary! For example, use it in the direct mode: Type a sentence or a paragraph, even mix in numbers, dollar signs, etc., then press enter. The text is spoken. At the same time a phoneme string is generated which can be saved to cassette or disk, modified or used in a Basic program.

We originally planned to sell this major piece of programming for about $40.00 but decided it was so useful that no 'Real Talker' user should be without it. Besides, it really shows off the capability of 'Real Talker'.

Also included with 'Real Talker' is our unique Phoneme Editor program. It allows you to explore and create artificial speech at the phoneme level. Phenomes are the fundimental sounds or building blocks of word pronunciation. There are 64 different phenomes, as well as 4 inflection levels at your disposal. Creating and modifying speech at the phenome level is both fascinating and educational. The Phenome Editor may also be used to customize the pronunciation of speech produced by the Text-to-Speech program.

You don’t have to use any of our utility programs though. If you write your own Basic Programs, you will find the pocket sized Votrax Dictionary (included free) is all you need to make your own Basic programs talk. This dictionary gives you quick access to the phoneme sequences used to create approximately 1400 of the most used words in the English language.

How about compatibility? 'Real Talker' is compatible with any 16K, 32K, 64K, Extended or non-extended Color Computer. It works with any cassette or disk based system, with or without the Radio Shack Multi-slot expander. No other synthesizer under $100 can make this claim. Most other CoCo voice synthesizers require an expensive Multi-slot expander in order to work with the disk system. 'Real Talker' requires only an inexpensive Y-adapter. This is an important consideration if you plan on adding a disk or have one already.

'Real Talker' comes completely assembled, tested and ready to use. It is powered by the CoCo and talks through your T.V. speaker so there is nothing else to add. Price includes Text-to-Speech and other programs on cassette (may be transferred to disk), User Manual and Votrax Dictionary. ONLY ........................................ $59.95

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ADD $2.00 PER ORDER FOR SHIPPING & HANDLING. F.O.D. ADD $1.00 EXTRA. SHIPPPING & HANDLING FOR CANADA IS $4.00. WE ACCEPT VISA, MASTER CARD, M.O.'S, CHECKS. N.Y. RESIDENTS MUST ADD SALES TAX.
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 everything 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 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 misjump, 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 viewscreen—they might just be nasty pirates who attack without warning.
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 appears 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 have 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
Evesville, 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
More Sugar

Sugar Software has announced three new products for the Color Computer.

The President 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. It takes from a selection of over 400 foods. The program costs $29.95, requires 32K, and is available on cassette.

For more information contact Sugar Software, 215 Leah Lane, Reynoldsburg, OH 43068. 614-861-0565.

Reader Service  555

Animation Fun

Triad Pictures Corporation has developed the Animator, a full-feature 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 cells 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 of personal printers. The portable GLP printer measures 13 inches wide, 7.5 inches deep, 2.8 inches high, and weighs 66 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 Gilengo. 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
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 570

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 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 questions 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.


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 you 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. Halama, 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 60346, 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 $1.50 postage and handling.

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
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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.

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 $279.5 plus $2 shipping.

Contact Spectrosystems, 11111 N. Kendall Drive, Suite A108, Miami, FL 33176. 305-274-3899.

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.

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/H is published at $60 a year, which includes a sturdy binder, 12 monthly issues, and an annual cumulation. CS/H 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.

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.

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This is a book of useful machine-language routines 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. This book is available in Microform and hardcopy.

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 layout, and anything else you need to know to program your machine. TRS-80 Color BASIC and Extended FC1006 $4.95

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. This book is available in Microform and hardcopy.

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 C77391 128 pp.

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Educational Systems, Inc.
Box 1226, Norman, OK 73070
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: $16.95

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.

CoCo16K .......................................................... 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.

Atari16k .......................................................... Tape: $19.95

CoCo16k .......................................................... 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!

CoCo16 ECB ...................................................... Tape: $16.95

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 blown up! 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!

Atari16K .......................................................... Tape: $18.95

CoCo 16k ECB .................................................... Tape: $18.95

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 II ... GRADE 3 & 4

SPELLING BEE III ... GRADE 5 & 6

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 it's too late. Requires printer for hard copy.

CoCo 32k ECB ..................................................... Tape: $16.95

TEACHING CLOCK

Tom 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 8, Apple II, Commodore 64, and VIC 20.
The HJL-57 Keyboard

Now available for all models, including CoCo 2.

Compare it with the rest. Then, buy the best.

If you've been thinking about spending good money on a new keyboard for your Color Computer, why not get a good keyboard for your money?

Designed from scratch, the HJL-57 Professional Keyboard is built to unlock all the potential performance of your Color Computer. Now, you can do real word processing and sail through lengthy listings...with maximum speed; minimum errors.

At $79.95, the HJL-57 is reasonably priced, but you can find other CoCo keyboards for a few dollars less. So, before you buy, we suggest that you compare.

Compare Design.
The ergonomically-superior HJL-57 has sculptured, low profile keycaps; and the three-color layout is identical to the original CoCo keyboard.

Compare Construction.
The HJL-57 has a rigidized aluminum baseplate for solid, no-flex mounting. Switch contacts are rated for 100 million cycles minimum, and covered by a spill-proof membrane.

Compare Performance.
Offering more than full-travel, bounce-proof keyswitches, the HJL-57 has RFI/EMI shielding that eliminates irritating noise on displays; and four user-definable function keys (one latchable), specially-positioned to avoid inadvertent actuation.

Free Function Key Program
Your HJL-57 kit includes usage instructions and decimal codes produced by the function keys, plus a free sample program that defines the function keys as follows: F1 = Screen dump to printer. F2 = Repeat key (latching). F3 = Lower case upper case flip (if you have lower case capability). F4 = Control key; subtracts 64 from the ASCII value of any key pressed. Runs on disc or tape; extended or standard Basic.

Compare Installation.
Carefully engineered for easy installation, the HJL-57 requires no soldering, drilling or gluing. Simply plug it in and drop it right on the original CoCo mounting posts. Kit includes a new bezel for a totally finished conversion.

Compare Warranties.
The HJL-57 is built so well, it carries a full, one-year warranty. And, it is sold with an exclusive 15-day money-back guarantee.

Compare Value.
You know that a bargain is a bargain only so long as it lasts. If you shop carefully, we think you will agree...The HJL-57 is the last keyboard your CoCo will ever need. And that's real value.

Order Today.
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. 

Call Toll Free 1-800-828-6968
In New York 1-800-462-4681

Ordering Information: Specify model (Original, F-version, or CoCo 2). Payment by C.O.D., check, MasterCard or Visa. Credit card customers include complete card number and expiration date. Add $2.00 for shipping ($3.50 for Canada). New York state residents add 7% sales tax. Dealer inquiries invited.