August 1989

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The RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

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Bill Barden on Programming in Different Languages

The Nickelodeon

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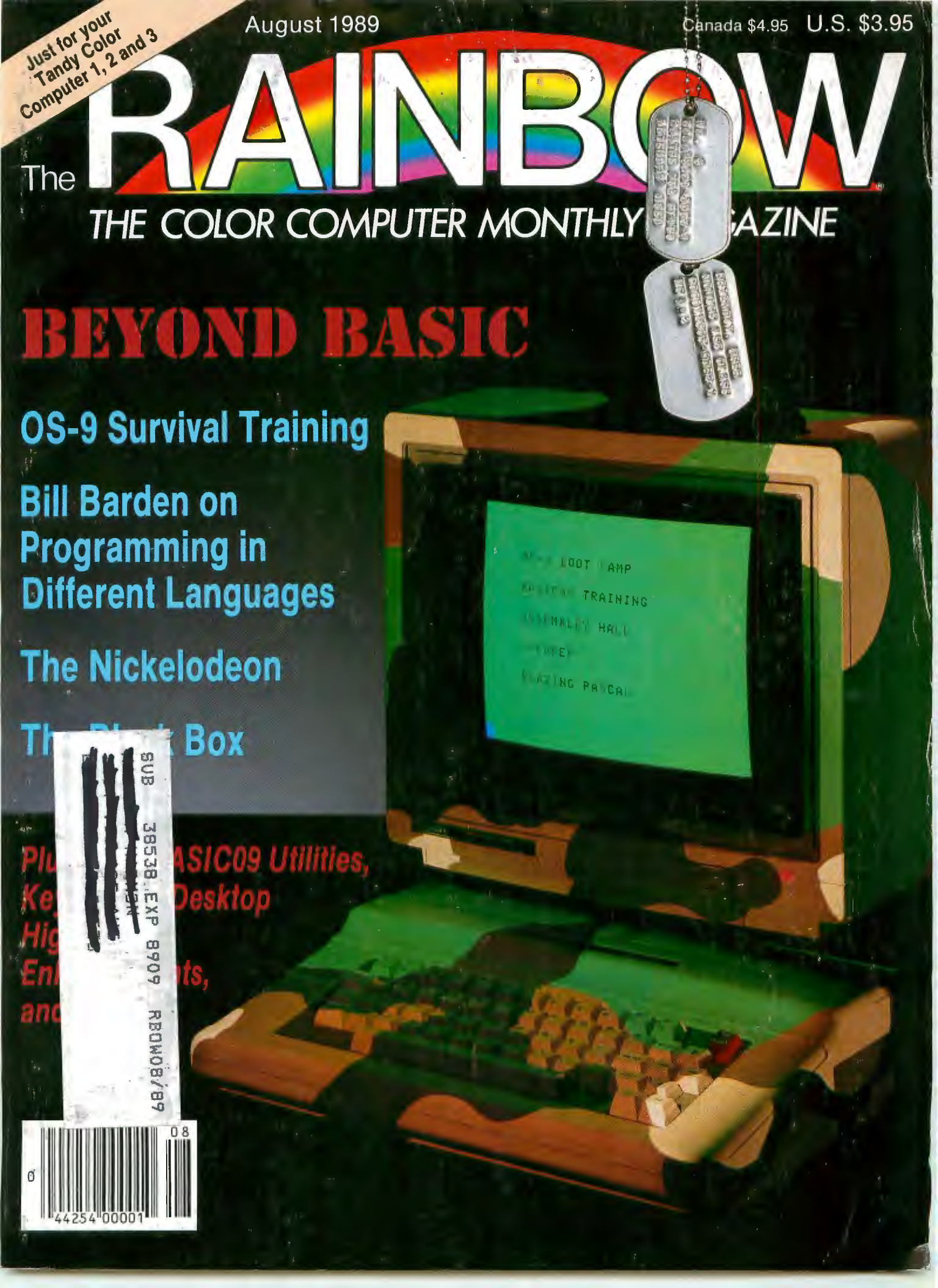

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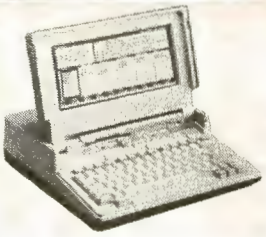

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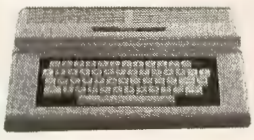

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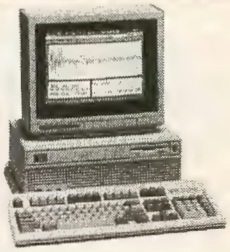

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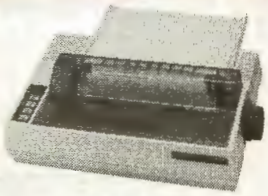

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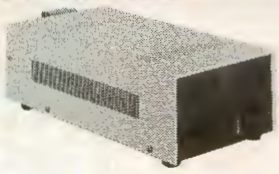

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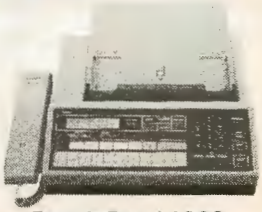

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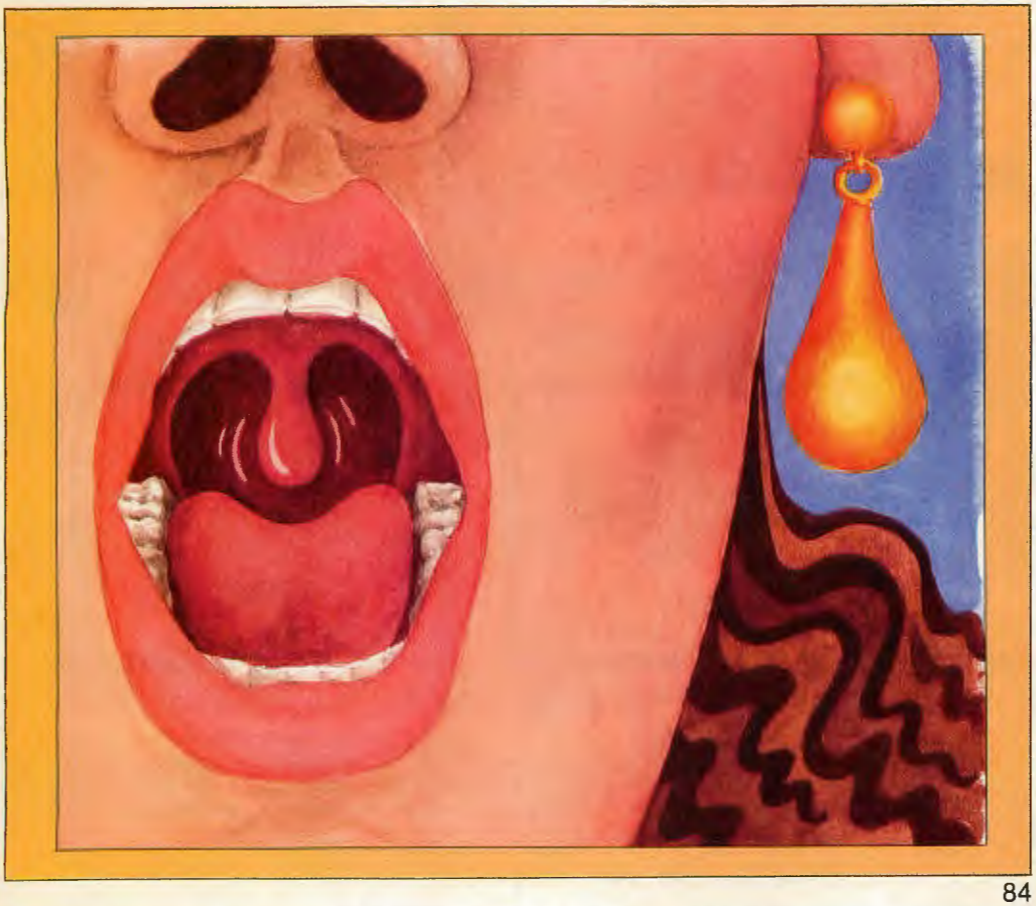

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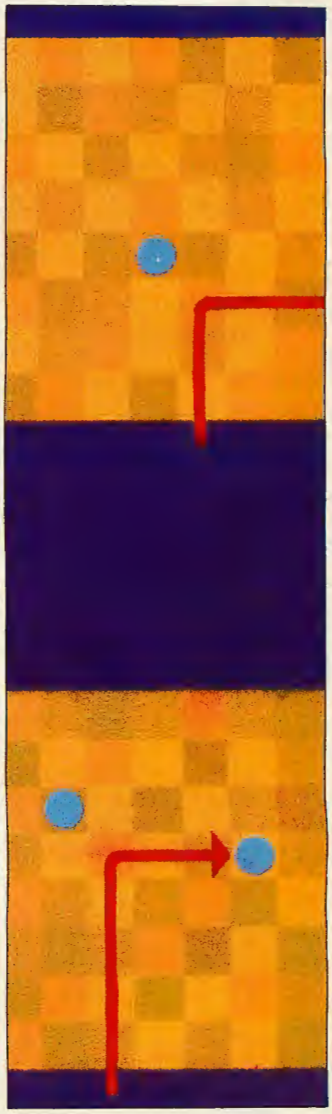

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Letters to the RAINBOW

A Worthy Trip

Editor:

I've used my Color Computer for quite some years now. It started with my eldest son on an old gray CoCo with 4K seven years ago.

I live in Holland, but recently had the opportunity to visit the United States at RAINBOWfest, Chicago.

RAINBOWfest started on Friday evening and before the opening there were large queues waiting in front of a large hall of the hotel, which contained some 20 stands, all from firms familiar to readers of THE RAINBOW.

The first thing everyone wanted to visit was the Tandy booth, to check out any bargains. There were several to be found as well as ample supplies of CoCo 3s, monitors, mouses, modems, Orchestra90, printers, etc.

It was interesting to come face to face with people I've done business with. Some even remembered my name from my order forms. I also met people who design the hardware and software, as well as some contributors to THE RAINBOW.

The lectures were very well attended, and after a while became full of familiar faces. The trip was well worth it.

M. Van Wamelen
Oedelum, Belgium

Exploiting the Power

Editor:

With the CoCo 3, Tandy introduced Microware's OS-9 Level II and a windowing environment, *Multi-Vue*. Last Fall, Tandy introduced the THOR technology (Tandy High-density Optical Recorder) as their gateway to a low-cost optical disk drive. Microware has recently released *Rave*, a graphics application generator for generating *Multi-Vue*-like programs that fully exploit the power of an optical disk.

Put all of these together, add an objective C compiler, and they become the home equivalent of Steve Job's NEXT computer ($7000 at last price). If Tandy's smart with pricing, they could blow it out of the water. Too bad they can't make it portable — it would be great for students.

John Tyler
Pittstown, New Jersey

HINTS AND TIPS

Editor:

In addition to Albert Schriefer's suggestion on ways to configure a *DeskMate-3* disk, ("Letters to THE RAINBOW," May '89, Page 6), here is another way of making it a 40-track single-sided or double-sided disk.

First format a 40-track disk with your OS-9 system disk. Load the following modules in memory: `OS9Gen`, `Copy`, `Makdir` and `Dsave`. Replace the OS-9 disk with the original *DeskMate* 35-track No. 1 disk. With the 40-track disk in Drive 1 and the 35-track *DeskMate* disk in Drive 0, enter the following commands:

```
OS9Gen /d1
```
then press ENTER
```
/d0/os9boot
```
then press ENTER and CTRL-BREAK
```
Dsave -s48 /d0 /d1 ! shell
```

With the OS-9 disk back in Drive 1, build the following patches:

For single-sided 40-track disks:

```
1 d0
c 18 23 28
v
```

for double-sided 40-track disks:

```
1 d0
c 18 23 28
c 19 01 02
v
```

Repeat the procedure for `d1`.

Build a startup file that includes those patches for your new 40-track *DeskMate* disk. Don't forget to copy the module `MODPATCH` on this new *DeskMate*'s `CMDS`.

You may as well include in your startup file a patch to change the disk step rate by changing byte 14 from Value 00 to 03....

Andre Beausejour
Charlesbourg, Quebec

Foiling Around

Editor:

I read in THE RAINBOW some while ago about some person asking about a fix to stop the cursor from flickering when using the Hi-Res Interface with *CoCo Max III*. The response said it was interference from your TV or monitor that caused this interference and suggested moving your monitor and interface further apart. This is o.k. if you are able to do it, but the way my system is set up, it's physically impossible.

On a whim, just the other day, I decided to try to stop some of this interference by wrapping aluminum foil around my interface and part of the cables on either side and, to my surprise, it worked! I found that by wrapping five or six layers of foil around the interface, you can stop close to 50 or 60 percent of the interference without moving anything. I also put a couple layers underneath my monitor for extra shielding. I hope this helps many fellow RAINBOW readers with the same problem.

Duane Doucet
Yar. Co., Nova Scotia

REVIEWING REVIEWS

Editor:

I want to thank Don Dollberg for his review of *Start OS-9: A Hands-On Guide to OS-9 Level II on the Color Computer 3*. We at Kenneth-Leigh Enterprises were overjoyed at his comments.

The Appendix on Compact Disc-Interactive has been included in the latest edition (it was included only on the disk in the First Edition). The Second Edition contains a great deal of new material, forms for joining the OS-9 Users Group, and a free DELPHI sign-up offer. The book is slightly smaller to fit better next to the computer.

Purchasers of the First Edition can write or call Kenneth-Leigh Enterprises for information on the DELPHI sign-up offer and on our low-cost upgrade policy to the Second Edition.

Thanks again to Don Dollberg for his fine review.

Paul K. Ward
Washington, DC

INFO PLEASE

Editor:

What happened to the Pen Pal section of the magazine? I'm sure I am not the only one who noticed it's missing.

THE RAINBOW is more than just information. It is a club letter to all CoCo users.

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by Walter Bayer

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UPS 2ND DAY AIR

Granted, RAINBOW has a lot of fine articles to keep us updated on what is happening and the programs are nice, but I would like to know other users, too. So please don't stop this section of the magazine.

Edward G. Russell
Key West, Florida

The Pen Pals and BBS portions of "Letters to the Editor" have been temporarily put on hold. Here at THE RAINBOW *we are developing a new system so that no one will be allowed to advertise their BBS or make a request for pen pals without first signing our "Non-Piracy Agreement."*

This decision is due to a number of complaints we have received from readers over the past several months. Some have written to tell us of pen pals offering to trade copyright programs, and BBSs providing and/or selling copyright programs on their systems for downloading.

Trading and/or selling copyright programs is a federal offense. We at THE RAINBOW *want to protect writers and programmers in the CoCo Community from software theft.*

MPI Madness

Editor:

I need some help. Who, if anybody, is making a Multi-Pak Interface? I recently bought a CoCo 3 and now find the MPI has been discontinued in both Canada and the United States. Where do I turn now?

Bill Lukawy
515 Piccadilly Ave
Thunder Bay, Ontario
P7B5C9 Canada

Yes, The Multi-Pak Interface has been discontinued by Radio Shack. If you cannot find another user willing to part with their MPI, consider Disto's 4-in-1 adapter. This won't let you select different cartridges, but it will give you a hard drive interface, a parallel port, real time clock and a true RS-232 serial port on one card designed to plug into a Disto disk controller. This is especially attractive to OS-9 users.

KUDOS

Editor:

First, thank you for a wonderful magazine. I picked up OS-9 Level II and *Multi-Vue* at RAINBOWfest, at a great price, and I do not know what I would have done without my back issues. I am starting to understand OS-9 and have found the answers to many problems in THE RAINBOW.

I would also like to send a thank you to Rick at Performance Peripherals. After I installed my 512K upgrade I had a very strange problem with my CoCo 3. I sent it out to Rick, and after a week and quite a few hours of work he found the fix. The best part was the price, which was very reasonable. I strongly recommend him if anyone else has a problem with their CoCo.

If anyone has a fix to make *Ghana Bwana* work on the CoCo 3, could you please drop me a line?

Keith A. Bauer
3305 15th Street
Menominee, MI 49858

A Real Pe'rl

Editor:

Just a short note to let you know how much I appreciate articles such as Richard Perlman's "Do-It-Yourself Database" in the February '89 issue. Though Mr. Perlman was developing a program specifically to be a database, his information was generic enough to be easily used in other applications.

I have been enjoying THE RAINBOW since April of 1985 and find I learn something new in almost every article. Keep up the excellent work.

Alan J. Wagner, Sr.
Quakertown, Pennsylvania

Still Waiting

Editor:

I greatly enjoyed the articles, "Do-It-Yourself Database," by Richard Perlman in the February and March issues. However, he says in the last paragraph, "In the next article, I'll go into more detail. . ." What happened? It was skipped in the April, May, June and July issues.

James B. English
Kansas City, Kansas

Due to health problems, Richard Perlman has been unable to continue the "Do-It-Yourself Database" series as planned. However, we do expect to publish his third installment in the September issue.

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type RAI **to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type** LET **to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.**

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"... *friendly...amazing execution speed...much easier to use than VIP software & 2 other word processing systems I've tried...very user-friendly...massive text storage capacity ...highest among word processors...*" - **Rainbow Oct. 88 Review for Word Power**

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Splits the screen in half so you can view one portion of your text while you edit another. You'll love it!

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UPS 2ND DAY AIR

Eight Years Strong

By now, most of you have had a month to peruse our Eighth Anniversary Issue last month and, for long-time readers of THE RAINBOW, I know some of you wondered why my column did not mention anything about it. Well, the truth is that I was simply confused about the month for which I was writing, thinking the column that ended up in July's issue was for the June issue. Of course, you really don't need me telling you that the anniversary is upon all of us because it says so on the cover.

As is done every year, the anniversary issue features a surprise. This year it's a booklet of One-Liners. (Incidentally, if you missed last month's issue, you can still get the booklet from us.) I thought the booklet was an appropriate way to celebrate an anniversary (which, except for *Byte*, may make us the longest continuously-published computer magazine in the world).

I have always been exceptionally partial to One-Liners, perhaps, because they hark back to the early days of the Color Computer, when the CoCo came with an astonishing 4K of memory. By the time the system overhead was accounted for, there was about 2K for program writing. I admit that 2K is quite a bit more than the average One-Liner (or Two-Liner), but the big deal in those days was fitting a usable program into the available memory.

Nope, those 2K spreadsheet programs were not as fancy as the programs we have today, but I think if you asked anyone to write a program that would do something "major" like spreadsheeting, word processing, data communications or the like, and required it to fit in 2K, you would be laughed out of the door. But it was done.

When THE RAINBOW first started, one of the most-often asked questions was whether the owner's CoCo was working right because the screen showed about 2K memory available and the "salesman told me it was a 4K machine." That question, of course, was repeated when Tandy came out with the "amazing" 16K upgrade and the memory available was some 14K.

Indeed, I remember the day when my local salesman called me to say the 16K upgrade was in, if I wanted it. I sped home, got my CoCo, and sped over to Radio Shack on my lunch hour to have a "full-blown" Color Computer. The two days it took to have it installed were among the longest of my life!

The interesting thing is that I never ran out of memory when I had the 4K CoCo, but I did when I got the 16K upgrade. I am sure I simply was more careful about what I was writing on the "little machine," and figured the sky was the limit with the "bigger" one. Of course, I knew a little more about programming by the time the upgrade was available.

Some earlier issues of THE RAINBOW had a few interesting debates about programming structures. But one of the most interesting debates was the one that went on in my own office — whether to compress code in listings or run it so that it was easier to read.

We finally decided we would use the easy-to-read format for our BASIC listings, although that meant we had to reject one or two programs. In order to simply get them to fit into the CoCo's memory, the authors would pack the listings, eliminating the spaces between keywords.

We thought an important part of our job was to teach our readers a little something about how programs worked, and if it was hard (or, sometimes, almost impossible) to read them, it would be difficult at best to figure out the logic of what the writer was trying to do. We have kept that general philosophy up to the present day.

The exception to that rule, of course, is our One-Liners (and Two-Liners). But each is an exercise in programming skills, and it really isn't hard to follow a single line's logic. And, too, they do remind us of our early days with CoCo, where every byte was precious.

—Lonnie Falk

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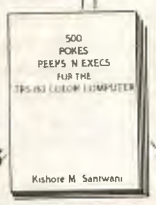

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UPS 2ND DAY AIR

How To Read Rainbow

When we use the term CoCo, we refer to an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

The BASIC program listings printed in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little disk and/or cassette symbols on the table of contents and at the beginning of articles indicate that the program is available through our RAINBOW ON DISK or RAINBOW ON TAPE service.

Using Machine Language

The easiest way to "put" a machine language program into memory is to use an editor/assembler, a program you can purchase from a number of sources. All you have to do, essentially, is copy the relevant instructions from THE RAINBOW's listing into CoCo.

Another method of putting an ML listing into CoCo is called "hand assembly" — assembly by hand, which *sometimes* causes problems with ORIGIN or EQUATE statements. You ought to know something about assembly to try this.

Use the following program if you want to hand-assemble ML listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I, VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7F80.

OS-9 and RAINBOW ON DISK

The OS-9 side of RAINBOW ON DISK contains two directories: CMDS and SOURCE. It also contains a file, `read.me.first`, which explains the division of the two directories. The CMDS directory contains executable programs and the SOURCE directory contains the ASCII source code for these programs. BASIC09 programs will only be offered in source form so they will only be found in the SOURCE directory.

OS-9 is a very powerful operating system. Because of this, it is not easy to learn at first. However, while we can give specific instructions for using the OS-9 programs, you will find that the OS-9 programs will be of little use unless you are familiar with the operating system. For this reason, if you haven't "learned" OS-9 or are not comfortable with it, we suggest you read *The Complete Rainbow Guide to OS-9* by Dale Puckett and Peter Dibble.

The following is not intended as a course in OS-9. It merely states how to get the OS-9 programs from RAINBOW ON DISK to your OS-9 system disk. Use the procedures appropriate for your system. Before doing so, however, boot the OS-9 operating system according to the documentation from Radio Shack.

1) Type `load dir list copy` and press ENTER.
2) If you have only one disk drive, remove the OS-9 system disk from Drive 0 and replace it with the OS-9 side of RAINBOW ON DISK. Then type `chd/d0` and press ENTER. If you have two disk drives, leave the sytem master in Drive 0 and put the RAINBOW ON DISK in Drive 1. Then type `chd/d1` and press ENTER.
3) List the `read.me.first` file to the screen by typing `list read.me.first` and pressing ENTER.
4) Entering `dir` will give you a directory of the OS-9 side of RAINBOW ON DISK. To see what programs are in the CMDS directory, enter `dir cmds`. Follow a similar method to see what source files are in the SOURCE directory.
5) When you find a program you want to use, copy it to the CMDS directory on your system disk with one of the following commands:

One-drive system: `copy /d0/cmds/`*filename*`/d0/cmds/`*filename* `-s`

The system will prompt you to alternately place the source disk (RAINBOW ON DISK) or the destination disk (system disk) in Drive 0.

Two-drive system: `copy /d1/cmds/`*filename*`/d0/cmds/`*filename*

Once you have copied the program, you execute it from your system master by placing that disk in Drive 0 and entering the name of the file.

The Rainbow Seal

RAINBOW CERTIFICATION SEAL

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has actually been seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification.

The Seal is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

We will appreciate knowing of instances of violation of Seal use.

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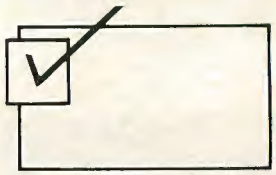

The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS*, type in the program and save it for later use, then type in the command RUN and press ENTER. Once the program has run, type NEW and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

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Key Ahead

Part II of II

By William F. Medlock

This is the second of two articles for improving the CoCo's operating system. The first article described an auto-repeat and a BREAK and CLEAR key lockout. This one, *Key Ahead*, allows you to type in information or a command before the computer is ready for it. Consider the following program:

```
10 FOR A = 1 TO 5000:NEXT A
30 INPUT"ENTER VALUE 1";B
40 FOR A = 1 TO 5000:NEXT A
50 INPUT"ENTER VALUE 2";C
60 PRINT B+C
```

For the sake of discussion, let us assume that lines 10 and 40 contain important data manipulation. As the CoCo runs now, you must wait for the computer to ask for each value. If a value is entered early, the computer completely ignores it. After Listing 2, KEYAHEAD, is installed, simply type in:

```
RUN and press ENTER
6 and press ENTER
7 and press ENTER
```

or other values desired; all at one shot without waiting. The characters typed in will not show on the screen until the computer is ready for them, at which time they appear in the same locations they normally would. The above program can also be used to test KEYAHEAD after it is installed.

Program Overview

As with *Repeat*, *Key Ahead* has a Start-Up routine to install it into the operating system. But unlike *Repeat*, *Key Ahead* has three discrete sections, each with independent functions. The first is the above-mentioned Start-Up routine, the second scans the keyboard, the third is used by the operating system for keyboard input. In the assembly listing (See Listing 1.), lines 190 through 480 comprise the first section; lines 500 through 770 comprise the second section; and lines 790 through 960 comprise the third section.

When *Key Ahead* is running, sections two and three provide two distinct functions simultaneously. Section 2 is an Interrupt routine that scans the keyboard. If a key has been pushed, the character is put in a FIFO (First In First Out) Buffer. Section three takes the place of POLCAT in the operation system. Things should make more sense as we explore each section.

Section One

Section 1, or the Start-Up routine, initializes Section 2 as an Interrupt routine, initializes the FIFO read and write pointers, disconnects POLCAT from the operating system, and replaces it with Section 3 of KEYAHEAD.

Since interrupt vectors are being changed, interrupts must be turned off before anything else. Line 250 does this by changing the value in the CC register. Lines 260 through 290 store the address of the old interrupt vector for use by SUPER in Section 2, and replace it with the address of SUPER.

Lines 300 through 320 initialize the values of the read and write pointers to the bottom of the buffer. Lines 330 and 340 store the top address of the buffer in TOP. This is done by adding the value SIZE to the relative address of BUFFER. The value of SIZE is declared in Line 980. The size of the buffer can be changed to any size by changing this value.

Since Section 2 uses POLCAT, which is the operating system's keyboard scanning routine, POLCAT must be disconnected from the rest of the operating system and replaced.

POLCAT is called by four different functions in the operating system: when BASIC executes an INPUT command; when BASIC executes an INPUT command while in the high-resolution mode; when BASIC executes an INKEY instruction; and after each command is executed to test for the press of the BREAK key and future INKEY values.

In each instance, POLCAT is called by a JSR command. The disconnection of POLCAT from the operating system is accomplished by replacing its address in each of these JSR commands, with the address of the third section. Line 350 calculates the address of READ, which is effectively the third section, and lines 360 through 380 place the address in three of the four JSR commands, as shown in the comments.

If the operating system is allowed to test for a press of the BREAK key after each instruction, it takes everything out of the buffer that the second section has placed in it. The BREAK test must be turned off. To do

---

William Medlock is a self-taught computer programmer who has worked at everything from fixing TVs to designing telemetry systems and hardware. He is currently involved in hardware, firmware and software development of LAN interfaces.

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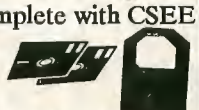

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this, instead of inserting the address of READ into the JSR command of this function, it is tricked into "thinking" that the test has taken place and the result is no key. This is done by replacing the JSR command with a CLRA and two NOP commands, lines 390 through 430. The changes in BREAK and INKEY operation is discussed in the caveat section at the end of the article.

There is one more connection that exists between POLCAT and the outside world. That is the POLCAT vector stored in locations $A000 and $A001.(There is more about this use of POLCAT in the Extended BASIC book or the *EDTASM* manual.) Lines 440 through 460 store the address of POLCAT for use by POLL in the second section and replace it with the address of READ. The installation of KEYAHEAD is complete. Lines 470 and 480 turn the interrupts back on and return control back to BASIC.

Section Two

There is one difficulty with setting up an Interrupt routine; there already is one. The CoCo has an interrupt task running all the time. One of the purposes of this task is to time out the disk drive motor. It also controls the timer accessed by BASIC. The solution to the problem is to execute each interrupt routine at every other interrupt.

A routine that allocates time in a computer is called a supervisor. *Key Ahead* has one called SUPER. Granted, it is probably the smallest supervisor you'll ever see, but it's all that is needed.

Location TOGGLE is alternately cleared and incremented. When TOGGLE contains a zero, it is incremented and control is passed to the original Interrupt routine, the address of which is stored in SUBONE. When TOGGLE contains a one, it is cleared and control is passed to POLL.

POLCAT is called by POLL, Line 680, and Line 690 tests for a key. Lines 700 and 710 store the character in the FIFO buffer. The exact location in the buffer is determined by the value of the write pointer WRPTR. After it is incremented the value of WRPTR is compared with the top of the buffer, Line 720. If they are equal, WRPTR is restored to the bottom of the buffer, Line 740. Line 750 places the pointer value back in memory, Line 760 clears the interrupt, and Line 770 returns control back to BASIC or the machine language application program that happens to be running.

Section Three

The third section, or READ, takes the place of POLCAT in the operating system. The same registers are pushed to the stack as were with POLCAT. If you're wondering why Section 2 did not push any registers, it is because the microprocessor automatically pushes the entire processor state to the stack whenever it receives an interrupt request.

Register A is cleared to show a no-key condition, Line 860. The read and write pointers are compared, lines 870 and 880; if they are equal, the buffer is empty. If the pointers are not equal, A is loaded with the top of the buffer and restored if the top has been reached, lines 910 through 930. Lines 940 through 960 place RDPTR back in memory, restore the registers and return control to the calling routine.

The size of the FIFO buffer can be changed by changing the value in Line 980. You'll never use more than 256 bytes. The PC uses much less, but the PC warns you when you have filled the buffer. *Key Ahead* does not. When the write pointer wraps around and catches up with the read pointer, *Key Ahead* thinks that the buffer is empty and everything that was typed ahead is lost. So it is best to keep the buffer size large.

This is not a multitasking environment in the strictest sense. In a multitasking environment, every task has its own stack. *Key Ahead* uses the existing stack.

Assembling the Program

Key Ahead was written using relative addressing. See the previous article for a discussion of PC relative indirect addressing. KEYAHEAD can be entered using a disk assembler such as Color Disk *EDTASM*, or the cartridge *EDTASM*. If a disk assembler is used, KEYAHEAD can be assembled to disk without a start address. It can then be loaded into any part of memory and started using:

```
LOADM"REPEAT",address
EXEC
```

The same procedure can be used if the cartridge *EDTASM* and a tape system is used, with CLOADM being used instead of LOADM. If you have a disk system but only have the cartridge *EDTASM*, first decide what address will be used for the start of KEYAHEAD. Then assemble to tape or assemble to memory and save to tape. Then re-insert the disk controller, load *Key Ahead* from tape and resave to disk using SAVEM.

Repeat and *Key Ahead* can be loaded and started individually; although starting *Key Ahead* alters the speed of *Repeat*. There are two cautions if this is done. First, always start *Repeat* first; the computer hangs if *Key Ahead* is started first. Second, make sure the two programs do not overlap. Just to make remembering easier, leave 256 bytes for *Repeat* and 512 bytes for *Key Ahead*.

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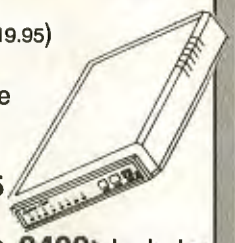

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Listing 1: KEYSBIN

```
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00100 ************************
00110 * KEYAHEAD             *
00120 * MAY BE LOADED TO ANY  *
00130 * LOCATION             *
00140 * MUST NOT BE INSTALLED *
00150 * BEFORE REPEAT        *
00160 * COCO III ONLY        *
00170 ************************
00180
00190 * FIRST SECTION
00200 ************************
00210 * START UP ROUTINE     *
00220 * INSTALLS KEYAHEAD IN  *
00230 * OPERATING SYSTEM     *
00240 ************************
00250 START  ORCC   #$50          DISABLE INTERRUPTS
00260LDD     $10D            INTERRUPT JUMP ADDR
00270STD     SUBONE,PCR
00280LEAY    SUPER,PCR       ADDR OF SUPER
00290STY     $10D            SUPER IS NEW INTERRUPT
00295                        *ENTRY POINT
00300LEAX    BUFFER,PCR      ADDR OF BUFFER
00310STX     WRPTR,PCR       INITIALIZE WRITE PNTR
00320STX     RDPTR,PCR       INITIALIZE READ PNTR
00330LEAX    BUFFER+SIZE,PCRADDR OF TOP OF BUFFER
00340STX     TOP,PCR         ADDR OF TOP INTO TOP
00350LEAX    READ,PCR        ADDR OF READ ROUTINE
00360STX     $A0DA           JMP FROM INPUT
00370STX     $F781           JMP FROM INPUT H RES
00380STX     $A569           JMP FROM INKEY
00390LDA     #$4F            CLRA CODE
00400LDY     #$ADEB          JMP FROM BREAK POLL
00410STA     ,Y+             INSERT CLRA
00420LDD     #$1212          2 NOP'S
00430STD     ,Y              INSERT NOP'S
00440LDD     $A000           POLCAT VECTOR
00450STD     KEYSUB,PCR
00460STX     $A000           READ IS NEW POLCAT
00465                        *VECTOR
00470ANDCC   #$AF            TURN ON INTERRUPTS
00480RTS                     BACK TO BASIC
00490
00500 * SECOND SECTION
00510 ************************
00520 * SUPERVISOR           *
00530 * CONTROLS TIME        *
00540 * DISTRIBUTION         *
00550 ************************
00560 SUPER  TST    TOGGLE,PCR    WHO'S TURN IS IT
00570BNE     POLL            POLL'S TURN
00580INC     TOGGLE,PCR      NEXT TIME POLL'S TURN
00590JMP     [SUBONE,PCR]    JUMP TO ORIG INTR
00595                        *ROUTINE
00600
00610 ************************
00620 * KEYBOARD POLL        *
00630 * USES POLCAT, WHICH HAS*
00640 * BEEN LIFTED OUT OF   *
00650 * OPERATING SYSTEM     *
00660 ************************
00670 POLL   CLR    TOGGLE,PCR    NEXT TIME ORIG INTR
00675                        *ROUTINE
00680JSR     [KEYSUB,PCR]    JUMP TO POLCAT
00690BEQ     POUT2           NO KEY
00700LDX     WRPTR,PCR       WRITE POINTER
00710STA     ,X+             STORE NEW CHARACTER
00720CMPX    TOP,PCR         TOP OF BUFFER
00730BNE     POUT            NOT TOP OF BUFFER
00740LEAX    BUFFER,PCR      RESET WRPTR TO BOTTOM
00750 POUT   STX    WRPTR,PCR      STORE WRPTR
00760 POUT2  LDA    $FF02          CLEAR INTERRUPT
00770RTI                     RETURN FROM INTERRUPT
00780
00790 * THIRD SECTION
```

If you are using *EDTASM*, *Repeat* and *Key Ahead* can be merged into one program (this is best from a performance point of view). First, delete all lines up to and including Line 90 in both programs. Make sure the listings include all comment and blank lines. Then, use the following command sequence:

```
LD REPEAT
LDA KEYAHEAD
N100,100
M2210,8300:12200,1
D2200
D6400
D7500
D8200
E2225
5D
```

Then change the constant in Line 6300 to #$15, and the constant in Line 7400 to #4. This command sequence assumes lines 730 and 840 are included in the REPEAT listing.

BASIC Program

If you are not already familiar with any of these procedures, or do not have any type of assembler, use the included BASIC program.

The BASIC version of *Key Ahead* can be used with a minimum of effort. Note that the line numbers are not consecutive multiples of ten, as is customary. The BASIC versions of *Key Ahead* and *Repeat* can be merged together so that all functions can be performed by one program, without any modification. The only requirement is to type in the programs exactly as they are listed. REM lines and lines not serving any purpose are there for a reason. Like the assembly language versions, *Repeat* and *Key Ahead* can be started separately, but the repeat speeds will be wrong. So it is best to merge them. The repeat speeds are corrected when the programs are merged.

Unfortunately, automatic merging can only be done with a disk system; but it is possible to merge manually by noting line number duplications. Remember that lines from KEYAHEAD take priority over lines from REPEAT. To merge the two programs, *Key Ahead* must be saved to disk in ASCII format (i.e., SAVE "KEYAHEAD", A). First load REPEAT, then type MERGE "KEYAHEAD".

Applications and Caveats

When *Repeat* and *Key Ahead* are running together, the repeat speeds no longer depend on what type of applications program is running (BASIC or machine language). Repeat speeds depend on the delay constants and the interrupt rate only.

When *Key Ahead* is running with machine language application programs with flashing cursors, many times the cursor

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```
00800 ************************
00810 * READ FROM FIFO BUFFER *
00820 * REPLACES POLCAT IN    *
00830 * OPERATING SYSTEM      *
00840 ************************
00850 READ     PSHS    U,X,B          PSH WHAT POLCAT PUSHES
00860  CLRA                   MAKE A SHOW NO KEY
00870  LDX     RDPTR,PCR      ADDR OF READ POINTER
00880  CMPX    WRPTR,PCR      ADDR OF WRITE POINTER
00890  BEQ     RDOUT2         POINTERS EQUAL BUFFER
00895                         *EMPTY
00900  LDA     ,X+            LOAD NEW CHARACTER
00910  CMPX    TOP,PCR        TOP OF BUFFER
00920  BNE     REDOUT         NOT TOP OF BUFFER
00930  LEAX    BUFFER,PCR     RESET RDPTR TO BOTTOM
00940 REDOUT   STX     RDPTR,PCR      STORE RDPTR
00950 RDOUT2   PULS    U,X,B          RESTORE REGISTERS
00960  RTS
00970
00980 SIZE     EQU     256
00990 ************************
01000 * MEMORY ALLOCATION     *
01010 ************************
01020 TOGGLE   RMB     1
01030 SUBONE   RMB     2
01040 KEYSUB   RMB     2
01050 WRPTR    RMB     2
01060 RDPTR    RMB     2
01070 BUFFER   RMB     SIZE
01080 TOP      RMB     2
01090  END
```

will flash much faster than normal. This is because the cursor is flashed by counting the number of keyboard polls and READ is much shorter than POLCAT.

There is no SHIFT-@ pause available while scrolling a LIST or DIR, or while running a BASIC program. SHIFT-@ was turned off by the same action that turned off the BREAK key test, and for the same reason. Every- time the operating system tests for a SHIFT-@, it takes a character from the buffer, draining the buffer dry, so you would be typing into a bottomless pit. BREAK only works when there is an INPUT or an INKEY, but it can be typed ahead (assuming *Repeat* is not inhibiting BREAK).

If you do not want the operator to be able to key ahead from one section of a program to the next, the INKEY line: `10 A$=INKEY$:IF A$<>""THEN 10` does nicely.

Machine language programs with SHIFT-@ or BREAK features, such as *EDTASM*, use the same access to POLCAT for all keyboard functions, the $A000 vector, so the buffer draw-out cannot be avoided. For this reason, usability of *Key Ahead* in this environment is severly restricted. If you insist on using *Key Ahead* with *EDTASM*, follow the cautions listed last month for *Repeat*, using $7D00 as the manual origin.

As with OS-9, disk access will slow down *Key Ahead*. Unless you hold the key down briefly, key action is not guaranteed. Write verification also hampers *Key Ahead* operation. A little practice during disk reads soon tells you how much of a pause on the key ensures results, but during disk writes, it is best to just wait.

As with *Repeat*, the assembled version of *Key Ahead* can be loaded and started by a BASIC program. Also, the BASIC version can be merged into the end of a program.

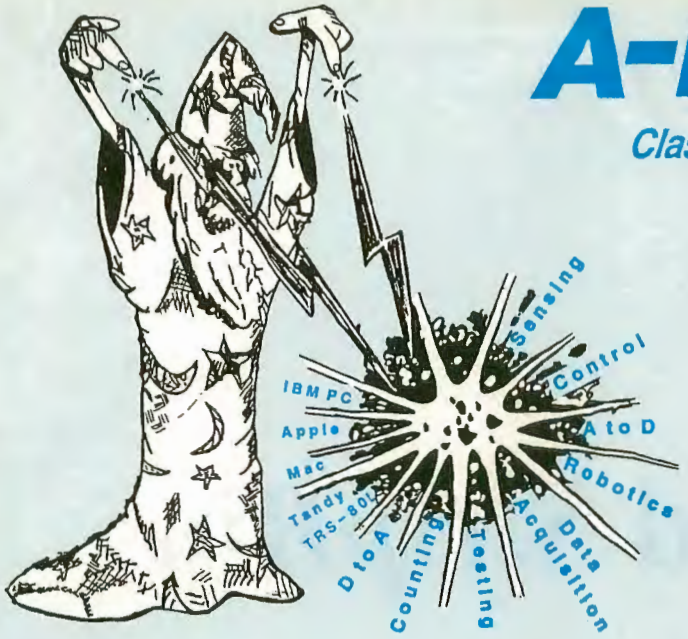
Testing

The short program at the beginning of this article can be used for testing, or `FOR A = 1 TO 5000:NEXT` can be used. All that's needed is something to keep the computer busy. When the computer is busy, nothing you type appears on the screen. When the computer is ready for input, the data you typed ahead appears on the screen as if it was entered normally.

(Questions or comments concerning this article may be addressed to the author at 2429F Wesvill Ct., Raleigh, NC 27607. Please include an SASE when requesting a reply.) ❑

Listing 2: KEYAHEAD

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 CLEAR 200,31999:REM ADD-1
30 PRINT"KEYAHEAD":OF=75
40 ADD=32000:EX=ADD
50 REM
60 REM
110 READ BYTE
120 IF BYTE = 256 THEN 140
130 POKE ADD,BYTE:ADD=ADD+1:GOTO
110
140 REM
180 REM
210 EXEC EX:END
240 DATA 26,80,252,1,13,237,141,
0,148,49,141,0,63,16,191,1,13,48
250 DATA 141,0,144,175,141,0,136
,175,141,0,134,48,141,1,132,175,
141,1
260 DATA 128,48,141,0,83,191,160
,218,191,247,129,191,165,105,134
,179,16,142
270 DATA 173,235,167,160,204,18,
18,237,164,252,160,0,237,141,0,8
9,191,160
280 DATA 0,28,175
290 DATA 57
370 DATA 109,141,0,76,38,8,108,1
41,0,70,110,157,0,67,111,141,0,6
2
380 DATA 173,157,0,61,39,20,174,
141,0,57,167,128,172,141,1,55,38
,4
390 DATA 48,141,0,49,175,141,0,4
1,182,255,2,59,52,84,79,174,141,
0
400 DATA 32,172,141,0,26,39,16,1
66,128,172,141,1,22,38,4,48,141,
0
410 DATA 16,175,141,0,10,53,84,5
7,256
```



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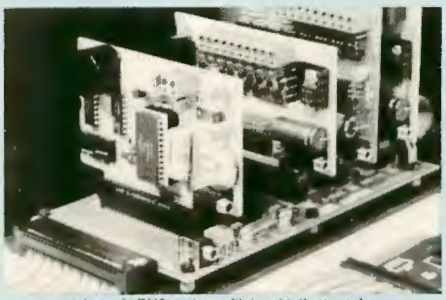

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Two BASIC09 utilities. . .

USTime and *StripBin*

By Jerry Yates

In the February 1989 issue of THE RAINBOW, Richard Ries gave us a BASIC09 program that sets the date and time in the U.S. format instead of the European or Military format. His program inspired me to write *USTime*, which displays the date and time as: January 23, 1989 9:23:45 am/pm, instead of 89/01/23 09:23:45. I find it much easier to read.

To run the program, simply type `runb ustime`. The best way to use this program is to type in Listing 1 and run it. After you are sure there are no errors, pack the program, then merge it with `Runb`.

I use the routine in several programs as a routine to display the date and time.

Listing 2, `StripBin`, is a BASIC09 program to strip the first X-modem block (128 bytes) from a file that was uploaded in CoCoBin format. (CoCoBin is a type of protocol used by *Wiz* and *WizPro*.) This block contains information about the file, such as the attributes, name of the file, and the number of blocks in the file.

This is great, but if you don't have *Wiz* or *WizPro*, and download one of the files, you will go crazy trying to find out what's wrong with it. I did just that several times.

I wrote this program to remove that block, rewrite the file, and set the "e pe" attributes. If you specify the `CMDS` directory in the destination path, all you have to do is run the file.

Jerry Yates is a self-taught programmer who is a supervisor for Stone Container Corporation in Louisville, Kentucky. He has an associate degree in electronics from DeVry Institute of Electronics and is the former President of the LoCo-CoCo Club.

Listing 1: `USTime`

```
PROCEDURE USTime
0000        (* USTime By Jerry Yates )
001A        (* 3005 Bob White Ct.    )
0034        (* Louisville, Ky. 40216 )
004E
004F        (* Display the date and time as: )
0071        (* Janurary 23, 1989  9:23:45 Pm. or Am.)
009A
009B        DIM month(12):STRING[10]
00AC        DIM flag:STRING[4]
00B8        DIM x:INTEGER
00BF
00C0        FOR x=1 TO 12
00D0          READ month(x)
00D9        NEXT x
00E4        x=VAL(MID$(DATE$,4,2))
00F1        PRINT month(x); " "; MID$(DATE$,7,2); ", 19"; LEFT$(DATE$,2
             ); "  ";
0116
0117        IF VAL(MID$(DATE$,10,2))<12 THEN
0128          flag=" Am."
0133        ELSE
0137          flag=" Pm."
0142        ENDIF
0144
0145        IF flag=" Pm." THEN
0155          x=VAL(MID$(DATE$,10,2))
0162          IF x>12 THEN
016E            x=x-12
0179          ENDIF
017B          PRINT x; RIGHT$(DATE$,6); flag
0189          END
018B        ELSE
018F          IF VAL(MID$(DATE$,10,2))<10 THEN
01A0            PRINT RIGHT$(DATE$,7); " "; flag
01AE          ELSE
01B2            PRINT RIGHT$(DATE$,8); " "; flag
01C0          ENDIF
01C2        ENDIF
01C4        END
01C6        DATA "January","February","March","April","May","June","July"
0203        DATA "August","September","October","November","December"
```

The last block of the file may contain some trash. This can be corrected by loading the file into memory, deleting the original, and saving it back to disk:

```
OS9: load /d0/cmds/filename
OS9: del /d0/cmds/filename
OS9: save /d0/cmds/filename filename
```

To run `StripBin` type:

```
OS9: basic09 stripbin
```

Follow the prompts. The program checks for errors 211, 215, 216 and 218. If one of these errors occur, you will be told which error occurred, what the error means, and given suggestions for the appropriate corrective action.

The program also warns to use the program only on files that are in the CoCoBin format. Using it on any other file makes the file useless. The original file is not deleted for just that reason.

(Questions or comments concerning this article may be addressed to the author at 3005 Bob White Court, Louisville, KY 40216. Please include an SASE when requesting a reply.) ❑

Listing 2: `StripBin`

```
PROCEDURE StripBin
 0000       DIM inpath,outpath,errnum:BYTE
 000F       DIM buffer,infile,outfile:STRING[128]
 0023       DIM answer,bell,cls:STRING[1]
 0037       cls=CHR$(12)
 003F       bell=CHR$(7)
 0047       PRINT cls
 004C       PRINT "StripBin Ver 1.00"
 0061       PRINT "Copyright (C) 1988"
 0077       PRINT "by Jerry Yates"
 0089       PRINT
 008B       PRINT "     W A R N I N G "
 00A2       PRINT bell
 00A7       PRINT "     Use this program only on a file that is in the CoCoBin format"
 00ED       PRINT "and was downloaded with standard Xmodem.  CoCoBin is a type of Xmodem"
 0136       PRINT "used by Wiz and WizPro.  It places an extra block at the beginning"
 017C       PRINT "of the file.  This progran strips that block and rewrites the file to"
 01C5       PRINT "to disk.  It will also set the 'e pe' attributes."
 01FA       PRINT
 01FC       ON ERROR GOTO 20
 0202 10    INPUT "Enter Source file (/path/filename)? ",infile
 0231       INPUT "Enter Dest. File (/path/filename)? ",outfile
 025C       PRINT
 025E       CREATE #outpath,""+outfile:WRITE
 026D       OPEN #inpath,""+infile:READ
 027C       GET #inpath,buffer
 0286       buffer=""
 028D       PRINT "Working";
 0299       WHILE EOF(#inpath)<>TRUE DO
 02A5         GET #inpath,buffer
 02AF         PUT #outpath,buffer
 02B9         PRINT ".";
 02BF         buffer=""
 02C6       ENDWHILE
 02CA       CLOSE #inpath
 02D0       CLOSE #outpath
 02D6       PRINT
 02D8       PRINT "The New attributes are: ";
 02F5       SHELL "attr "+outfile+" e pe"
 030A       PRINT "Done!!!!"
 0316       PRINT
 0318       PRINT "Another (Y/N)? ";
 032C       INPUT answer
 0331       IF answer="Y" OR answer="y" THEN
 0346         GOTO 10
 034A       ENDIF
 034C       END
 034E 20    errnum=ERR
 0357       PRINT bell
 035C       PRINT "Error #"; errnum;
 036C       IF errnum=211 THEN
 0378         PRINT " Unexpected End of File"
 0393       ELSE
 0397         IF errnum=215 THEN
 03A3           PRINT " Bad Path Name"
 03B5           PRINT "Check Path and Enter again."
 03D4         ELSE
 03D8           IF errnum=216 THEN
 03E4             PRINT " File <"; infile; "> Not Found"
 0401             PRINT "Recheck Source (/path/flename)."
 0424           ELSE
 0428             IF errnum=218 THEN
 0434               PRINT " File <"; outfile; "> Already Exists"
 0456               PRINT "Delete <"; outfile; "> or enter another Dest. File"
 0486             ENDIF
 0488           ENDIF
 048A         ENDIF
 048C       ENDIF
 048E       PRINT
 0490       GOTO 10
  0494        END
```


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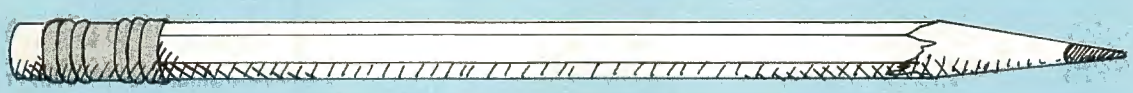

By Dale Tinklepaugh

For pictures you might want to use in a number of different programs, *Quick Draw* can make it easier to generate, save and use graphics designs. It is used to interactively draw a picture in high resolution and then to create a disk file of BASIC statements. The data file can be merged with other programs and used to draw the same picture over and over again.

After loading *Quick Draw* and typing RUN, you will be prompted for any legal output filename. Next you will be asked for the starting line number for the DATA statements. The program will increment the following line numbers by two.

After entering the starting line number, you will be asked for the minima and maxima for the picture. Enter standard-integer high-resolution coordinates. *Quick Draw* draws the box containing all points within the specified range. A blinking cursor controlled by the arrow keys will appear in the upper left corner of the box. You can change the program to use a joystick if you like, but I prefer keys for ease in maintaining precise control.

Nothing will be drawn until you press R. Then each point the cursor leaves will be reset. If you want to set some points, press P and pass the cursor through the points you want to set. When the picture is the way you want it, press S to save the contents of the graphics area to disk.

To use the disk file, you will need to merge it with a BASIC program that has room for the data lines. It will also need a section of code that reads the data, writes it into graphics memory and gets the data into an array.

Core is a program showing what is needed to recreate the picture. A program can use several such segments with several sets of data to draw different pictures. *Core* has been written to merge with a data file starting at Line 100. If PIC.DAT is the name of such a file, then the following commands will finish the task:

```
LOAD "CORE"
MERGE "PIC.DAT"
SAVE "filename"
RUN
```

A disk can be used to store a library of designs. If a mnemonic filename does not convey the nature of the data, you can load the data file, insert a remark and save the file in ASCII format (i.e., SAVE "PIC.DAT", A).

(Questions or comments concerning these programs may be addressed to the author at 14684 Joshua Tree Ave., Sunnymead, CA 92388. Please enclose an SASE when requesting a reply.) □

Dale Tinklepaugh, who has been computing for 10 years, enjoys color graphics, assembly language and exploring new ways to apply computers to improve personal productivity. A software engineer at Hughes Aircraft, he is also studying for his master's degree in computer engineering at USC.

Listing 1: QUIKDRAW

```
Ø ' COPYRIGHT 1989  FALSOFT,INC
1Ø PCLEAR4
2Ø INPUT"OUTPUT FILE NAME";OF$
3Ø INPUT"LEFTMOST X";XL
4Ø INPUT"RIGHTMOST X";XR
5Ø INPUT"TOPMOST Y";YT
6Ø INPUT"BOTTOMMOST Y";YB
7Ø INPUT"BEGINNING LINE NUMBER";
K
8Ø LG=INT(XL/8):RG=INT(XR/8)
9Ø IF XR/8<>INT(XR/8) THEN ODD=1
 ELSE ODD=Ø
1ØØ M1=INT((XR-XL-1)/8):M2=YB-YT
11Ø DIM V(M1,M2),N(15)
12Ø PMODE4
13Ø SCREEN1,1
14Ø PCLS
15Ø COLOR 1
16Ø LINE (XL,YT)-(XR,YB),PSET,BF
17Ø X=XL:Y=YT:CO=1
18Ø A$=INKEY$:IF A$<>"" GOTO 22Ø
19Ø PSET(X,Y)
2ØØ A$=INKEY$:IF A$<>"" GOTO 22Ø
21Ø PRESET(X,Y):GOTO 18Ø
22Ø IF A$="P" THEN CO=1 ELSE IF
A$="R" THEN CO=Ø
23Ø IF CO=1 THEN PSET(X,Y) ELSE
PRESET(X,Y)
24Ø IF(A$=CHR$(9) AND X+1<=XR) T
HEN X=X+1
25Ø IF(A$=CHR$(8) AND X-1>=XL) T
HEN X=X-1
26Ø IF(A$=CHR$(1Ø) AND Y+1<=YB)
THEN Y=Y+1
27Ø IF(A$=CHR$(94) AND Y-1>=YT)
THEN Y=Y-1
28Ø IF(A$="S") THEN 3ØØ
29Ø GOTO 18Ø
3ØØ OPEN "O",#1,OF$
31Ø PRINT #1,K;" DATA ";M1;",";M
2;",";XL;",";XR;",";YT;",";YB;",
";LG;",";RG
32Ø T=Ø:K=K+2
33Ø FOR I=Ø TO M2
34Ø FOR J=LG TO RG
35Ø AD=&HEØØ+32*(YT+I)+J
36Ø N(T)=PEEK(AD)
38Ø T=T+1:IF T<=15 THEN GOTO 41Ø
39Ø GOSUB 46Ø
4ØØ T=Ø:K=K+2
41Ø NEXT J
42Ø NEXT I
43Ø IFT<=15 THEN GOSUB 46Ø
44Ø CLOSE #1
45Ø END
46Ø PRINT #1,K;" DATA ";N(Ø);","
;N(1);",";N(2);",";N(3);",";N(4)
;",";N(5);",";N(6);",";N(7);",";
N(8);",";N(9);",";N(1Ø);",";N(11
);",";N(12);",";N(13);",";N(14);
",";N(15)
47Ø RETURN
```

Listing 2: CORE

```
Ø ' COPYRIGHT 1989  FALSOFT,INC
1Ø PCLEAR4
12 DIM V(29,39)
14 PMODE4
16 SCREEN1,1
18 PCLS
2Ø COLOR 1
128Ø READ M1,M2,XL,XR,YT,YB,LG,R
G
129Ø FOR I=Ø TO M2
13ØØ FOR J=LG TO RG
131Ø AD=&HEØØ+32*(YT+I)+J
132Ø READ B
133Ø POKE AD,B
134Ø NEXT J
135Ø NEXT I
136Ø GET(XL,YT)-(XR,YB),V,G
137Ø PCLS
14ØØ PUT(XL,YT)-(XR,YB),V,PSET
2ØØØ GOTO 2ØØØ
```


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Find the hidden balls with a shooting ray of light

The Black Box

By Evan Veal

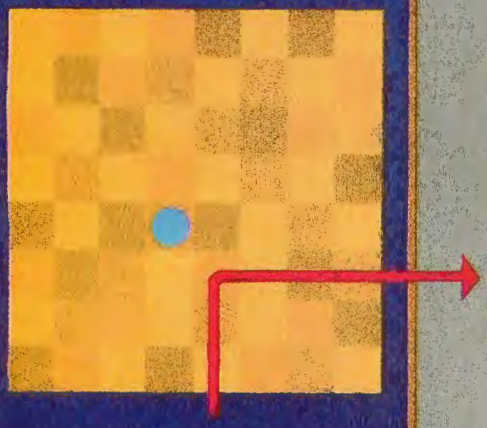

Figure 1: A Simple Detour

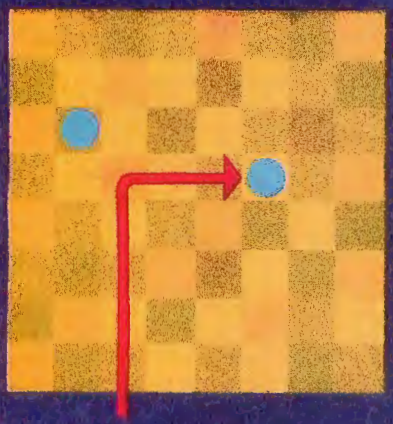

Figure 2: A Detour Leading to a Hit

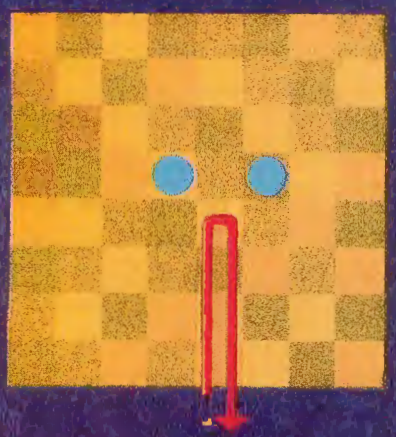

Figure 3: A Deflection Due to a Double Detour

The Black Box, a new twist to the game of Hide and Seek, requires skill, logic and luck. In this game the computer is the hider and you are the seeker. The computer has hidden five balls within the "black box" (an 8-by-8 grid), and you must find them.

Your only tool in finding these hidden balls is a ray of light that you shoot into the box. The ray of light must follow certain rules as it travels through the box, and the presence of the balls affects its path. Upon shooting the ray of light into the box, you are shown where the ray exited the box, if it did actually exit the box. From this information you must deduce the positions of the balls within the box. When you think you have correctly located a ball, you may mark it on the grid. The object of the game is to gain points by locating the five balls in the fewest possible moves.

The rules governing the movement of the ray of light inside the box are as follows:

- Barring interference, the ray of light travels in a straight line and the exit point is exactly opposite the entry point.
- If the ray scores a direct hit on a ball, it does not exit the box, but the entry point is marked with a hit marker and a beep is sounded.
- If the ray of light approaches a ball from the side (i.e., the ball is in Row 8 and the light passes down Row 7) it makes a 90-degree turn away from the ball. This is called a *detour*. The light is guided by these three rules and all phenomena observed are properties of those rules.

A *reflection* occurs when the light exits at the same place it entered. This suggests that either the light was detoured in such a way as to send it back to its entry point, or that there is a ball in the square immediately adjacent to the square where entry was attempted. The latter is true due to the third rule. If the ball is directly adjacent, it triggers the 90-degree detour before the ray has had a chance to enter the box. Thus, the only possible direction for the ray of light is out of the box.

The ray of light can be detoured any number of times before it exits the box or hits a ball. One should note that, under normal circumstances, the ray of light should always exit the box or register a hit. However, certain exotic ball combinations can cause the ray of light to be trapped in an infinite loop within the box, neither exiting nor hitting a ball. This causes the game to seemingly hang-up after you fire a ray. This occurence is very rare, but if it happens, press BREAK and run it again.

The following diagrams illustrate common light path patterns in *The Black Box*:

- Figure 1 illustrates a simple detour.

Evan Veal is a student at the College of William & Mary in Williamsburg, Virginia. He is majoring in computer science and his hobbies include programming on the CoCo and writing science-fiction short stories.

- Figure 2 is a detour that leads to a hit (resulting in a red hit marker).
- Figure 3 shows a reflection caused by two detours (a common configuration for a reflection).
- Figure 4 shows a reflection due to a ball adjacent to the entry point. (Note the arrow indicating the path of the light.) The light never actually entered the box.
- Figure 5 shows what looks like a hit, but turns out to be a detour.

The third rule comes into effect one square before the ball. The light is detoured away from Ball A and so never hits Ball B, which is right next to Ball A, directly in the light's path. Things like this add an exciting twist to *The Black Box*. You've got to keep a sharp eye out for the expected, as well as the unexpected.

Playing the Game

To play *The Black Box*, move the cursor over the grid with your right joystick. You may fire a ray of light into the box by positioning the cursor in one of the border boxes and pressing the fire button on the joystick. To place a ball on the grid where you suspect one is located, press the fire button on the joystick. To remove a ball, reposition the cursor over it and press the fire button again. Note that balls may be placed only in the grid in the center. They may not be placed in border boxes, and attempting to do so results in firing a ray. Placing the cursor in any of the four corners of the board and pressing the fire button puts you in the Solve menu to the side.

Once within this menu you may "solve" the game, which causes the computer to display the real positions for the balls, and tallies up your score. Each ball located correctly is worth 100 points, and additional points are awarded according to how many turns you used in solving the game. The number of moves currently used is constantly updated below the menu.

You may also "kill" the current game and get a new one if you cannot solve the current one. The Kill option, however, does not display the solution of the game or your score. The third option on the side menu is the Back option, which allows you to leave the menu and resume playing the game.

To run *The Black Box*, type (C)LOAD"BLACKBOX", and then RUN, after the program has loaded. The program uses a high-speed poke and requires a joystick. If your machine cannot accept the high-speed poke, delete Line 5 from the listing.

The program also contains instructions within the code. If you don't want to type in the instructions, delete them. The code is modularized and the instructions are contained within the last module. In order to delete this module, delete lines 2700 through 2900. Then press N (No) when the program asks if you want instructions. Good luck and good hunting.

(Questions or comments concerning this article may be addressed to the author at 9323 Avenue A, Brooklyn, NY 11236. Please enclose an SASE when requesting a reply.) ❑

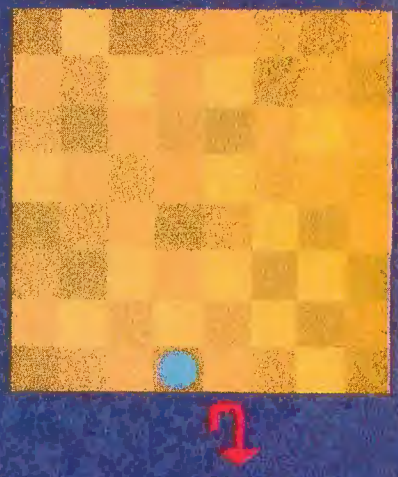

Figure 4: A Typical Reflection

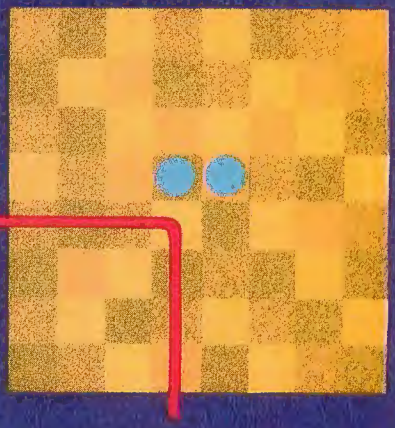

Figure 5: A Hit That Looks Like a Detour

50	133	1740	150
220	211	2200	65
325	194	2415	150
415	148	2680	141
770	133	2770	16
995	206	2860	189
1260	28	END	202
1510	79		

The listing: BLACKBOX

```
0 ' COPYRIGHT 1989  FALSOFT,INC
2 ' DRAW INTRO SCREEN
5 POKE 65495,0
10 CLS0:PMODE3,1
12 PRINT@224,"      B   L   A
C   K"
14 PRINT@288,"          B   O
X"
16 PRINT@448," [C] COPYRIGHT 198
5 EVAN VEAL"
18 TIMER=0
19 IF TIMER>=300 THEN20 ELSE 19
20 CLEAR 2500
25 CLS0:PRINT@256,"     INSTRUCT
IONS(Y OR N)?"
26 A$=INKEY$:IF A$<>"Y" AND A$<>
"N" THEN 26 ELSE IF A$="Y" THEN
GOSUB 2750
27 '
28 ' INITIALIZE VARIABLES
30 DATA 62,1,88,25,106,43,124,61
,142,79,160,97,178,115,196,133,2
14,151,236,174
40 DATA U4NR5U4R5D8BR4,R7L5U8L2R
7D4NL5D4BR4,BU8NR5D8R5BR4,NL1NR5
U8NL1R5D8BR4,NR5U4NR2U4R5BD8BR4,
```

```
U4NR2U4R5BD8BR4,U8R5ND1L5D8R5U3N
L2D3BR4,U4NU4R5U4D8BR4,R4L2U8NL2
R2BD8BR5,NU3R4U8NL2NR2BD8BR4,U8D
4R2NE4F4BR4,NU8R5BR4,U8F4E4D8BR4
,U8F8NU8BR4,NR5U8R5D8BR4
50 DIM NUM$(40),L$(15,2),CL(0,10
),CC(0,10),CS(0,10),CD(0,10),GR(
9,9),ZX(9),ZY(9),BL(5,2),B(10,2)
,MV$(40,2),M(20,2),AL$(26)
60 DATA U8R5D4L5D4BR9,U8R8D8NL8N
H2NF2BR4,U8R5D4L5R1F4BR4,R5U4L5U
4R5BD8BR4,BR3U8NL3R3BD8BR3,NU8R5
NU8BR4,BU8D4F4E4U4BD8BR4,BU8D8E4
F4U8BD8BR4,U2E4U2BL4D2F4D2BR4,BR
3U4NE4NH4D4BR8,BU8R8G8R8BR4
70 FOR N=0TO9:READA,B:ZX(N)=A:ZY
(N)=B:NEXT N
80 FOR N=1TO26:READA$:AL$(N)=A$:
NEXT N
130 NUM$(1)="R4L2U8NG2BR7BD8":NU
M$(2)="NR6U4R4U4NL5BR7BD8":NUM$(
3)="R5U4NL2U4NL5BR5BD8":NUM$(4)=
"BR4U6D2NR2L4U4BR10BD8":NUM$(5)=
"R6U5L4U3R5BR5BD8"
140 NUM$(6)="NU8R5U3L5BR10BD3":N
UM$(7)="U2E6NL7BR5BD8":NUM$(8)="
NR5U4NR5U4R5D8BR5":NUM$(9)="BU5N
R5U3R5D8BR5":NUM$(0)="NR8U8R8NG8
D8BR5"
150 FOR N=10TO40
160 K$=STR$(N):K1=VAL(MID$(K$,2,
1)):K2=VAL(RIGHT$(K$,1))
170 NUM$(N)=NUM$(K1)+NUM$(K2)
180 K$=""
190 NEXT N
210 PCLS:COLOR2,5:LINE(4,3)-(12,
10),PSET,BF:GET(0,0)-(15,15),CC,
G:COLOR3,5:LINE(2,2)-(12,12),PSE
T,BF:GET(0,0)-(15,15),CD,G
220 PCLS:GET(0,0)-(15,15),CD,G
230 L$(1,1)="3,3":L$(1,2)="R10D1
0U5NL10D5L10U10":L$(2,1)="1,10":
L$(2,2)="R12H6G6"
240 L$(3,1)="7,2":L$(3,2)="R4D5R
4D2L4D5L4U5L4U2R4U5":L$(4,1)="3,
3":L$(4,2)="R10G10R10H10"
250 L$(5,1)="3,3":L$(5,2)="R10NG
10D10NH10L10U10":L$(6,1)="BM1,5"
:L$(6,2)="R14G7H7C1D5C3R14H7G7"
260 L$(7,1)="7,2":L$(7,2)="D6L3F
5E5L3U6L4":L$(8,1)="3,7":L$(8,2)
="R2U2R2U2R4D2R2D2R2D3L2D2L2D2L4
U2L2U2L2U3"
270 L$(9,1)="3,3":L$(9,2)="R10D1
0L10U10F10":L$(10,1)="3,3":L$(10
,2)="R10D10L10U10"
280 L$(11,1)="6,7":L$(11,2)="U6R
4D6R4D3NL12L2D4L8U4L2U3R4":L$(12
,1)="7,9":L$(12,2)="S2U10R4D10F8
L20E8S4"
290 L$(13,1)="2,13":L$(13,2)="U8
NR4U4R4ND4R8D8NL4D4L4NU4L8":L$(1
4,1)="2,14":L$(14,2)="U12R6ND12R
6D6NL12D6L12"
300 L$(15,1)="7,10":L$(15,2)="U5
H2U1R5D1G2D6R4D4L9U4R4"
310 PMODE3,1:PCLS:SCREEN1,1:COLO
R2,5
320 MV=0:P=1:BL=1:M=0:CO=0:MA=0:
TD=0:SC=5
324 '
325 ' DRAW GAME SCREEN
330 FOR Y=24TO 168 STEP 18:LINE(
86,Y)-(230,Y),PSET:NEXTY
340 FOR X=86TO 230 STEP 18:LINE(
X,24)-(X,168),PSET:NEXTX
350 LINE(81,18)-(235,173),PSET,B
:LINE(81,18)-(60,0),PSET,BF:LINE
(235,173)-(254,191),PSET,BF:LINE
(235,18)-(254,0),PSET,BF:LINE(81
,173)-(60,191),PSET,BF:LINE(60,0
)-(254,191),PSET,B
360 FOR Y=24 TO 168 STEP 18:LINE
(60,Y)-(81,Y),PSET:LINE(235,Y)-(
254,Y),PSET:NEXTY:FOR X=86 TO230
 STEP 18:LINE(X,0)-(X,18),PSET:L
INE(X,173)-(X,191),PSET:NEXTX:PA
INT(203,172),2,2
370 DRAW"BM3,30C2;"+AL$(2)+AL$(1
2)+AL$(1)+AL$(3)+AL$(11)
380 DRAW"BM13,46C2;"+AL$(2)+AL$(
15)+AL$(24)
390 LINE(0,18)-(50,54),PSET,B
400 DRAW"BM6,109C4;"+AL$(19)+AL$
(15)+AL$(12)+AL$(22)+AL$(5)
405 DRAW"BM8,132C4;"+AL$(2)+AL$(
1)+AL$(3)+AL$(11)
410 DRAW"BM10,154C4;"+AL$(11)+AL
$(9)+AL$(12)+AL$(12)
414 '
415 'PLACE BALLS
420 FOR X=1TO8:FOR Y=1TO8:GR(X,Y
)=0:NEXTY,X
430 FOR N=1TO5
440 X=RND(8):Y=RND(8)
450 BL(N,1)=X:BL(N,2)=Y
460 GR(X,Y)=-1
470 FOR M=1TO5
480 IF M=N THEN M=5:GOTO500
490 IF (BL(M,1)=BL(N,1)) AND (BL
(M,2)=BL(N,2)) THEN  GOTO 440
500 NEXT M,N
640 DRAW"BM0,174C2;"+AL$(13)+AL$
(15)+AL$(22)+AL$(5)+AL$(19)+"U2B
U2U2"
644 '
645 'START POLLING ROUTINE
650 PUT(0,176)-(30,184),CL,PSET
660 DRAW"BM0,184C2"+NUM$(MV)
670 X2=X1:Y2=Y1
680 X=JOYSTK(0):Y=JOYSTK(1)
690 Z=INT(X/7):GOSUB1770:X1=ZX
700 OX=Z
710 Z=INT(Y/7):GOSUB1760:Y1=ZY
720 OY=Z
730 PUT(X2,Y2)-(X2+15,Y2+15),CS,
PSET
740 GET(X1,Y1)-(X1+15,Y1+15),CS,
```

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```
G
750 PUT(X1,Y1)-(X1+15,Y1+15),CC,
PSET
760 A=PEEK(65280):IF A=254 OR A=
126 THEN COLOR1,5:LINE(X1,Y1)-(X
1+15,Y1+15),PSET,BF:COLOR3,5:GOT
0780
770 X2=X1:Y2=Y1:GOTO680
780 SOUND150,2
790 IF OX<>0 AND OX<>9 AND OY<>0
 AND OY<>9 THEN GOTO2020
800 IF OX=0 AND OY=0 THEN 2190
810 IF OX=0 AND OY=9 THEN 2190
820 IF OX=9 AND OY=0 THEN 2190
830 IF OX=9 AND OY=9 THEN 2190
834 '
835 'SAVE MOVE -CHECK IF REPEAT
840 K$=STR$(OX)+","+STR$(OY)
850 FOR N=0 TO MV
860 IF MV$(N,1)=K$ THEN 900
870 NEXT N
880 MV$(MV,1)=K$
890 GOTO1000
894 '
895 'REPEAT MOVE PROCESSING
900 Z=OX:GOSUB1770:X1=ZX
910 Z=OY:GOSUB1760:Y1=ZY
920 X$=MV$(N,0):GOSUB1940:X=K1:Y
=K2
930 L=P
940 P=VAL(MV$(N,2))
950 IF P=17 THEN P=L:COLOR4,5:MV
=MV-1:GOTO 1720
960 IF P=18 THEN P=L:COLOR3,5:MV
=MV-1:GOTO1530
970 ZP$="Y"
990 GOTO 1600
994 '
995 'CONVERT X,Y TO GRAPHICS LOC
ATIONS
1000 IF X1=62 OR X1=236 THEN GOT
O 1020
1010 IF Y1=1 OR Y1=174 THEN 1070
1020 IF X1=236 THEN 1050
1030 Y=INT(Y1/18):X=0
1040 FLG$="X+1":GOTO 1120
1050 Y=INT(Y1/18):X=9
1060 FLG$="X-1":GOTO1120
1070 IF Y1=174 THEN GOTO1100
1080 X=INT((X1-66)/18):Y=0
1090 FLG$="Y+1":GOTO1120
1100 X=INT((X1-66)/18):Y=9
1110 FLG$="Y-1":GOTO1120
1114 '
1115 'PROCESSING OF BEAM PATH
1120 IF LEFT$(FLG$,1)="Y" THEN 1
320
1130 IF RIGHT$(FLG$,2)="-1" THEN
 GOTO 1230
1140 IF X=9 THEN 1580
1150 IF GR(X,Y)=-1 THEN 1510
1160 IF Y+1<10 THEN IF X=0 AND G
R(X+1,Y+1)=-1 THEN 1580
1170 IF Y-1>-1 THEN IF X=0 AND G
R(X+1,Y-1)=-1 THEN 1580
1180 IF Y-1<>0 THEN IF GR(X+1,Y-
1)=-1 THEN FLG$="Y+1":GOTO1120
1190 IF Y+1<>9 THEN IF GR(X+1,Y+
1)=-1 THEN FLG$="Y-1":GOTO1120
1200 IF GR(X,Y)=-1 THEN 1510
1210 IF X+1<>10 THEN X=X+1:GOTO1
120
1220 GOTO1120
1230 IF X=0 THEN 1580
1240 IF GR(X,Y)=-1 THEN 1510
1250 IF Y+1<10 THEN IF X=9 AND G
R(X-1,Y+1)=-1 THEN 1580
1260 IF Y-1>-1 THEN IF X=9 AND G
R(X-1,Y-1)=-1 THEN 1580
1270 IF Y-1<>0 THEN IF GR(X-1,Y-
1)=-1 THEN FLG$="Y+1":GOTO1120
1280 IF Y+1<>9 THEN IF GR(X-1,Y+
1)=-1 THEN FLG$="Y-1":GOTO1120
1290 IF GR(X,Y)=-1 THEN 1510
1300 IF X-1<>-1 THEN X=X-1:GOTO1
120
1310 GOTO1120
1320 IF RIGHT$(FLG$,2)="-1" THEN
GOTO 1420
1330 IF Y=9 THEN 1580
1340 IF GR(X,Y)=-1 THEN 1510
1350 IF X+1<10 THEN IF Y=0 AND G
R(X+1,Y+1)=-1 THEN 1580
1360 IF X-1>-1 THEN IF Y=0 AND G
R(X-1,Y+1)=-1 THEN 1580
1370 IF X-1<>0 THEN IF GR(X-1,Y+
1)=-1 THEN FLG$="X+1":GOTO1120
1380 IF X+1<>9 THEN IF GR(X+1,Y+
1)=-1 THEN FLG$="X-1":GOTO1120
1390 IF GR(X,Y)=-1 THEN 1510
1400 IF Y+1<>10 THEN Y=Y+1:GOTO1
120
1410 GOTO1120
1420 IF Y=0 THEN 1580
1430 IF GR(X,Y)=-1 THEN 1510
1440 IF X+1<10 THEN IF Y=9 AND G
R(X+1,Y-1)=-1 THEN 1580
1450 IF X-1>-1 THEN IF Y=9 AND G
R(X-1,Y-1)=-1 THEN 1580
1460 IF X-1<>0 THEN IF GR(X-1,Y-
1)=-1 THEN FLG$="X+1":GOTO1120
1470 IF X+1<>9 THEN IF GR(X+1,Y-
1)=-1 THEN FLG$="X-1":GOTO1120
1480 IF GR(X,Y)=-1 THEN 1510
1490 IF Y-1<>-1 THEN Y=Y-1:GOTO1
120
1500 GOTO1120
1504 '
1505 ' ***HIT***
1510 COLOR3,5
1520 MV$(MV,0)=MV$(MV,1):MV$(MV,
2)="18"
1530 LINE(X1,Y1)-(X1+15,Y1+15),P
RESET,BF
1540 LINE(X1,Y1)-(X1+15,Y1+15),P
SET,BF
1550 GET(X1,Y1)-(X1+15,Y1+15),CS
,G
```

```
1560 COLOR2,5
1565 SOUND 180,4
1570 MV=MV+1:GOTO650
1574 '
1575 '***REFLECTION***
1580 IF X=OX AND Y=OY THEN GOTO1
700
1590 MV$(MV,0)=STR$(X)+","+STR$(
Y):MV$(MV,2)=STR$(P)
1600 Z=X:GOSUB1770:X3=ZX
1610 Z=Y:GOSUB1760:Y3=ZY
1620 X$=L$(P,1):GOSUB1940:C=K1:C
1=K2
1630 T=C+X1:T1=C1+Y1:T2=C+X3:T3=
C1+Y3
1640 COLOR1,5:LINE(X3,Y3)-(X3+15
,Y3+15),PSET,BF:COLOR3,5165Ø
DRAW"BM"+STR$(T)+","+STR$(T
1)+"C3"+L$(P,2):DRAW"BM"+STR$(T2
)+","+STR$(T3)+"C3"+L$(P,2)
1660 GET(X1,Y1)-(X1+15,Y1+15),CS
,G
1670 IF ZP$="Y" THEN ZP$="N":P=L
:GOTO650
1680 P=P+1:MV=MV+1
1690 GOTO650
1694 '
1695 '***DETOUR***
1700 COLOR4,5
1710 MV$(MV,0)=MV$(MV,1):MV$(MV,
2)="17"
1720 LINE(X1,Y1)-(X1+15,Y1+15),P
SET,BF
1730 GET(X1,Y1)-(X1+15,Y1+15),CS
,G
1740 COLOR3,5
1750 MV=MV+1:GOTO650
1754 '
1755 'X,Y/PIXEL CONVERSION
1760 ZY=ZY(Z):RETURN
1770 ZX=ZX(Z):RETURN
1940 T=INSTR(1,X$,","):K1=VAL(LE
FT$(X$,T-1)):K2=VAL(RIGHT$(X$,LE
N(X$)-T)):X$="":RETURN
2014 '
2015 'PLACE BALL ON GRID
2020 K$=STR$(OX)+","+STR$(OY)
2030 FOR N=1TO10
2040 IF (B(N,1)=OX) AND (B(N,2)=
OY) THEN LINE(X1,Y1)-(X1+15,Y1+1
5),PRESET,BF:GET(X1,Y1)-(X1+15,Y
1+15),CS,G:GOTO2140
2050 NEXTN
2060 IF BL>=10 THEN GOTO680
2070 FOR N=1TO6
2080 CIRCLE(X1+9,Y1+9),N,2
2090 NEXT N
2100 GET(X1,Y1)-(X1+15,Y1+15),CS
,G
2110 B(BL,1)=OX:B(BL,2)=OY
```


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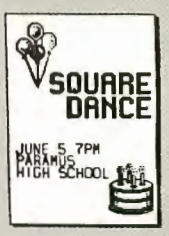

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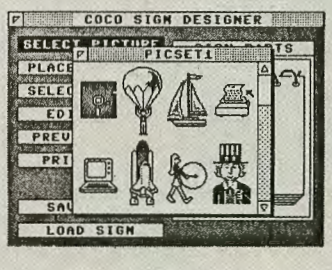
Super easy-to-use point and click graphical interface, features windows, scroll bars, radio buttons, and joystick or mouse control.



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```
2120 BL=BL+1
2130 GOTO680
2140 BL=BL-1
2150 FOR H=N TO 9
2160 B(H,1)=B(H+1,1):B(H,2)=B(H+
1,2)
2170 NEXTH
2180 GOTO680
2184 '
2185 ' MENU SELECTION
2190 J1=JOYSTK(0):J2=JOYSTK(1)
2200 IF J2<21 THEN LINE(0,95)-(5
6,114),PSET,B
2210 IF J2>42 THEN LINE(0,140)-(
56,159),PSET,B
2215 IF (J2>=21) AND (J2<=42) TH
EN LINE(0,117)-(56,136),PSET,B
2220 A=PEEK(65280):IF A=254 OR A
=126 THEN 2240
2230 LINE(0,95)-(56,114),PRESET,
B:LINE(0,117)-(56,136),PRESET,B:
LINE(0,140)-(56,159),PRESET,B:GO
TO2190
2240 IF J2>42 THEN 310
2243 IF (J2>=21) AND (J2<=42) TH
EN LINE(0,117)-(56,136),PRESET,B
:GOTO 650
2244 '
2245 'SOLVE GAME
2250 FOR N=1TO5
2270 Z=BL(N,1):GOSUB1770:X=ZX:Z=
BL(N,2):GOSUB1760:Y=ZY
2280 FOR T=1TO5
2290 IF (B(T,1)=BL(N,1)) AND (B(
T,2)=BL(N,2)) THEN BL(N,1)=-10:G
OTO 2320
2300 NEXT T
2305 SOUND 30,7
2310 COLOR4,5:LINE(X,Y)-(X+15,Y+
15),PSET,BF:GOTO2410
2320 COLOR2,5:LINE(X,Y)-(X+15,Y+
15),PSET,BF
2330 FOR T=1TO500:NEXTT
2340 SOUND190,3
2350 FOR T=1 TO10
2360 COLOR4,5:LINE(X,Y)-(X+15,Y+
15),PSET,BF
2370 FOR Z=1TO100:NEXTZ
2380 COLOR2,5:LINE(X,Y)-(X+15,Y+
15),PSET,BF
2390 NEXT T
2400 FOR W=1TO750:NEXTW
2410 NEXT N
2414 '
2415 'SCORING
2420 FOR N=1TO5
2430 IF BL(N,1)<>-10 THEN SC=SC-
1
2440 NEXT N
2450 IF SC=0 THEN SO=0:GOTO2500
2460 A=SC*100:B=1-(MV/32):SO=INT
(A+(B*125))
2494 '
2495 'DRAW END SCREEN
2500 LINE(0,95)-(57,160),PRESET,
BF
2510 DRAW"BM0,120C2;"+AL$(19)+AL
$(3)+AL$(15)+AL$(18)+AL$(5)
2520 SO$=STR$(SO)
2530 DRAW"BM3,136C3"
2540 FOR N=1TOLEN(SO$)
2550 K$=MID$(SO$,N,1)
2560 IF K$=" " THEN 2600
2570 IF K$=""THEN 2600
2580 DRAWNUM$(VAL(K$))
2590 K$=""
2600 K$="":NEXT N
2610 LINE(0,15)-(56,55),PRESET,B
F
2620 DRAW"BM6,12C2;"+AL$(16)+AL$
(12)+AL$(1)+AL$(25)
2630 DRAW"BM0,25C2;"+AL$(1)+AL$(
7)+AL$(1)+AL$(9)+AL$(14)+"BR4U1B
U2U3R5U4L7D2"
2640 DRAW"BM9,45C2;"+AL$(25)+"BR
6"+AL$(14)
2650 J1=JOYSTK(0)
2660 IF J1<=32 THEN LINE(6,34)-(
21,48),PSET,B:LINE(25,34)-(39,48
),PRESET,B
2670 IF J1>32 THEN LINE(25,34)-(
39,48),PSET,B:LINE(6,34)-(21,48)
,PRESET,B
2680 IF PEEK(65280)=254 OR PEEK(
65280)=126 THEN GOTO2690 ELSE GO
TO2650
2690 IF J1<=32 THEN 310 ELSE END
2700 TIMER=0
2705 IF TIMER<=65 THEN 2705
2710 PRINT@480," press fire butt
on to continue";
2720 IF PEEK(65280)<>126 AND PEE
K(65280)<>254 THEN 2720 ELSE CLS
:PRINT@11,"BLACK BOX":RETURN
2730 TIMER=0
2731 IF TIMER<=30 THEN 2731
2735 PRINT" <-MORE->"
2740 IF PEEK(65280)<>126 AND PEE
K(65280)<>254 THEN 2740 ELSE RET
URN
2745 'INSTRUCTIONS
2750 CLS:PRINT@11,"BLACK BOX"
2760 PRINT"OBJECT:"
2770 PRINT"  THE OBJECT OF BLACK
 BOX IS    TO LOCATE FIVE BALLS
WHICH ARE  HIDDEN WITHIN THE GRI
D OR BOX.  YOU LOCATE THEM BY FI
RING RAYS  OF LIGHT INTO THE BOX
 AND       OBSERVING WHERE THEY
EXIT."
2780 PRINT"  THE LIGHT RAYS ARE
BENT IN    PARTICULAR WAYS WHEN
THEY ENCOU -NTER THE BALLS WITHI
N THE BOX  AND YOU MUST DEDUCE T
HE BALLS'  POSITIONS BY OBSERVIN
G HOW EACH RAY OF LIGHT IS BENT
WITHIN THE GRID."
2790 GOSUB2700
```

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```
2810 PRINT"PLAYING THE GAME:"
2820 PRINT"   WHEN THE GAME BEGI
NS THE      CURSOR WILL BE SOMEWH
ERE ON THE GRID. TO SHOOT RAYS O
F LIGHT IN -TO THE GRID YOU POSI
TION THE    CURSOR IN ONE OF THE
BORDER      BOXES AND PRESS THE F
IRE BUTTON"
2830 PRINT" WHEN YOU DO THIS THE
 BOX MAY    TURN PURPLE OR ORANGE
 OR AN      ICON WILL APPEAR IN I
T. IF IT    TURNS PURPLE THIS SIG
NIFIES A    HIT. IF THE BOX TURNS
 ORANGE     IT SIGNIFIES A REFLEC
TION."
2840 GOSUB2700
2850 PRINT"  IF AN ICON APPEARS
IT MEANS    THE BEAM OF LIGHT HAS
 EXITED     THE GRID AT SOME OTHE
R POINT."
2860 PRINT"   WHEN YOU THINK YOU
 HAVE       LOCATED A BALL MOVE T
HE CURSOR   ONTO ITS SUSPECTED LO
CATION ON   THE GRID AND PRESS TH
E FIRE      BUTTON. A BALL WILL A
PPEAR       AT THAT POINT. TO REM
OVE A BALL  MERELY REPOSITION THE
 CURSOR"
2870 PRINT"OVER IT AND PRESS THE
 FIRE BUT   -TON AND IT WILL BE R
EMOVED."
2875 GOSUB2700
2880 PRINT"    WHEN YOU THINK YO
U HAVE      LOCATED ALL OF THE BA
LLS OR AS   MANY AS POSSIBLE, THE
N MOVE THE  CURSOR TO ONE OF THE
FOUR CORN   -ERS OF THE GRID AND
PRESS THE   FIRE BUTTON. THIS WIL
L PUT YOU   IN THE SIDE MENU."
2890 PRINT"    HERE, SELECTING T
HE SOLVE    OPTION WILL GIVE THE
SOLUTION    TO THE MAZE AND YOUR
SCORE."
2892 GOSUB2730
2895 PRINT"   YOU MAY ALSO AT AN
YTIME       DURING THE GAME GO TO
 THE SIDE   MENU AND SELECT THE <
KILL>       OPTION WHICH WILL KIL
L THE"
2900 PRINT"CURRENT GAME AND GIVE
 YOU A NEW ONE."
2905 GOSUB2700
2920 PRINT:PRINT"    YOU ARE NOW
READY TO FACE          THE CHALLE
NGE OF THE                   BLA
CK BOX"
2930 PRINT:PRINT"  GOOD LUCK AND
 GOOD HUNTING!"
2940 GOSUB2700
2950 RETURN
```


* ultra * ultra * ultra *

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Colorful equations

The Graphics Corner Part I of III

By William P. Nee

Welcome to The Graphics Corner. This mini-series will show you three ways to create color graphics on your CoCo, using BASIC and machine language programs, one and two-dimensional arrays, and the CoCo's upper 32K RAM memory. These three programs should be modified and experimented with as much as possible since the variations are endless.

Listing 1: COLRDEMO

```
10 PMODE 3,1:PCLS:SCREEN 1,1
20 FOR X=0 TO 30:XX=X+X
30 FOR Y=0 TO 30
40 C=(X*X+Y*Y) AND 3
50 PSET(XX,Y,C):NEXT Y,X
60 GOTO 60
```

Our first program explains how to use a mathematical equation of almost any type to make a graphics pattern. As we go across and down the entire screen, each *x* (horizontal) and *y* (vertical) point is computed according to the formula we select, and the result is used to determine the color of that point. Since we want the maximum number of colors, we'll use PMODE 3, colors 0 through 3. If our color value is greater than 3, we will AND it with 3 — this keeps the color value between 0 and 3.

Bill Nee bucked the "snowbird" trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo.

Let's try a quick demonstration. The equation for a circle, *x*x+y*y*, draws well, so we'll let our color C=(X*X+Y*Y) AND 3. Since PMODE 3 uses two bits across for each color, we need to double the *x* value when we set it (not when we compute it). Listing 1 gives a quick demonstration.

The result is pretty, but there's not too much to it. We need to be able to enlarge the pattern and choose how far it goes horizontally and vertically. Let's use the same formula for comparison. First, choose the coordinates where the graphics will start and how far they'll go in each direction. Let's start with an *x* value of -32 and a *y* value of -32, and go +64 in each direction. Next, scale each value. Since there are 128 color bits across, each one is 64/128 (the *x* distance/128) of the distance across; and since there are 192 pixels down, each one is 64/192 (the *y* distance/192) of the distance down. The *x* values will be the horizontal distance across (H) times the *x* scale (XS) added to the original starting point (XC); the *y* values will be the vertical distance down (V) times the *y* scale (YS) added to the original starting point (YC). Our new program should look like Listing 2.

Now let's make a few refinements. We'll use DATA lines for the starting coordinates and distances, and read them at the beginning of the program. Instead of having to re-compute the color value at every point, use the DEF FN command in BASIC. At the start of the program we'll define the color as DEF FN(C)=INT(X*X+Y*Y) AND 3. As an option,

Listing 2: CIRCLE1

```
5 XC=-32:XS=64/128:YC=-32:YS=64/
192
10 PMODE 3,1:PCLS:SCREEN 1,1
20 FOR H=0 TO 30:X=XC+H*XS:HH=H+
H
30 FOR V=0 TO 30:Y=YC+V*YS
40 C=INT(X*X+Y*Y) AND 3
50 PSET(HH,V,C):NEXT V,H
60 GOTO 60
```

Listing 3: CIRCLE2

```
0 DIM XC,YC,XD,YD,XS,YS,MX,MY,H,
HH,V,X,XX,Y,C
1 READ XC,XD,YC,YD:XS=XD/128:YS=
YD/192:MX=127:MY=191
2 DEF FN F(C)=INT(X*X+Y*Y)AND 3
3 PMODE3,1:PCLS:SCREEN1,1
4 FORH=0TOMX:HH=H+H:X=XC+H*XS:FO
RV=0TOMY:Y=YC+V*YS:PSET(HH,191-V
,FNF(C)):NEXTV,H
5 GOTO 5
6 DATA -32,+64
7 DATA -32,+64
```

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Table 1

XC	XD	YC	YD	Equations
-8	16	-8	16	INT(32*(SIN(X)*SIN(X)+COS(Y)*COS(Y))) AND 3
0	10	-3	6	INT(EXP(X)*COS(Y)) AND 3
-16	32	-16	32	INT(SQR(ABS(X*X-Y*Y))) AND 3
-4	8	-4	8	INT(X*X+Y*Y)*(X:X+Y*Y)-2(X*X-Y*Y)) AND 3
-2.5	5	-2.5	5	INT((X*X+Y*Y)*(X*X+Y*Y)*(X*X+Y*Y)-(X*X-Y*Y)*(X*X-Y*Y)) AND 3

you can have the *y* point PSET as (...,191-V,C) — this makes our display a little more realistic-looking since most graphs are numbered from low to high as you go up. Finally, we'll define all our variables at the start of the program (so BASIC will have locations for them immediately), renumber the program, and combine lines where possible — to get that extra added speed. If your computer will handle it, you can also insert the fast poke (POKE 65495,0) in the first line. The final program should look about like Listing 3.

With the mechanics of the program out of the way, let's have some fun with it. Since the equation makes designs, start by changing it to X*X-Y*Y. What a difference a sign makes!

Another variation is X*X+2*Y. You can make the numbers cubic powers X*X*X=Y*Y*Y, but if the value before you AND it with 3 is too large, you will get a Function Call Error. You can only AND a number if it is between -32768 and +32767.

Another variation is to use SIN and COS. But since their value is only between -1 and +1, you must include a multiplier in the formula, such as INT(32*(SIN(X)+COS(Y)) AND 3. If you use LOG, the starting coordinates will usually have to be greater than zero (try to find LOG(0) or LOG(-32)). Another way to vary the display is to keep the formula the same, but increase or decrease the distance. Try Listing 3 again, but use XC=-16, XD=+32, YC=-16, YD=+32. Finally, you can vary the AND number. Try using . . . AND 2 in the formula computation.

Table 1 is a list of functions and their coordinates I've found interesting to graph. You will find many more on your own. That's it for The Graphics Corner this month. Next time we'll investigate one-dimensional arrays and use two ML programs to create a graphics display that really zips along.

(Questions or comments concerning this article may be addressed to the author at Route 2, Box 216C Mason, WI 54856-9302. Please enclose an SASE when requesting a reply.)

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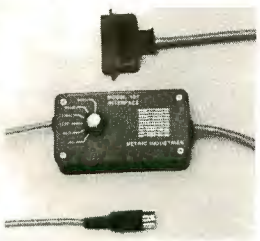

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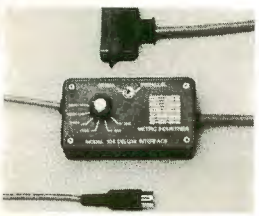

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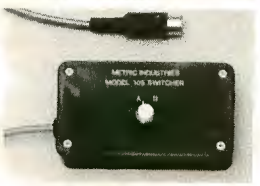

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High-density printer enhancements for the shoestring desktop publisher, Desktop High

High Capacity Screen Dumps for the Shoestring Desktop Publisher

Part II of III

By H. Allen Curtis

In Part I of this three-part article (May '89, Page 100), it was pointed out that the quality of any desktop publisher is reflected directly and crucially by the quality of its screen dumps. Presented were high-quality, high-capacity screen dumps maximizing the capabilities of printers commonly owned by DESKTOPL users. In this article analogous screen dumps are presented for DESKTOPH users.

The screen dumps formerly developed to work with DESKTOPH print two screen images per page. The new high-capacity screen dumps employ eight and 12 screens in printouts. The eight-screen dumps produce two-column printouts with four screen images per column. The 12-screen dumps yield three-column printouts with four screen images per column.

Two screen dumps — one for the two-column, eight-screen printout and the other for the three-column, 12-screen printouts — were written to work with the Tandy DMP-series of dot-matrix printers. Each of the screen dumps work in either of two graphics modes — the 800 dots-per-line or the 960 dots-per-line mode. Commonly used DMP-105, -106, -110 and -200 printers have one or the other of these two modes. Each of the DMP-130 and -130A, connected as a serial printer, has only a graphics mode providing 480 dots per line. Therefore, they will not work with these two screen dumps. However, with a parallel-to-serial interface connection, the DMP-130 and -130A will work with the other pair of screen dumps presented in this part of the article.

Each column of the two-column, eight-screen dump in the 960 dots-per-line mode is 480 dots wide. The screen dump prints the left- most three-quarters of each screen (480*192 of the possible 640*192 dots). Thus, the page capacity of the screen dump is 8*3/4=6 screens, which is three times the page capacity of the screen dumps generally in use. In the 800 dots-per-line mode each column is 400 dots wide, leading to a page capacity of five screens. The page capacities of the three-column, eight-screen dump in the 800 and 960 dots-per-line modes are also five and six screens, respectively. This is due to the fact that each column is proportionally narrower for this screen dump.

The other pair of screen dumps developed for this part of the article are for Epson or Epson-compatible printers. Here Epson-compatible means almost all dot-matrix printers other than the Tandy printers. The printers must be able to operate in a 960 dots-per-line mode and/or in a 1920 dots-per-line mode. One screen dump provides a two-column, eight-screen printout in the 960 dots-per-line mode. The other screen dump yields a three-column, 12-screen printout optionally in the 960 or 1920 dots-per-line mode. The screen dump for the two-column, eight-screen printout, like its counterpart for Tandy printers, has a six-screen-per-page capacity. The page capacities of the three-column, 12-screen, dump are six and 12 screens in the 960 and 1920 dots-per-line modes, respectively. The screen dump with the 12 screens-per-page capacity prints at a dot density of 240 dots-per-inch, a density approaching the 300 dots-per-inch capabilities of expensive laser printers.

There is a drawback, however, to the screen dump operating in the high-density 1920 dots-per-line mode. Each screen image is condensed to such an extent that only one (Font 4) of the 19 available fonts is large enough for suitable use with the dump. Hence, until a new set of large fonts (if there is a substantial reader response) is developed, it is preferable to employ the three-column, 12-screen dump in the 960 dots-per-line mode.

For DESKTOPH there are two BASIC driver programs, each servicing two high-capacity screen dumps. One driver is for DMP printers, the other for Epson-compatible printers. The printer drivers are shown in Listings 1 and 2. DRIVERHT, the program of Listing 1, is the driver for DESKTOPH and Tandy-DMP printers. Likewise, DRIVERHE, the program of Listing 2, is the driver for

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DESKTOPH and Epson-compatible printers.

Your DESKTOPH program will have to be altered to work with DRIVERHT or DRIVERHE, by merging with it one of four patch programs — HALTER, HALTERD, HALTERE, and HALTERDE — of Listings 3, 4, 5 and 6, respectively. Which one of the patch programs you must merge with DESKTOPH depends on what version of that program you are using. Presently, there are effectively four different versions of DESKTOPH. These different versions are an outgrowth of selling to many DESKTOPH users a built-in screen dump, enhancements or both. The four versions are as follows:

- Version 1 — The original DESKTOPH with 2, 10 or 19 fonts, with or without the word processor input feature introduced in *The Desktop Publisher: A Reprise* (September '88 issue of THE RAINBOW).
- Version 2 — Like Version 1 with the exception that a patch program merged with DESKTOPH gives the O command screen dump capabilities.
- Version 3 — Like Version 1, but a patch program merged with DESKTOPH provides some new commands.
- Version 4 — A combination of Versions 2 and 3.

The programs HALTER, HALTERD, HALTERE, and HALTERDE are associated with Versions 1, 2, 3 and 4 respectively, of DESKTOPH. Each of these patch programs gives the O command of DESKTOPH the ability to transfer control to DRIVERHT or DRIVERHE. Those of you with Epson or Epson-compatible printers will have to change Line 725 of the patch program associated with your version of DESKTOPH. In that line you will have to replace DRIVERHT with DRIVERHE.

Each patch program expands the powers of the O command further. It adds an option to the O command allowing you to look at the directory of the disk in Drive 0. For later printing, you will be saving eight or 12 screens on disk by means of the Save Screen option of the O command. To keep track of what files are already on the disk, you may occasionally need to use the directory option of the O command. Each patch program gives DESKTOPH the ability, by means of the O and I commands, to address drives when saving and loading screen files. If you have more than one drive, you may want to save screen files on a disk in a drive other than Drive 0. You should then append to DIR in Line 725 a drive number 1, 2 or 3 corresponding to the drive you intend to employ. Some of you having Version 2 or Version 4 of DESKTOPH may need to change Line 725, by replacing THENCLS:EXEC&H149 with the BASIC commands in the corresponding part of Line 725 of your present DESKTOPH. For instance, many of you using HDUMP105 screen dump need to make the replacement:

```
THENCLS:PRINT#-2,CHR$(27);CHR$(20
;:EXEC&H132A.
```

When you have typed the patch program for DESKTOPH and made, if needed, any of the discussed changes in Line 725, save it in ASCII format. For example, to save HALTERD in ASCII format, type: SAVE"HALTERD",A and press ENTER.

Baud Rate	Value
1200	41
2400	18
4800	6 or 7
9600	1

Table 1

To make the necessary alteration of DESKTOPH, do the following: Get out the disk containing your version of DESKTOPH and its font files, then make a backup copy of the disk. Put away the original and work with the backup copy. For compatibility with DRIVERHT or DRIVERHE, your DESKTOPH version must have the filename DH. Therefore, insert the disk containing DESKTOPH in the drive and type: RENAME"DESKTOPH/BAS"TO"DH/BAS" and press ENTER. Now enter LOAD "DH", then insert in the drive the disk containing the patch program — HALTER, HALTERED, HALTERE, or HALTERDE. If your patch program is HALTERDE, for instance, type: MERGE"HALTERDE" and press ENTER. Do similarly for any one of the other three patch programs, but with its name instead of HALTERDE. Finally, insert the disk containing DH in your drive and type: SAVE"DH" and press ENTER.

Depending on what printer you have, you may have to change some lines of the driver program, DRIVERHT or DRIVERHE, whichever one you will be using. The poke command in Line 5 of each of these programs is employed to set the baud rate of your particular printer. If your printer operates at 600 baud, you need not change Line 5. Otherwise, delete the apostrophe from Line 5 and replace the question mark with the value associated with the baud rate of your printer. These values are given in Table 1. If the control codes for initiating the 800 or 960 dots-per-line graphics mode are other than 27,20 or 27,19, respectively, for your DMP printer, you need to change Line 740 or 730 of DRIVERHT, accordingly.

If you have a printer that is Epson-compatible but not an Epson, you may have to tailor-make DRIVERHE to fit the needs of your printer. Tailor-making DRIVERHE involves changing seven DATA statements containing Epson printer-control code sequences. Lines 650 through 670 contain the control codes for a two-column printout. Similarly, lines 720 through 750 hold control codes needed for three-column printouts. The first DATA value in each of the lines specifies the number of values in the control code sequence represented by the remainder of the DATA statement. Lines 650 and 720 are identical and specify the control code sequence for line spacing.

For ordinary printing your printer provides a line spacing of one-sixth inch, which produces six lines of print per inch. For the printer graphics modes the line spacing must be a closer, 7/72 inch. The Epson control code sequence yielding the required line spacing is 27,49. In lines 650 and 720 the initial value of 2 indicates the following values. 27 and 49 represent the control code sequence. Check your printer manual to see whether or not 27,49 is the control code sequence for a line spacing of 7/72 inch. If your printer has a different control code sequence for that line spacing, modify lines 650 and 720 accordingly. If the control code has three values, for instance, in addition to changing the control code sequence, you will have to alter the initial value to 3. In such a case, the DATA statement would end with four zero values instead of the five required for the Epson printer. It may be that your printer automatically adjusts the line spacing to fit the graphics modes. In that event, you need to replace the initial value 2 in lines 650 and 720 with 0. However, if your printer does not have automatic line spacing adjustment and you make the 0 for 2 substitution, your printout will show noticeable gaps between lines.

BASIC lines 670 and 740 also deal with line spacing. They hold control code sequences for the return to one-sixth inch line spacing. Therefore, check your manual for a 27,50 control code sequence, and if needed, make changes in lines 670 and 740 analogous to those made for lines 650 and 720. Lines 660, 730 and 750 contain the Epson control code sequences for specifying the graphics modes. Lines 660 and 750 are exactly the same. The graphics mode indicated by each of those two lines is the one with a dot density of 960 dots per line (120 dots per inch). The first two values, 192 and 3 indicate a maximum of 192+3*256=960 dots that are to be printed per line. If your printer manual has a different control code sequence for this graphics mode, be sure to change lines 660 and 750 so that the codes specify a maximum of 960 dots printed per line.

Line 730 holds the control sequence for

the graphics mode with a dot density of 1920 dots per line (240 dots per inch). The last two values of the Epson code sequence specify a maximum of 128+7*256=1920 (the width of three screens) that are to be printed per line. If your printer requires another control code sequence for the 1920 dots-per-line mode, modify Line 730 accordingly. Be sure to make the change in such a way that the code will provide for a maximum of 1920 dots per line.

A few tips on the typing of the driver program, DRIVERHT or DRIVERHE, should prove helpful. Before you run the driver that you are typing, save it on disk. Each driver contains some pokes to memory. Any typing error involving the pokes or related memory locations could cause the loss of the whole program, when it is run. After saving the driver in its entirety, run it. When the driver asks whether you want a two- or three-column printout, press 3. You will then be asked to wait a few moments.

If you made an error in DRIVERHT lines 50 through 150 or DRIVERHE lines 50 through 120, the program will stop and report the line in which the error occurs. Respond to the error report by comparing your erroneous line with the correct rendition in the listing before rectifying the error. Repeat this running and correcting process until the driver executes to the point at which the screen with the few moments wait request is replaced with another prompt screen. Press BREAK to stop the program. Next, run the program and press 2 for a two-column printout. A request for a few moments wait will occur. If you made a mistake in typing DRIVERHT, lines 290 through 370 or DRIVERHE, lines 270 through 330, the program will stop and report the number of the erroneous line. Rectify the error. Repeat running and correcting the program until it can execute beyond the screen containing the few moments wait request. Finally, save the driver program on disk.

Both DRIVERHT and DRIVERHE provide prompts and messages to lead you through the program in effecting the desired two- or three-column printout. You must, however, have ready on disk the required screen files previously saved by the desktop publisher program DH. The eight- or less character filename of each screen file must adhere to the structure described in Tables 2 and 3. In these tables the heading, Screen Image Printout Destination, refers to the location on the printed page of the screen image.

The patch programs, HALTER, HALTERD, HALTERE, and HALTERDE of listings 3 through 6 have given the program DH a handy new feature. The feature promotes pleasingly-spaced two- and three-column printouts. With the new feature DH positions every character of any font within a vertical distance of eight, 12, 16 or 24 dots on the screen. Each of those distances divides evenly into the 192-dot vertical size of a DH screen. This means that with a top margin setting of zero in the M command of DH, each screen holds exactly 24, 16, 12 or eight lines of characters depending on the font in use. This guarantees that in a printout of two-screen images, one above the other in a column, the spacing between screen images will be indistinguishable from the spacing between lines of either screen image written with the same font.

Tables 4 through 8 give the margin settings specified by DH's M and W com-

Final Two Characters of Filename	Screen Image Printout Destination
L1	Top ¼ of Left Column
L2	2nd ¼ of Left Column
L3	3rd ¼ of Left Column
L4	Bottom ¼ of Left Column
R1	Top ¼ of Right Column
R2	2nd ¼ of Right Column
R3	3rd ¼ of Right Column
R4	Bottom ¼ of Right Column

Table 2: Filename Structure for Two-Column, Eight-Screen Printout

Final Two Characters of Filename	Screen Image Printout Destination
L1	Top ¼ of Left Column
L2	2nd ¼ of Left Column
L3	3rd ¼ of Left Column
L4	Bottom ¼ of Left Column
M1	Top ¼ of Middle Column
M2	2nd ¼ of Middle Column
M3	3rd ¼ of Middle Column
M4	Bottom ¼ of Middle Column
R1	Top ¼ of Right Column
R2	2nd ¼ of Right Column
R3	3rd ¼ of Right Column
R4	Bottom ¼ of Right Column

Table 3: Filename Structure for Three-Column, 12-Screen Printout

Each Screen Destined for Left-Column Printout			Each Screen Destined for Right-Column Printout		
Margins			Margins		
Top	Left	Right	Top	Left	Right
0	64	392	0	8	336

Table 4: Margin Settings for Two-Column, Eight-Screen Printout in 800 Dots-Per-Line Graphics Mode

Each Screen Destined for Left-Column Printout			Each Screen Destined for Right-Column Printout		
Margins			Margins		
Top	Left	Right	Top	Left	Right
0	64	472	0	8	416

Table 5: Margin Settings for Two-Column, Eight-Screen Printout in 960 Dots-Per-Line Graphics Mode

Screen Destined for Left Column Printout	Screen Destined for Middle Column Printout	Screen Destined for Right Column Printout
Margins Top Left Right 0 32 264	Margins Top Left Right 0 16 248	Margins Top Left Right 0 0 232

Table 6: Margin Settings for Three-Column, 12-Screen Printout in 800 Dots-Per-Line Graphics Mode

Screen Destined for Left Column Printout	Screen Destined for Middle Column Printout	Screen Destined for Right Column Printout
Margins Top Left Right 0 32 320	Margins Top Left Right 0 16 304	Margins Top Left Right 0 0 288

Table 7: Margin Settings for Three-Column, 12-Screen Printout in 960 Dots-Per-Line Graphics Mode

mands that produce pleasingly spaced two- and three-column, high-capacity printouts. It must be pointed out and emphasized that the right margin setting for the screens intended for a two-column, eight-screen printout (800 dots-per-line graphics mode) must not exceed 400. The reason for this is that each column cannot exceed 400 dots of the 800 dots per line. For similar reasons the right margin settings for the printouts associated with Tables 5, 6 and 7 must not exceed 480, 264 and 320 respectively. In every case, you must be using the higher of the two resolutions of the DH screen available to you through the R command.

A typical session for producing a two-column printout is as follows: It is assumed that you are making use of the word processor input file feature of DH. If your copy of DH does not have this feature, you need to write a screen when others are employing the feature. It is also assumed that you already have on a disk the word processor file in proper form for input. Suppose the filename of the file is MYDOC. You need a blank formatted disk for saving screens. Since eight screen files almost completely fill a single-sided 35-track disk, you cannot have the MYDOC file on the same disk with the screen files. This means that those with only one disk drive will swap the MYDOC file and screen files disks to make the former ready for the I command and the latter for the O command.

Depending on the size of the font you choose, a MYDOC file of 60 to 90 lines, each line 60 characters long, should be sufficient to fill a page in the two-column, eight-screen format. Your printer should be ready to use. Load and run DH. Select a font suitable for your prospective two-column

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document. If the highest density graphics mode that your printer has is 800 dots per line, make the left-column margin settings in accordance with Table 4. If your printer has 960 dots-per-line graphics mode, make the settings according to Table 5. If you have only one disk drive, swap the DH disk with the one containing MYDOC.

Next, by means of the ASCII Input option of the I command, employ the word processor input feature to fill a screen. When the screen is full, opt to have the remainder of the MYDOC file recorded in a file called REST. Take this option every time you fill a screen. Employ the O command to see the screen on disk and choose a filename six or less characters in length. Supposing you chose the name DUMP, when saving the screen, type the filename as DUMPL1, where the final two characters indicate that the screen image is to be printed as the top part of the left column of the page. If your disk containing MYDOC is in a drive other than 0, append to the filename the usual colon and drive number.

Now clear the screen and use the word processor input feature to bring information from REST. Save the screen as previously, but this time use the filename DUMPL2. Repeat twice the process used to obtain the second screen file. Save the third and fourth screens as DUMPL3 and DUMPL4. After you have saved a full left column of screens, make the right-column margin settings in accordance with Table 4 or Table 5 again, then clear the screen. Input another screen and save it as DUMPR1. Continue the process analogously until all eight screens have been saved.

Suppose REST becomes empty before all the required screens have been filled and saved. You must still have a full complement of screens saved on disk. Suppose that you were able to save seven screens. In such a case, clear the screen and save the blank screen as DUMPR4. At this point, you must make certain that the disk containing DRIVERHT or DRIVERHE is in Drive 0. It is convenient to have the program recorded on the disk containing DH. Select the high-capacity screen dump option of the O command. This causes the driver program to be loaded and run. Answer the two- or three-column prompt by pressing 2. DRIVERHT will ask you to press 1 for the 800 dots-per-line graphics mode and 2 for the 960 dots-per-line-graphics mode. Type the appropriate number. You are asked whether or not you need to be refreshed about file and filename requirements. For the first usage of the driver, press Y for Yes.

After reading the provided information, you are given three options. Take the option to load screens for dumping. If you do not have more than one disk drive, you will have to insert the disk containing the screen files just saved. When asked for a filename, enter DUMP if the screen file is in Drive 0; otherwise, enter DUMP followed by a colon and the appropriate disk drive number. The driver program then loads DUMPL1 and DUMPR1, initiates the appropriate screen dump and printing ensues. When the screens of DUMPL1 and DUMPR1 are printed, the driver loads DUMPL2 and DUMPR2 to resume printing. This process continues until the two-column printout is complete. At that time you are given three options for further action. To take the option to return to DH, make certain that the DH disk is in Drive 0. Taking that option causes DH to be loaded and run. If the file REST contains more information, you will want to prepare screen files for a second two-column printout.

If writing a newsletter, for instance, you may want to have the newsletter name span the two or three columns of the printout. The following example indicates how this can be accomplished: Select a medium- to large-sized font, say Font 1. Suppose the newsletter is called *The CoCoNut Chronicle* and you want a two-column printout. Clear the screen. Turn word wrap off by means of the W command. Using the R command, select the lower of the two resolutions of the DH screen. This produces a double-width newsletter name when the screen is in the higher resolution. For balanced spacing, "*The CoCoNut*" should appear in the left column of the printout; whereas "*t Chronicle*" should be in the right column. Press the space bar two times and then type The Coconut.

Each of the patch programs of listings 3 through 6 has added another feature to DH (a feature also introduced to DH previously in my September '88 article). With this feature DH can move a printed line of characters left or right. The printed line must generally begin or end with one or more spaces when moving it right or left, respectively. To move a printed line right you must position the cursor to the right half of the screen. To move the line left, the cursor must be in the left half of the screen.

Now, employ the R command to change the screen to its higher resolution. By means of the T command, set both tabs to 400 or to 480, depending on whether the printout will be at a dots-per-line density of 800 or 960, respectively. Return to the graphics screen via the B command. Then press the down-arrow key to position the cursor at 400 or 480. Repeatedly press the SHIFT up-arrow until the "t" of "CoCoNut" is just to the right of the cursor. Press the space bar to erase "t". Then select a suitable font.

Make the left-column margin settings according to Table 4 or 5. Press ENTER twice to space down to a convenient place to start writing the text of the newsletter. Use the word processor input feature to fill the rest of the screen and save it on disk as the top left column. After you have saved all the screens for the left column do the following: Clear the screen; choose Font 1; change the screen to its lower resolution; with the M command set the top and left

Time:	Process: Generate screen and save it as:
1	DUMPL1 DUMPL2 Swap disks
2	DUMPL3 DUMPL4 Swap disks
3	DUMPM1 DUMPM2 Swap disks
4	DUMPM3 DUMPM4 Swap disks
5	DUMPR1 DUMPR2 Swap disks
6	DUMPR3 DUMPR4

Table 9

Screen Destined for Left Column Printout			Screen Destined for Middle Column Printout			Screen Destined for Right Column Printout		
Margins			Margins			Margins		
Top	Left	Right	Top	Left	Right	Top	Left	Right
0	64	640	0	32	608	0	0	576

Table 8: Margin Settings for Three-Column, 12-Screen Printout in 1920 Dots-Per-Line Graphics Mode

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Based on a popular arcade game which we can't mention (But sounds like "Art Gannoyed"). BASH challenges you to clear the screen by "BASHING" your ball through multiple brick layers. Of course you'll have help getting through this 20 level game by activating options like, Slow Ball, Expanded Paddle, Multi-Ball, and more!

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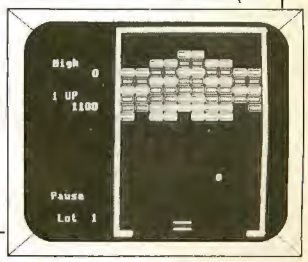

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by Nickolas Marentes

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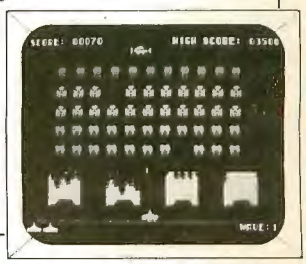

MINE RESCUE

by Steve Bjork

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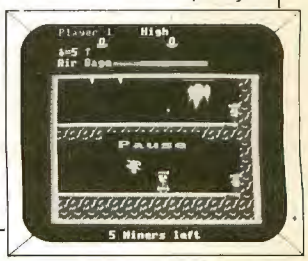

warp fighter 3-D

by Steve Bjork

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margins to 0; type t Chronicle; return the screen to the higher resolution; select the text font again; make the right-column margin settings according to Table 4 or 5; and press ENTER twice. Fill the rest of the screen and save it as the top-right column.

Because a single-sided 35-track disk does not have the capacity to hold more than eight screen files, the screens associated with the three-column printout must be recorded on two disks, six screens per disk. The screens representing the top half of the printout must be saved on one disk and those for the bottom half must be on the other disk.

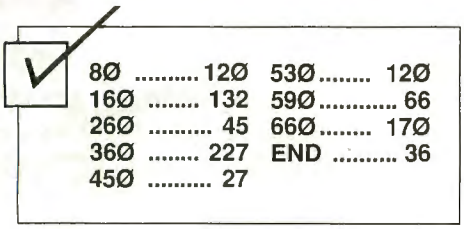
Thus, the two disks must be swapped five times during the process of generating and saving 12 screens for the three-column printout. In Table 9, the process is illustrated for a pair of disks associated with a six or less character filename, DUMP.

In DRIVERHT or DRIVERHE, the two disks needed for a three-column printout need to be swapped once only after the top half of the page has been printed. Because you may want to have several copies of the three-column printout, it is well that the disk swapping has been minimized in the driver programs.

Before this article concludes, be aware of the following: For a two or more page continuation of a two- or three-column printout, use two or more word processor input files. Employing one long word processor file is very time-consuming while the REST file is being derived after the filling of every screen. Each word processor file should terminate at the end of a paragraph. If REST becomes empty before a screen is completely filled, position the cursor to the beginning of the next line. Then use the ASCII file option of the I command to fill the remainder of the screen and following screens with information from the next word processor file.

(Questions or comments concerning this article may be addressed to the author at 172 Dennis Drive, Williamsburg, VA 23185. Please include an SASE when requesting a reply.)

Editors Note: The patches in listings 3 through 6 are in tokenized format on this month's RAINBOW ON TAPE/DISK. In order to use them, you need to save them in ASCII format on a fresh disk using the A option of the SAVE command.



Listing 1: DRIVERHT

```
0 ' COPYRIGHT 1989, FALSOFT,INC
5 'POKE150,?
10 PCLEAR2:CMP:WIDTH40:CLS3:LOCA
TE7,2:ATTR0,2:PRINT"HIGH CAPACIT
Y SCREEN DUMPS":LOCATE11,4:PRINT
"FOR TANDY PRINTERS":LOCATE11,6:
PRINT"BY H. ALLEN CURTIS":LOCATE
18,8:ATTR3,2:PRINT"FOR";:LOCATE1
4,11:ATTR7,2:PRINT"FALSOFT, INC"
:
20 LOCATE13,13:PRINT"COPYRIGHT 1
989";:LOCATE13,14:ATTR0,2,U:PRIN
T"              ";:ATTR0,2
30 LOCATE3,18:PRINT"TYPE 2 OR 3
DEPENDING ON WHETHER        YOU
WANT A 2 OR 3 COLUMN PRINTOUT,
    RESPECTIVELY.";:LOCATE15,14
40 K=1:C=0:X=&H1000:W$(0)="12":W
$(1)="TRIO":W$(2)="1/4":W$(3)=",
 M1":M$="PRESS SPACE TO CONTINUE
":DIMS$(13),C(13)
50 S$(0)="1F314F8D3027028A018D27
27028A028D2127028A048D1B27028A08
8D15":C(0)=1763
60 S$(1)="27028A108D0F27028A208D
0927028A408A807EA285308850E684D4
5039":C(1)=2617
70 S$(2)="C680D7508DC0045026FA39
861B97528D3E8D2D8D358DE933410A51
26F8":C(2)=3227
80 S$(3)="8D2634408D338DDB33410A
5126F835408D1B8D2A8DCD33410A5126
F88D":C(3)=2788
90 S$(4)="0A0A5226D039390D7EA285
3388291E32C628D751398E7071BFFFA2
398E":C(4)=2969
100 S$(5)="727320F78E7A7B20F28D1
F86128DDC8DA3C6788D1F1F238DDFC67
88D17":C(5)=3560
110 S$(6)="1F238DDEC6788D0F8DDD0
F6F39C6FED76FCE40001F32398E4000A
6C0A7":C(6)=3365
120 S$(7)="80A6C0A7805A26F5398DE
517FF6CC6F08DE81F238DA8C6F08DE01
F238D":C(7)=4163
130 S$(8)="A7C6F020C78DCC861C17F
F53C6508DCD1F238D8DC6508DC51F238
D8CC6":C(8)=3837
140 S$(9)="5020AC8DB117FF388D1B1
7FF778D1617FF798D11860117FF29860
DBDA2":C(9)=3173
150 S$(10)="85861EBDA285208C30C9
01904FC6A0A7805A26FB39ABCDEFABCD
EFABCD":C(10)=4121
160 K$=INKEY$:IFK$=""THEN160ELSE
IFK$="2"THEN280ELSEIFK$<>"3"THEN
SOUND60,3:GOTO160
170 LOCATE3,18:PRINTSTRING$(120,
32):LOCATE10,18:PRINT"A FEW MOME
NTS PLEASE";:LOCATE15,14
180 FORI=0TO10:FORJ=1TO29:A$=MID
$(S$(I),2*J-1,2):A=VAL("&H"+A$):
C=C+A:POKEX,A:X=X+1:NEXT:IFC<>C(
I)THENCLS3:LOCATE8,12:PRINT"TYPI
NG ERROR IN LINE";50+10*I:ENDELS
EC=0:NEXT
190 GOSUB720:GOSUB680
200 K$=INKEY$:IFK$=""THEN200ELSE
IFK$="N"THEN500
210 GOSUB690
220 K$=INKEY$:IFK$=""THEN220
230 GOSUB710
```

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```
240 LOCATE4,11:PRINT"OF A TRIO O
F FILES INDICATE              THE
 LEFT, MIDDLE, AND RIGHT
     PARTS OF THE TOP 1/4 OF THE
             PRINTOUT.  L2, M2,
AND R2                 INDICATE TH
E NEXT 1/4, ETC.               EXC
EPT FOR THE LAST 2
250 LOCATE4,17:PRINT"CHARACTERS,
 THE FILENAME OF               ALL
 FILES MUST BE THE SAME.":LOCATE
6,20:PRINTM$;
260 K$=INKEY$:IFK$=""THEN260
270 GOTO500
280 K=2:W$(0)="8":W$(1)="PAIR":W
$(3)="    ":LOCATE3,18:PRINTSTRI
NG$(120,32):LOCATE10,18:PRINT"A
FEW MOMENTS PLEASE";:LOCATE15,14
290 S$(0)="1F314F8D3027028A018D2
727028A028D2127028A048D1B27028A0
88D152702":C(0)=1804
300 S$(1)="8A108D0F27028A208D092
7028A408A807EA285308850E684D4503
9C680D750":C(1)=3197
310 S$(2)="8DC0045026FA39861B975
28D2E8D1D8D258DE933410A5126F88D1
68D258DDD":C(2)=3261
320 S$(3)="33410A5126F88D0A0A522
6E039390D7EA2853388151E32C63CD75
1398E7071":C(3)=2812
330 S$(4)="BFFFA2398E727320F78D1
B86128DE18DB8C6788D1B8DDC8DE4C67
88D138E7A":C(4)=4284
340 S$(5)="7BBFFFA20F6F39C6FED76
FCE40001F32398E4000A6C0A780A6C0A
7805A26F5":C(5)=3985
350 S$(6)="39128DE48D85C6F08DE88
DA98DB1C6F020CB8DD4861C17FF74C65
08DD58D96":C(6)=4662
360 S$(7)="8D9EC65020B88DC117FF6
18D158D918D11860117FF58860DBDA28
5861EBDA2":C(7)=3755
370 S$(8)="85209E30C901904FC6A0A
7805A26FB39ABCDEFABCDEFABCDEFABC
DEFABCDEF":C(8)=4960
380 FORI=0TO8:FORJ=1TO31:A$=MID$
(S$(I),2*J-1,2):A=VAL("&H"+A$):C
=C+A:POKEX,A:X=X+1:NEXT:IFC<>C(I
)THENCLS3:LOCATE8,12:PRINT"TYPIN
G ERROR IN LINE";290+10*I:ENDELS
EC=0:NEXT
390 GOSUB720:GOSUB680
400 K$=INKEY$:IFK$=""THEN400ELSE
IFK$="N"THEN500
410 CLS3:LOCATE6,4:PRINT"YOU SHO
ULD HAVE READY 8 FILES
 (SCREEN IMAGES) FOR LOADING.
420 LOCATE6,6:PRINT"THE SCREEN I
MAGES OF ONE PAIR             OF F
ILES SHOULD CORRESPOND TO
    THE TOP FOURTH PART OF THE
            PRINTED PAGE.  ANOTH
ER PAIR
430 LOCATE6,10:PRINT"SHOULD CORR
ESPOND TO THE NEXT             FOU
RTH PART OF THE PAGE, ETC.":LOCA
TE8,20:PRINTM$;
440 K$=INKEY$:IFK$=""THEN440
450 CLS3:LOCATE6,4:PRINT"THE LAS
T 2 CHARACTERS OF EACH
 FILENAME MUST INDICATE WHERE
         THE SCREEN IMAGE IS TO
BE                PRINTED.  FOR I
NSTANCE, L1                AND R1
ENDING THE FILENAMES
460 LOCATE6,9:PRINT"OF A PAIR OF
 FILES INDICATE                THE
LEFT AND RIGHT PORTIONS
    OF THE TOP FOURTH OF THE
            PAGE.  L2 AND R2 IND
ICATE                 THE NEXT FOU
RTH, ETC.  EXCEPT
470 LOCATE6,14:PRINT"FOR THE LAS
T 2 CHARACTERS,               THE
 FILENAMES OF ALL FILES
     MUST BE THE SAME."
480 LOCATE8,20:PRINTM$;
490 K$=INKEY$:IFK$=""THEN490
500 GOSUB670
510 K$=INKEY$:IFK$=""THEN510
520 IFK$="3"THENPCLEAR4:ENDELSEI
FK$="2"THENPCLEAR4:RUN"DH"ELSEIF
K$<>"1"THEN510
530 WIDTH32:CLS:PRINT@130,"ENTER
 PART OF FILENAME COMMON   TO AL
L FILES.  (IF YOU HAVE     MORE
THAN 1 DRIVE, YOU MAY      ADDRE
SS A DRIVE BY APPENDING    A COL
ON FOLLOWED BY THE DRIVE   NUMBE
R TO THE FILENAME PART.
540 IFK=1THENCLEAR200,&H3FFF:K=1
:X(1)=&H109A:X(2)=&H10D4:X(3)=&H
10ED:X(4)=&H1108 ELSECLEAR200,&H
3FFF:K=2:X(1)=&H1085:X(2)=&H10BC
:X(3)=&H10CC:X(4)=&H10DF
550 L$(1)="L1":L$(2)="L2":L$(3)=
"L3":L$(4)="L4":M$(1)="M1":M$(2)
="M2":M$(3)="M3":M$(4)="M4":R$(1
)="R1":R$(2)="R2":R$(3)="R3":R$(
4)="R4":O(1)=0:O(2)=240:O(3)=480
:O(4)=160:H=&HFFA2
560 PRINT@326,">>>  ";:LINEINPUT
F$
570 A=INSTR(1,F$,":"):IFA>0THEND
$=RIGHT$(F$,LEN(F$)-A+1):F$=LEFT
$(F$,A-1)ELSED$=""
580 IFK=2THENFORI=1TO4:POKEH,&H7
0:POKEH+1,&H71:LOADM F$+L$(I)+"/
HR1"+D$,O(I):LOADM F$+L$(I)+"/HR
2"+D$,O(I)+8192:POKEH,&H72:POKEH
+1,&H73:LOADM F$+R$(I)+"/HR1"+D$
,O(I):LOADM F$+R$(I)+"/HR2"+D$,O
(I)+8192:POKEH,&H7A:POKEH+1,&H7B
:EXECX(I):NEXT:GOTO660
590 FORI=1TO2:POKEH,&H70:POKEH+1
,&H71:LOADM F$+L$(I)+"/HR1"+D$,O
```

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	301-256-7558 or 301-256-2953	VISA/MC/Check/Money Order/COD

```
(I):LOADM F$+L$(I)+"/HR2"+D$,O(I
)+8192:POKEH,&H72:POKEH+1,&H73:L
OADM F$+M$(I)+"/HR1"+D$,O(I):LOA
DM F$+M$(I)+"/HR2"+D$,O(I)+8192
600 POKEH,&H7A:POKEH+1,&H7B:LOAD
M F$+R$(I)+"/HR1"+D$,O(I):LOADM
F$+R$(I)+"/HR2"+D$,O(I)+8192:EXE
CX(I):NEXT
610 Q$=D$:IFQ$=""THENQ$="0"ELSEQ
$=RIGHT$(D$,1)
620 CLS:PRINT@194,"INSERT DISK W
ITH SECOND SET     OF SCREEN FIL
ES IN DRIVE ";Q$:PRINT@258,"AND
PRESS SPACE."
630 K$=INKEY$:IFK$<>" "THEN630
640 FORI=3TO4:POKEH,&H70:POKEH+1
,&H71:LOADM F$+L$(I)+"/HR1"+D$,O
(I):LOADM F$+L$(I)+"/HR2"+D$,O(I
)+8192:POKEH,&H72:POKEH+1,&H73:L
OADM F$+M$(I)+"/HR1"+D$,O(I):LOA
DM F$+M$(I)+"/HR2"+D$,O(I)+8192
650 POKEH,&H7A:POKEH+1,&H7B:LOAD
M F$+R$(I)+"/HR1"+D$,O(I):LOADM
F$+R$(I)+"/HR2"+D$,O(I)+8192:EXE
CX(I):NEXT
660 PRINT#-2:CLEAR200,&H7FFF:GOT
0500
670 WIDTH40:CLS3:LOCATE10,10:PRI
NT"1 LOAD FOR DUMP":LOCATE10,11:
PRINT"2 RETURN TO DH":LOCATE10,1
2:PRINT"3 EXIT PROGRAM":RETURN
680 CLS3:LOCATE3,8:PRINT"DO YOU
NEED TO REVIEW FILE AND
 FILENAME REQUIREMENTS FOR EXECU
TING     THIS SCREEN DUMP?   (Y/
N)  ";:RETURN
690 CLS3:LOCATE6,5:PRINT"YOU SHO
ULD HAVE READY ";W$(0):LOCATE6,6
:PRINT"FILES (SCREEN IMAGES) FOR
                LOADING.  THE IMA
GES OF ONE              ";W$(1);"
 OF FILES SHOULD CORRESPOND
    TO THE TOP ";W$(2);" OF THE
PRINTOUT. ";
700 LOCATE6,10:PRINT"ANOTHER ";W
$(1);"  SHOULD CORRESPOND
  TO THE NEXT ";W$(2);" OF THE P
RINTOUT,        ETC.":LOCATE8,20
:PRINTM$;:RETURN
710 CLS3:LOCATE4,6:PRINT"THE LAS
T 2 CHARACTERS OF EACH
 FILENAME MUST INDICATE WHERE
         THE SCREEN IMAGE IS TO
BE              PRINTED.  FOR E
XAMPLE, L1";W$(3);"           AN
D R1 ENDING THE FILENAMES":RETUR
N
720 CLS3:LOCATE13,8:PRINT"GRAPHI
CS MODES":LOCATE10,11:PRINT"1: 8
00 DOTS PER LINE":LOCATE10,13:PR
INT"2: 960 DOTS PER LINE"
730 K$=INKEY$:IFK$=""THEN730ELSE
IFK$="2"THENPRINT#-2,CHR$(27);CH
R$(19);:RETURNELSEIFK$<>"1"THENS
OUND60,3:GOTO730
740 PRINT#-2,CHR$(27),CHR$(20);:
IFK=2THENPOKE&H1071,&H1F:POKE&H1
075,&H32:RETURNELSEPOKE&H1081,&H
30:POKE&H1085,&H21:POKE&H107A,&H
86:RETURN
```

80	150	440	8
160	33	540	223
260	182	630	74
360	140	END	213

Listing 2: DRIVERHE

```
0 ' COPYRIGHT 1989, FALSOFT,INC
5 'POKE150,?
10 PCLEAR2:CMP:WIDTH40:CLS3:LOCA
TE7,2:ATTR0,2:PRINT"HIGH CAPACIT
Y SCREEN DUMPS":LOCATE6,4:PRINT"
FOR EPSON COMPATIBLE PRINTERS":L
OCATE10,6:PRINT"BY H. ALLEN CURT
IS":LOCATE18,8:ATTR3,2:PRINT"FOR
";:LOCATE14,11:ATTR7,2:PRINT"FAL
SOFT, INC":
20 LOCATE13,13:PRINT"COPYRIGHT 1
989";:LOCATE13,14:ATTR0,2,U:PRIN
T"               ";:ATTR0,2
30 LOCATE3,18:PRINT"TYPE 2 OR 3
DEPENDING ON WHETHER       YOU
WANT A 2 OR 3 COLUMN PRINTOUT,
    RESPECTIVELY.";:LOCATE15,14
40 K=1:C=0:X=&H1200:W$(0)="12":W
$(1)="TRIO":W$(2)="1/4":W$(3)=",
 M1":M$="PRESS SPACE TO CONTINUE
50 S$(0)="1F314F8D3F27028A808D36
27028A408D3027028A208D2A27028A10
8D24":C(0)=2063
60 S$(1)="27028A088D1E27028A048D
1827028A028D1227028A017EA285C680
D750":C(1)=2268
70 S$(2)="8DC4045026FA39308850E6
84D4503986189752 8E7071BFFFA28D65
8D3C":C(2)=3550
80 S$(3)="8DDD33410A5126F88D2D8E
7273BFFFA28DCD33410A5126F88D1D33
C9FD":C(3)=3534
90 S$(4)="808E7A7BBFFFA28DB93341
0A5126F88D09860D8DAA0A5226C03933
8801":C(4)=3117
100 S$(5)="1E32C650D75139C6FED76
F8D12CE40001F328DA48D1A8E7A7BBFF
FA20F":C(5)=3481
110 S$(6)="6F393410308C208D11351
0393410308C1E20F43410308C2120EDE
68027":C(6)=2257
120 S$(7)="08A680BDA2855A26F839A
BCDEFABCDEFABCDEFABCDEFABCDEFABC
```

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```
DEFAB":C(7)=5080
130 K$=INKEY$:IFK$=""THEN130ELSE
IFK$="2"THEN260ELSEIFK$<>"3"THEN
SOUND60,3:GOTO130
140 LOCATE3,18:PRINTSTRING$(120,
32):LOCATE10,18:PRINT"A FEW MOME
NTS PLEASE";:LOCATE15,14
150 FORI=0TO7:FORJ=1TO29:A$=MID$
(S$(I),2*J-1,2):A=VAL("&H"+A$):C
=C+A:POKEX,A:X=X+1:NEXT:IFC<>C(I
)THENCLS3:LOCATE8,12:PRINT"TYPIN
G ERROR IN LINE";50+10*I:ENDELSE
C=0:NEXT
160 FORI=1TO26:READA:NEXT:X=X-19
:FORI=1TO26:READA:POKEX,A:X=X+1:
NEXT
170 GOSUB760:GOSUB680
180 K$=INKEY$:IFK$=""THEN180ELSE
IFK$="N"THEN470
190 GOSUB690
200 K$=INKEY$:IFK$=""THEN200
210 GOSUB710
220 LOCATE4,11:PRINT"OF A TRIO O
F FILES INDICATE              THE
 LEFT, MIDDLE, AND RIGHT
     PARTS OF THE TOP 1/4 OF THE
            PRINTOUT.  L2, M2,
AND R2                INDICATE TH
E NEXT 1/4, ETC.              EXC
EPT FOR THE LAST 2
230 LOCATE4,17:PRINT"CHARACTERS,
 THE FILENAME OF              ALL
 FILES MUST BE THE SAME.":LOCATE
6,20:PRINTM$;
240 K$=INKEY$:IFK$=""THEN240
250 GOTO470
260 K=2:W$(0)="8":W$(1)="PAIR":W
$(3)="    ":LOCATE3,18:PRINTSTRI
NG$(120,32):LOCATE10,18:PRINT"A
FEW MOMENTS PLEASE";:LOCATE15,14
270 S$(0)="1F314F8D3F27028A808D3
627028A408D3027028A208D2A27028A1
08D242702":C(0)=2104
280 S$(1)="8A088D1E27028A048D182
7028A028D1227028A017EA285C680D75
08DC40450":C(1)=2648
290 S$(2)="26FA39308850E684D4503
9861897528E7071BFFFA28D518D288DD
D33410A51":C(2)=3658
300 S$(3)="26F88D198E7273BFFFA28
DCD33410A5126F88D09860D8DBE0A522
6D4393388":C(3)=3484
310 S$(4)="151E32C63CD75139C6FED
76F8D12CE40001F328DB88D1A8E7A7BB
FFFA20F6F":C(4)=3613
320 S$(5)="393410308C208D1135103
93410308C1E20F43410308C2120EDE68
02708A680":C(5)=2448
330 S$(6)="BDA2855A26F839ABCDEFA
BCDEFABCDEFABCDEFABCDEFABCDEFABC
DEFABCDEF":C(6)=5837
340 FORI=0TO6:FORJ=1TO31:A$=MID$
(S$(I),2*J-1,2):A=VAL("&H"+A$):C
=C+A:POKEX,A:X=X+1:NEXT:IFC<>C(I
)THENCLS3:LOCATE8,12:PRINT"TYPIN
G ERROR IN LINE";270+10*I:ENDELS
EC=0:NEXT
350 X=X-24:FORI=1TO28:READA:POKE
X,A:X=X+1:NEXT
360 GOSUB680
370 K$=INKEY$:IFK$=""THEN370ELSE
IFK$="N"THEN470
380 CLS3:LOCATE6,4:PRINT"YOU SHO
ULD HAVE READY 8 FILES
 (SCREEN IMAGES) FOR LOADING.
390 LOCATE6,6:PRINT"THE SCREEN I
MAGES OF ONE PAIR           OF F
ILES SHOULD CORRESPOND TO
    THE TOP FOURTH PART OF THE
            PRINTED PAGE.  ANOTH
ER PAIR
400 LOCATE6,10:PRINT"SHOULD CORR
ESPOND TO THE NEXT            FOU
RTH PART OF THE PAGE, ETC.":LOCA
TE8,20:PRINTM$;
410 K$=INKEY$:IFK$=""THEN410
420 CLS3:LOCATE6,4:PRINT"THE LAS
T 2 CHARACTERS OF EACH
 FILENAME MUST INDICATE WHERE
         THE SCREEN IMAGE IS TO
BE                PRINTED.  FOR I
NSTANCE, L1               AND R1
ENDING THE FILENAMES
430 LOCATE6,9:PRINT"OF A PAIR OF
 FILES INDICATE               THE
LEFT AND RIGHT PORTIONS
    OF THE TOP FOURTH OF THE
            PAGE.  L2 AND R2 IND
ICATE                 THE NEXT FOU
RTH, ETC.  EXCEPT
440 LOCATE6,14:PRINT"FOR THE LAS
T 2 CHARACTERS,               THE
 FILENAMES OF ALL FILES
     MUST BE THE SAME."
450 LOCATE8,20:PRINTM$;
460 K$=INKEY$:IFK$=""THEN460
470 GOSUB640
480 K$=INKEY$:IFK$=""THEN480
490 IFK$="3"THENPCLEAR4:ENDELSEI
FK$="2"THENPCLEAR4:CLEAR200,&H7F
FF:RUN"DH"ELSEIFK$<>"1"THEN480
500 WIDTH32:CLS:PRINT@130,"ENTER
 PART OF FILENAME COMMON   TO AL
L FILES.  (IF YOU HAVE     MORE
THAN 1 DRIVE, YOU MAY      ADDRE
SS A DRIVE BY APPENDING    A COL
ON FOLLOWED BY THE DRIVE   NUMBE
R TO THE FILENAME PART.
510 IFK=1THENCLEAR200,&H3FFF:K=1
ELSECLEAR200,&H3FFF:K=2
520 L$(1)="L1":L$(2)="L2":L$(3)=
"L3":L$(4)="L4":M$(1)="M1":M$(2)
="M2":M$(3)="M3":M$(4)="M4":R$(1
)="R1":R$(2)="R2":R$(3)="R3":R$(
```

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Sample Calligrapher Fonts

The CoCo Calligrapher!

The Font Massager - This OS9/MS-DOS utility program allows you to do many things to Calligrapher font files. You may create new fonts, modify existing fonts, invert fonts, compress fonts, double the height and/or width, halve the height and/or width and convert between RS-DOS and OS9/MS-DOS formats. (Note: OS9 and MS-DOS font files are identical and need no conversion. Simply copy or upload the files from one OS to the other.). Specify OS9 or MS-DOS; **$19.95**.

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```
4)="R4"
530 PRINT@326,">>>  ";:LINEINPUT
F$
540 A=INSTR(1,F$,":"):IFA>0THEND
$=RIGHT$(F$,LEN(F$)-A+1):F$=LEFT
$(F$,A-1)ELSED$=""
550 IFK=2THENFORI=1TO4:POKE&HFFA
2,&H70:LOADM F$+L$(I)+"/HR1"+D$:
POKE&HFFA2,&H71:LOADM F$+L$(I)+"
/HR2"+D$:POKE&HFFA2,&H72:LOADM F
$+R$(I)+"/HR1"+D$:POKE&HFFA2,&H7
3:LOADM F$+R$(I)+"/HR2"+D$:POKE&
HFFA2,&H7A:EXEC&H1284:NEXT:GOTO6
30
560 FORI=1TO2:POKE&HFFA2,&H70:LO
ADM F$+L$(I)+"/HR1"+D$:POKE&HFFA
2,&H71:LOADM F$+L$(I)+"/HR2"+D$:
POKE&HFFA2,&H72:LOADM F$+M$(I)+"
/HR1"+D$:POKE&HFFA2,&H73:LOADM F
$+M$(I)+"/HR2"+D$
570 POKE&HFFA2,&H7A:LOADM F$+R$(
I)+"/HR1"+D$:LOADM F$+R$(I)+"/HR
2"+D$,8192:EXEC&H1298:NEXT
580 Q$=D$:IFQ$=""THENQ$="0"ELSEQ
$=RIGHT$(D$,1)
590 CLS:PRINT@194,"INSERT DISK W
ITH SECOND SET     OF SCREEN FIL
ES IN DRIVE ";Q$:PRINT@258,"AND
PRESS SPACE."
600 K$=INKEY$:IFK$<>" "THEN600
610 FORI=3TO4:POKE&HFFA2,&H70:LO
ADM F$+L$(I)+"/HR1"+D$:POKE&HFFA
2,&H71:LOADM F$+L$(I)+"/HR2"+D$:
POKE&HFFA2,&H72:LOADM F$+M$(I)+"
/HR1"+D$:POKE&HFFA2,&H73:LOADM F
$+M$(I)+"/HR2"+D$
620 POKE&HFFA2,&H7A:LOADM F$+R$(
I)+"/HR1"+D$:LOADM F$+R$(I)+"/HR
2"+D$,8192:EXEC&H1298:NEXT
630 CLEAR200,&H7FFF:GOTO470
640 WIDTH40:CLS3:LOCATE10,10:PRI
NT"1 LOAD FOR DUMP":LOCATE10,11:
PRINT"2 RETURN TO DH":LOCATE10,1
2:PRINT"3 EXIT PROGRAM":RETURN
650 DATA 2,27,49,0,0,0,0,0
660 DATA 5,27,42,1,192,3,0,0,0,0
670 DATA 2,27,50,0,0,0,0,0
680 CLS3:LOCATE3,8:PRINT"DO YOU
NEED TO REVIEW FILE AND
 FILENAME REQUIREMENTS FOR EXECU
TING     THIS SCREEN DUMP?   (Y/
N)  ";:RETURN
690 CLS3:LOCATE6,5:PRINT"YOU SHO
ULD HAVE READY ";W$(0):LOCATE6,6
:PRINT"FILES (SCREEN IMAGES) FOR
                LOADING.  THE IMA
GES OF ONE              ";W$(1);"
 OF FILES SHOULD CORRESPOND
    TO THE TOP ";W$(2);" OF THE
PRINTOUT. ";
700 LOCATE6,10:PRINT"ANOTHER ";W
$(1);"  SHOULD CORRESPOND
  TO THE NEXT ";W$(2);" OF THE P
RINTOUT,        ETC.":LOCATE8,20
:PRINTM$;:RETURN
710 CLS3:LOCATE4,6:PRINT"THE LAS
T 2 CHARACTERS OF EACH
 FILENAME MUST INDICATE WHERE
          THE SCREEN IMAGE IS TO
BE              PRINTED.  FOR E
XAMPLE, L1";W$(3);"           AN
D R1 ENDING THE FILENAMES":RETUR
N
720 DATA 2,27,49,0,0,0,0,0
730 DATA 5,27,42,3,128,7,0,0,0,0
740 DATA 2,27,50,0,0,0,0,0
750 DATA 5,27,42,1,192,3,0,0,0,0
760 CLS3:LOCATE13,8:PRINT"GRAPHI
CS MODE":LOCATE10,11:PRINT"1: 96
0 DOTS PER LINE":LOCATE10,13:PRI
NT"2: 1920 DOTS PER LINE"
770 K$=INKEY$:IFK$=""THEN770ELSE
IFK$="2"THENRETURNELSEIFK$<>"1"T
HENSOUND60,10:GOTO770
780 X=X-18:FORI=0TO9:READA:POKEX
+I,A:NEXT:POKE&H1290,&H29:POKE&H
1294,&H28:RETURN
```

Listing 3: HALTER

```
18 ON ERR GOTO7000
25 GOSUB820:POKE&HFFA2,&H70:SAVE
M"OUT1",&H4000,&H5FFF,&HAC73:POK
E&HFFA2,&H71:SAVEM"OUT2",&H4000,
&H5BFF,&HAC73:POKE&HFFA2,&H7A:RE
NAME"OUT1/BIN"TOF$+"/HR1":RENAME
"OUT2/BIN"TOF$+"/HR2":DRIVE0:RET
URN
30 GOSUB820:RENAMEF$+"/HR1"TO"IN
1/BIN":RENAMEF$+"/HR2"TO"IN2/BIN
":POKE&HFFA2,&H70:LOADM"IN1":POK
E&HFFA2,&H71:LOADM"IN2":POKE&HFF
A2,&H7A
35 RENAME"IN1/BIN"TOF$+"/HR1":RE
NAME"IN2/BIN"TOF$+"/HR2":DRIVE0:
RETURN
170 IFK=21THENHPUT(U,T)-(W-1,T+.
5*D),4:HPUT(U,T+.5*D)-(W-1,T+D),
4:L=U:GOTO65
171 IFK=95THENI=2*H+2:HPUT(L,T)-
(L+1,T+D),1:IFL>W*.5THENHGET(U,T
)-(W-I-1,T+.5*D+.5),6:HPUT(U+I,T
)-(W-1,T+.5*D+.5),6:HGET(U,T+.5*
D+1.5)-(W-I-1,T+D),6:HPUT(U+I,T+
.5*D+1.5)-(W-1,T+D),6:GOTO175
172 IFK=95THENHGET(U+I,T)-(W-1,T
+.5*D+.5),6:HPUT(U,T)-(W-1-I,T+.
5*D+.5),6:HGET(U+I,T+.5*D+1.5)-(
W-1,T+D),6:HPUT(U,T+.5*D+1.5)-(W
-1-I,T+D),6
```

Color Computer Software from Cer-Comp Ltd.

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CBASIC supports all the enhanced hardware available in the CoCo 2 & 3, including Hi-Res Graphics, & Screen displays, Extended Memory and Interrupts. We even added advanced commands not available in Basic to give you a level of control only available to very advanced Machine Language Programmers. Plus we made it exceptionally easy to use, not like some other compilers. CBASIC is the friendliest and easiest compiler available for the Color Computer.

CBASIC is a powerful tool for the Beginner as well as the Advanced Basic or Machine Language programmer. CBASIC features well over 150 Compiled Basic Commands and Functions that fully support Disk Sequential and Direct access files, Tape, Printer and Screen I/O. It supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Enhanced Color Basic, including Graphics H/GET, H/Put, H/Play and H/DRAW, all with 99.9% syntax compatibility.

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- Complete Full and Half Duplex operation,
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- Display or Print the contents of the 50k Buffer.
- Freeze Display & Review information On line.
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- Built in 2 Drive RAMDISK for 512K RAM.

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DISASSEMBLER & SOURCE CODE GENERATOR

The SOURCE will allow you to easily & quickly Disassemble Color Computer machine language programs Directly from Disk and generate beautiful, Assembler Source code.

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- Allows specifying FCB, FDB and FCC areas.
- Disassemble programs Directly from disk.
- Automatically locates address.
- Output listings to the Printer, Screen or both.
- Generates Assembler source directly to disk.
- Built in Hex/Ascii dump/display.
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- Selectable Foreground & Background colors.
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- Menu display with single key commands.
- Written in Ultra Fast Machine Language.

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EDT/ASM III

DISK EDITOR ASSEMBLER

EDT/ASM III is a Disk based co-resident Text Editor & Assembler. It is designed to take advantage of the new features available in the CoCo-3 with either 128K or 512K of memory. It has 8 display formats from 32/40/64/80 columns. There is also a free standing ML Debug Monitor.

EDT/ASM III has the most powerful, easy to use Text Editor available in any Editor/Assembler package for the Color Computer.

- Local and Global string search and/or replace.
- Full Screen line editing .
- Easy to use Single key editing commands.
- Load & Save standard ASCII formatted files.
- Block Move & Copy, Insert, Delete, Overtype.
- Create and Edit files larger than memory.

The Assembler features include:

- Supports Conditional IF/THEN/ELSE assembly.
- Supports Disk Library file up to 9 levels deep.
- Supports standard Motorola directives.
- Allows multiple values in FCB & FDB directives
- Allows assembly from the Buffer, Disk or both.

Coco 1, 2 or 3 Disk $59.95

```
275 IFK$="O" OR K$="o"THENCLS:LO
CATE8,9:PRINT"1: SAVE SCREEN ON
DISK":LOCATE8,10:PRINT"2: DIR":L
OCATE8,11:PRINT"3: HI C SCREEN D
UMP":GOTO725
370 INPUT#1,D,S:CLOSE#1:IFD>7 AN
D D<11THEND=11ELSEIFD>11 AND D<1
5THEND=15ELSEIFD>15THEND=23
720 END
725 K$=INKEY$:IFK$=""THEN725ELSE
IFK$="1"THENGOSUB25:GOTO230ELSEI
FK$="2"THENCLS:DIR:PRINT"      P
RESS SPACE TO CONTINUE"ELSEIFK$=
"3"THENDRIVE0:RUN"DRIVERHT"ELSES
OUND60,3:GOTO230
726 K$=INKEY$:IFK$=""THEN726ELSE
230
820 GOSUB485:CLS:LOCATE12,8:PRIN
T"FILENAME: ";:LINEINPUTF$:Z$=RI
GHT$(F$,2):IFASC(Z$)=58THENDRIVE
VAL(RIGHT$(Z$,1)):F$=LEFT$(F$,LE
N(F$)-2):RETURNELSERETURN
7000 IFERLIN=2330THEN2340
7001 IFERLIN=50THEN60
```

Listing 4: HALTERD

```
18 ON ERR GOTO7000
25 GOSUB820:POKE&HFFA2,&H70:SAVE
M"OUT1",&H4000,&H5FFF,&HAC73:POK
E&HFFA2,&H71:SAVEM"OUT2",&H4000,
&H5BFF,&HAC73:POKE&HFFA2,&H7A:RE
NAME"OUT1/BIN"TOF$+"/HR1":RENAME
"OUT2/BIN"TOF$+"/HR2":DRIVE0:RET
URN
30 GOSUB820:RENAMEF$+"/HR1"TO"IN
1/BIN":RENAMEF$+"/HR2"TO"IN2/BIN
":POKE&HFFA2,&H70:LOADM"IN1":POK
E&HFFA2,&H71:LOADM"IN2":POKE&HFF
A2,&H7A
35 RENAME"IN1/BIN"TOF$+"/HR1":RE
NAME"IN2/BIN"TOF$+"/HR2":DRIVE0:
RETURN
170 IFK=21THENHPUT(U,T)-(W-1,T+.
5*D),4:HPUT(U,T+.5*D)-(W-1,T+D),
4:L=U:GOTO65
171 IFK=95THENI=2*H+2:HPUT(L,T)-
(L+1,T+D),1:IFL>W*.5THENHGET(U,T
)-(W-I-1,T+.5*D+.5),6:HPUT(U+I,T
)-(W-1,T+.5*D+.5),6:HGET(U,T+.5*
D+1.5)-(W-I-1,T+D),6:HPUT(U+I,T+
.5*D+1.5)-(W-1,T+D),6:GOTO175
172 IFK=95THENHGET(U+I,T)-(W-1,T
+.5*D+.5),6:HPUT(U,T)-(W-1-I,T+.
5*D+.5),6:HGET(U+I,T+.5*D+1.5)-(
W-1,T+D),6:HPUT(U,T+.5*D+1.5)-(W
-1-I,T+D),6
275 IFK$="O" OR K$="o"THENCLS:LO
CATE8,9:PRINT"1: SCREEN DUMP":LO
CATE8,10:PRINT"2: SAVE SCREEN ON
 DISK":LOCATE8,11:PRINT"3: DIR":
LOCATE8,12:PRINT"4: HI C SCREEN
DUMP":GOTO725
370 INPUT#1,D,S:CLOSE#1:IFD>7 AN
D D<11THEND=11ELSEIFD>11 AND D<1
5THEND=15ELSEIFD>15THEND=23
720 END
725 K$=INKEY$:IFK$=""THEN725ELSE
IFK$="1"THENCLS:EXEC&H1249:GOTO2
30ELSEIFK$="2"THENGOSUB25:GOTO23
0ELSEIFK$="3"THENCLS:DIR:PRINT"
     PRESS SPACE TO CONTINUE"ELS
EIFK$="4"THENDRIVE0:RUN"DRIVERHT
"ELSESOUND60,3:GOTO230
726 K$=INKEY$:IFK$=""THEN726ELSE
230
820 GOSUB485:CLS:LOCATE12,8:PRIN
T"FILENAME: ";:LINEINPUTF$:Z$=RI
GHT$(F$,2):IFASC(Z$)=58THENDRIVE
VAL(RIGHT$(Z$,1)):F$=LEFT$(F$,LE
N(F$)-2):RETURNELSERETURN
7000 IFERLIN=2330THEN2340
7001 IFERLIN=50THEN60
```

Listing 5: HALTERE

```
18 ON ERR GOTO7000
25 GOSUB820:POKE&HFFA2,&H70:SAVE
M"OUT1",&H4000,&H5FFF,&HAC73:POK
E&HFFA2,&H71:SAVEM"OUT2",&H4000,
&H5BFF,&HAC73:POKE&HFFA2,&H7A:RE
NAME"OUT1/BIN"TOF$+"/HR1":RENAME
"OUT2/BIN"TOF$+"/HR2":DRIVE0:RET
URN
30 GOSUB820:RENAMEF$+"/HR1"TO"IN
1/BIN":RENAMEF$+"/HR2"TO"IN2/BIN
":POKE&HFFA2,&H70:LOADM"IN1":POK
E&HFFA2,&H71:LOADM"IN2":POKE&HFF
A2,&H7A
35 RENAME"IN1/BIN"TOF$+"/HR1":RE
NAME"IN2/BIN"TOF$+"/HR2":DRIVE0:
RETURN
170 IFK=21THENHPUT(U,T)-(W-1,T+.
5*D),4:HPUT(U,T+.5*D)-(W-1,T+D),
4:L=U:GOTO65
171 IFK=95THENI=2*H+2:HPUT(L,T)-
(L+1,T+D),1:IFL>W*.5THENHGET(U,T
)-(W-I-1,T+.5*D+.5),6:HPUT(U+I,T
)-(W-1,T+.5*D+.5),6:HGET(U,T+.5*
D+1.5)-(W-I-1,T+D),6:HPUT(U+I,T+
.5*D+1.5)-(W-1,T+D),6:GOTO175
172 IFK=95THENHGET(U+I,T)-(W-1,T
+.5*D+.5),6:HPUT(U,T)-(W-1-I,T+.
5*D+.5),6:HGET(U+I,T+.5*D+1.5)-(
W-1,T+D),6:HPUT(U,T+.5*D+1.5)-(W
-1-I,T+D),6
```

```
275 IFK$="O" OR K$="o"THENCLS:LO
CATE8,9:PRINT"1: SAVE SCREEN ON
DISK":LOCATE8,10:PRINT"2: DIR":L
OCATE8,11:PRINT"3: HI C SCREEN D
UMP":GOTO725
370 INPUT#1,D,S:CLOSE#1:D=SF*D:S
=SF*S:M(0)=SF*(D(CD)+2)-2:IFD>7
AND D<11THEND=11ELSEIFD>11 AND D
<15THEND=15ELSEIFD>15THEND=23
720 END
725 K$=INKEY$:IFK$=""THEN725ELSE
IFK$="1"THENGOSUB25:GOTO230ELSEI
FK$="2"THENCLS:DIR:PRINT"      P
RESS SPACE TO CONTINUE"ELSEIFK$=
"3"THENDRIVE0:RUN"DRIVERHT"ELSES
OUND60,3:GOTO230
726 K$=INKEY$:IFK$=""THEN726ELSE
230
820 GOSUB485:CLS:LOCATE12,8:PRIN
T"FILENAME: ";:LINEINPUTF$:Z$=RI
GHT$(F$,2):IFASC(Z$)=58THENDRIVE
VAL(RIGHT$(Z$,1)):F$=LEFT$(F$,LE
N(F$)-2):RETURNELSERETURN
7000 IFERLIN=2330THEN2340
7001 IFERLIN=50THEN60
```

Listing 6: HALTERDE

```
18 ON ERR GOTO7000
25 GOSUB820:POKE&HFFA2,&H70:SAVE
M"OUT1",&H4000,&H5FFF,&HAC73:POK
E&HFFA2,&H71:SAVEM"OUT2",&H4000,
&H5BFF,&HAC73:POKE&HFFA2,&H7A:RE
NAME"OUT1/BIN"TOF$+"/HR1":RENAME
"OUT2/BIN"TOF$+"/HR2":DRIVE0:RET
URN
30 GOSUB820:RENAMEF$+"/HR1"TO"IN
1/BIN":RENAMEF$+"/HR2"TO"IN2/BIN
":POKE&HFFA2,&H70:LOADM"IN1":POK
E&HFFA2,&H71:LOADM"IN2":POKE&HFF
A2,&H7A
35 RENAME"IN1/BIN"TOF$+"/HR1":RE
NAME"IN2/BIN"TOF$+"/HR2":DRIVE0:
RETURN
170 IFK=21THENHPUT(U,T)-(W-1,T+.
5*D),4:HPUT(U,T+.5*D)-(W-1,T+D),
4:L=U:GOTO65
171 IFK=95THENI=2*H+2:HPUT(L,T)-
(L+1,T+D),1:IFL>W*.5THENHGET(U,T
)-(W-I-1,T+.5*D+.5),6:HPUT(U+I,T
)-(W-1,T+.5*D+.5),6:HGET(U,T+.5*
D+1.5)-(W-I-1,T+D),6:HPUT(U+I,T+
.5*D+1.5)-(W-1,T+D),6:GOTO175
172 IFK=95THENHGET(U+I,T)-(W-1,T
+.5*D+.5),6:HPUT(U,T)-(W-1-I,T+.
5*D+.5),6:HGET(U+I,T+.5*D+1.5)-(
W-1,T+D),6:HPUT(U,T+.5*D+1.5)-(W
-1-I,T+D),6
275 IFK$="O" OR K$="o"THENCLS:LO
CATE8,9:PRINT"1: SCREEN DUMP":LO
CATE8,10:PRINT"2: SAVE SCREEN ON
 DISK":LOCATE8,11:PRINT"3: DIR":
LOCATE8,12:PRINT"4: HI C SCREEN
DUMP":GOTO725
370 INPUT#1,D,S:CLOSE#1:D=SF*D:S
=SF*S:M(0)=SF*(D(CD)+2)-2:IFD>7
AND D<11THEND=11ELSEIFD>11 AND D
<15THEND=15ELSEIFD>15THEND=23
720 END
725 K$=INKEY$:IFK$=""THEN725ELSE
IFK$="1"THENCLS:EXEC&H1249:GOTO2
30ELSEIFK$="2"THENGOSUB25:GOTO23
0ELSEIFK$="3"THENCLS:DIR:PRINT"
      PRESS SPACE TO CONTINUE"ELS
EIFK$="4"THENDRIVE0:RUN"DRIVERHT
"ELSESOUND60,3:GOTO230
726 K$=INKEY$:IFK$=""THEN726ELSE
230
820 GOSUB485:CLS:LOCATE12,8:PRIN
T"FILENAME: ";:LINEINPUTF$:Z$=RI
GHT$(F$,2):IFASC(Z$)=58THENDRIVE
VAL(RIGHT$(Z$,1)):F$=LEFT$(F$,LE
N(F$)-2):RETURNELSERETURN
7000 IFERLIN=2330THEN2340
7001 IFERLIN=50THEN60
```


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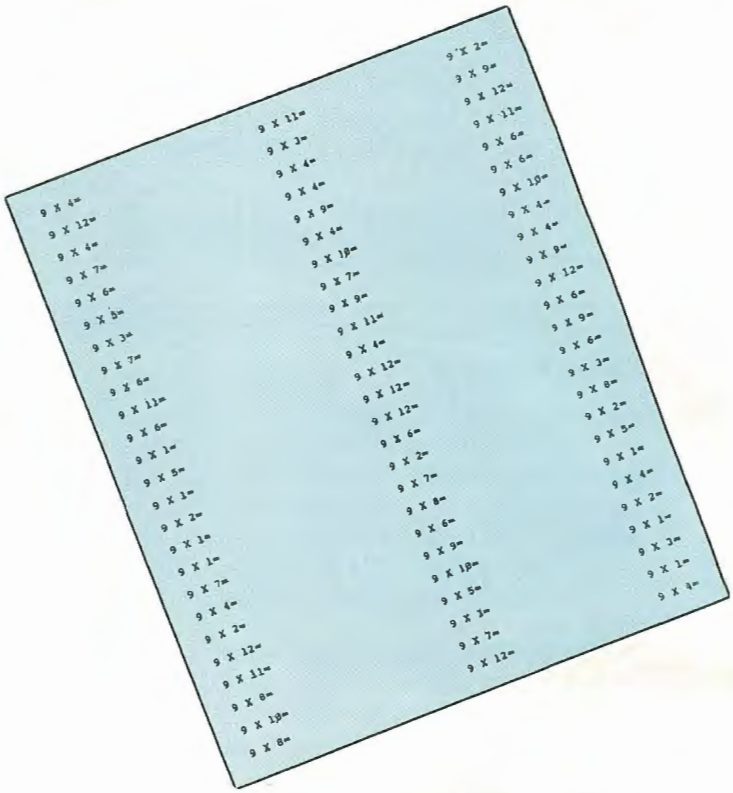
A program for timed drills in both multiplication and division



Time Test

By Mary C. Crooks

Time Test is a new approach to computer-aided drill on multiplication and division tables: It is the way I give my third-grade son two-minute timed tests on the multiplication or division table he is trying to master. It duplicates the handwritten test strip that his teacher gives him in school. After setting a timer for two minutes, I give him the strip and a pencil. This test-taking practice, closely approximating the actual test, gives him more confidence than just working on the computer using a drill program.

The program is short and can be further shortened by removing the REM statements (lines 10 through 29), which contain credits and explanation. This saves 548 bytes of memory. As those REMs state, *Time Test* creates and sends to the printer randomly generated problems testing on the multiplication or division tables or on a mixture of both (review test).

All you need is a 16K Extended Color BASIC disk or cassette system and printer. In lines 660 through 670 I use an Epson MX-80 to print out the test strips, utilizing its TAB command to

Line	Function
30 through 100	Reserve memory, dimension array, show title screen
110 through 300	Get keyboard input on chose of test type (Variables X, A, Y)
340 through 350	Determine type of problem if review (Variable Y)
390	Specifies multiplication table to test if review (Variable AA)
400 through 430	Create multiplication problem (Array E$)
470	Specifies division table to test if review (Variable AA)
480 through 510	Create multiplication problem (Array E$)
550 through 570	Loop counts problems created
610 through 680	Print out problems created (Array E$)
690 through 750	Get keyboard input to end or start again

Table 1

Mary Crooks, a busy housewife and mother of two, has been programming for about a year and helped to organize and run the computer center at her son's elementary school. She holds a degree in art and enjoys all things creative.

space my vertical columns. Run time is about a minute and a half from start to printout. All decisions required are menu-driven, so it's hard to make a mistake.

Seventy-five problems are sent to the printer, aligned so that there are three vertical columns of 25 problems. In a printer using paper 8½ inches-by-11 inches, this creates three test strips 2 4/5 inches-by-11 inches when cut.

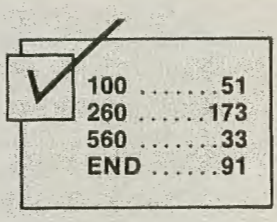
You specify the type of test you want — multiplication, division or review. If you choose multiplication or division, you then specify the table to test (i.e., 7x). If you choose review, the computer randomly generates the tables and type of problems.

Liberally used REMs denote the purpose of each program module, and very little needs explaining. The meat of the program is in the use of Array E$ to store the 75 problems generated. The array is made by adding together the string variables that represent the component parts of the algorithms for multiplication and division. This requires using STR$ to convert the numeric expressions AA, RND(12) and AA*RND(12) to strings needed in the array. Using commas to print screen menus (see lines 60 and 90) is a neat way to double-space text with minimal typing. I thank Richard White for this tip in his column "Bits and Bytes of BASIC" (April '84, Page 64)!

Major program areas are shown in Table 1.

Now, I wonder if my son's teacher could use an easier way to make up those timed tests?

(Questions or comments concerning this program may be directed to the author at 7955 Hillsboro Court, Pleasanton, CA 94566. Please enclose an SASE when requesting a reply.) □



The listing: TIMETEST

```
 Ø ' COPYRIGHT 1989  FALSOFT,INC
 1Ø '**********TIME TEST*******
 11 '******M.CROOKS-4/3Ø/84*****:
 12 '********PLEASANTON,CA******:
 13 '
 14 'THIS PROGRAM CREATES AND
 15 'SENDS TO THE PRINTER
 16 'RANDOMLY GENERATED PROBLEMS
 17 'TESTING ON THE MULTIPLICA-
 18 'TION OR DIVISION TABLES OR
 19 'ON A MIXTURE OF BOTH.
 2Ø '
 21 'SEVENTY-FIVE PROBLEMS ARE
```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ADOS-3 (reviewed July 1987)
Customize default startup message, colors, screen width, baud rate, step rates, processor speed, number of tracks (35, 40, or 80). Disk I/O and printing are reliable at double CPU speed. Extra commands such as FAST, SLOW, AUTO, RUNM, SCAN, CAT, PRT ON/OFF. Keystroke macros; arrow-key scroll through BASIC programs, edit/repeat of last command; auto-edit of error line, ML monitor, lots more. Usable as a disk utility or in EPROM. 128K Coco 3. EPROM-burning (cost is $15-20) information provided. Disk, **$34.95.**

ADOS for Coco 1 and 2 (reviewed June 1987) Disk, **$27.95.** ADOS plus ADOS-3, **$50.**

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```
22 'SENT TO THE PRINTER,
23 'ALIGNED SO THAT THERE ARE
24 'THREE VERTICAL COLUMNS OF
25 'TWENTY-FIVE PROBLEMS.
27 '****************************
28 '          START
29 '****************************
3Ø CLEAR 8ØØ:DIM E$(75)
4Ø K=Ø:A=Ø:X=Ø:N=Ø:Y=Ø
5Ø CLS:FORI=1TO3:PRINT:NEXT
6Ø PRINTTAB(11)"TIME TEST",,,
7Ø PRINT"  THIS PROGRAM TESTS ON
LY THE"
8Ø PRINT"  MULTIPLICATION AND DI
VISION"
9Ø PRINT"  TABLES ONE THROUGH TW
ELVE.",,,
1ØØ PRINT:INPUT"  PRESS<ENTER>TO
 CONTINUE";W$
11Ø CLS:PRINT:PRINTTAB(6)"WHAT K
IND OF TEST?","   >>>SELECT DIGI
T 1 OR 2<<<"
12Ø PRINT@32*5+3," 1-MULT. OR DI
V.
13Ø PRINT@32*6+3," 2-REVIEW TEST
 (MIXTURE OF":PRINT@32*7+7," MUL
T. & DIV. PROBLEMS)"
14Ø PRINT:INPUT"   WHICH ONE<TYP
E 1 OR 2>";X
15Ø IFX<1 OR X>2THENGOTO14Ø
16Ø GOTO55Ø
17Ø IF X=2THENGOTO34Ø
18Ø IF A<>Ø THEN GO TO 3ØØ
19Ø '****************************
2ØØ '          TEST
21Ø '****************************
22Ø CLS:PRINT:PRINT:PRINT"  ON W
HAT TABLE DO YOU WISH","  TO TES
T?"
23Ø INPUT"      >>>TYPE 1-12<<<"
;A
24Ø IF A<1OR A>12THENGOTO22Ø
25Ø CLS:PRINT:PRINT TAB(4)"WHAT
ARE PROBLEMS TO BE?","   >>>SELE
CT DIGIT 1 OR 2<<<"
26Ø PRINT@32*4+5," 1-MULTIPLICAT
ION"
27Ø PRINT@32*5+5," 2-DIVISION"
28Ø PRINT:INPUT"   WHICH ONE<TYP
E 1 OR 2>";Y
29Ø IF Y<1 OR  Y>2 THEN GO TO 28
Ø
3ØØ IF Y=1 THEN 39Ø ELSE 47Ø
31Ø '****************************
32Ø '          REVIEW
33Ø '****************************
34Ø Y=RND(2)
35Ø IF Y=1 THEN GO TO 39Ø ELSE 4
7Ø
36Ø '****************************
37Ø '       MULTIPLICATION
38Ø '****************************
39Ø IF A=Ø THEN AA=RND(12)
4ØØ IF A<>Ø THEN AA=A
41Ø A$=STR$(AA):B$=" X":C$=STR$(
RND(12)):D$="="
42Ø E$(K)=A$+B$+C$+D$
43Ø GOTO57Ø
44Ø '****************************
45Ø '         DIVISION
46Ø '****************************
47Ø IF A=Ø THEN AA=RND(12)
48Ø IF A<>ØTHEN AA=A
49Ø A$=STR$(AA*RND(12)):B$=" /":
C$=STR$(AA):D$="="
5ØØ E$(K)=A$+B$+C$+D$
51Ø GO TO 57Ø
52Ø '****************************
53Ø '       END OF DATA
54Ø '****************************
55Ø FOR K=1 TO 75:IF K=2 THEN CL
S:PRINT@1Ø3,"CREATING PROBLEMS":
PRINT@23Ø,"1Ø SECONDS, PLEASE!"
56Ø GOTO17Ø
57Ø NEXT
58Ø '****************************
59Ø '       PRINT OUT
6ØØ '****************************
61Ø CLS:PRINT:PRINT" PLEASE POSI
TION PAPER AT START"
62Ø PRINT" OF SHEET & TURN ON PR
INTER.",,," WHEN YOU ARE READY T
O PRINT"," OUT THE COPIES OF TES
TS-"
63Ø PRINT:INPUT"     PRESS<ENTER>
TO BEGIN";W$
64Ø CLS:PRINT@2Ø3,"PRINTING"
65Ø FOR N=1 TO 75 STEP 3
66Ø PRINT#-2,E$(N);TAB(3Ø),E$(N+
1);TAB(6Ø);E$(N+2)
67Ø PRINT#-2:NEXT N
68Ø CLS:PRINT@1Ø3,"PRINTING COMP
LETE",,,,,"   DO YOU WANT TO-"
69Ø PRINT@32*8+6," 1-CREATE MORE
 TESTS"
7ØØ PRINT@32*9+6," 2-END"
71Ø PRINT:INPUT"   WHICH ONE<TYP
E 1 OR 2>";X
72Ø IF X<1 OR X>2 THEN GO TO 71Ø
73Ø IF X=1 GO TO 4Ø
74Ø CLS:PRINT@2Ø3,"THE END";:
75Ø GOTO75Ø
```

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Dear Larry:

Your reply to Dwayne Fitzgerald (May '89, Page 98) frightens me a little.

There is indeed software available to allow a CoCo to read and print out morse code—several different programs, in fact. I'm not even sure that such a program has not appeared in THE RAINBOW some time ago. I know a RTTY program did. Unfortunately it doesn't provide for changing to different transmission rates, and it used the least common one.

One of THE RAINBOW's advertisers, T&D software, sells a tape (issue #15, Sept '83) for eight dollars, which includes a morse code program that I believe will do what Dwayne wants. The only hardware required is an audio patch cord to connect the audio of the receiver to the microphone jack on the CoCo.

I have a program for the TS1000 from Thomas Woods. If I recall correctly, it costs about ten dollars.

If these sources do not supply Dwayne's needs, he should look at Computer Shopper's classified ads for suppliers of CoCo public domain software.

Billy R. Pogue
Lake Havaser City, Arizona

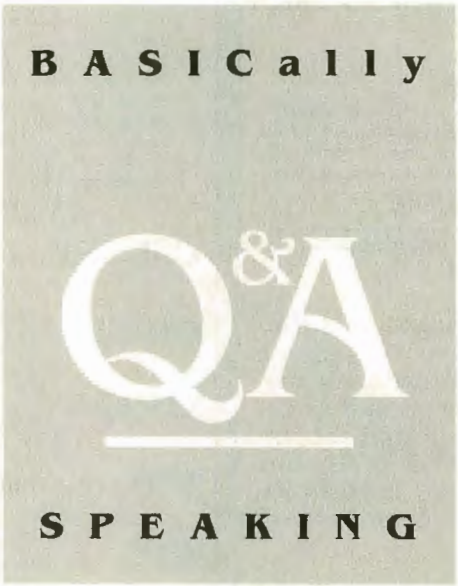
Thank you for the valuable information. I have very little knowledge of HAM radio, and therefore do not pay close attention to articles and reviews in THE RAINBOW involving this subject. To be perfectly honest with you, I saw the article on RTTY, but had no idea what it was. Thanks again for helping me with Dwayne's question

Dear Larry:

I've developed a fairly attractive (but cumbersome) game of 21. I would like to know how to make the computer deal its own hand. I would also like to keep a running total of the card values.

G.F. Watson
Phoenix, Arizona

Larry Boeldt has programmed on the Color Computer for five years. He has experience with BASIC, Pascal and FORTRAN IV. He runs a software customizing business for the CoCo market.



By Larry Boeldt

Listed below is a program that simulates a hand of 21 being played. The user simply chooses whether they want to have another card dealt to them. It keeps a total of the card values, as well as determines if they win or lose. Keep in mind that this is a very bare bones program. It does illustrate a few unique techniques for simulating a deck of cards being played.

Note that in lines 1 through 3 variables are described and accounted. This is a good programming practice. When you need to change the program, you will know the meaning of each variable.

To simulate a deck of cards, each individual card must have its own number to make it distinct. For this I started with the Ace of Hearts, represented by the number one. The King of Hearts is represented by the number 13, the Ace of Diamonds is 14, etc. The order of suits is Hearts, Diamonds, Clubs and Spades. In other words, the King of Spades is 52.

The values must be broken down by suits and face cards given the value of 10. This is done in lines 1012 through 1018. The suit is put into A$ and T is converted to the card type index value (1=ONE, 2=TWO. . .13=KING).

The rest of the program is easy to understand. If you have any questions about this program, write to me in care of THE RAINBOW. I will be glad to answer them in a future column.

Listing 2: GAMEOF21

```
0 ' THE GAME OF "21"
1 ' A()=DECK OF CARDS  A$()=CARD
NAMES   C=COUNTER FOR CARDS
2 ' R,N=RANDOMIZERS AND MISCELLA
NEOUS COUNTERS   RT=RUNNING TOTA
L OF CARDS
3 ' NC=NUMBER OF CARDS DEALT IN
A GIVEN HAND   T=CARD NUMBER (IN
CARD SUIT)
4 '
5 ' Cards By Larry Boeldt
6 ' Copyright(C), Larry Boeldt
7 ' For RAINBOW MAGAZINE'S
8 ' BASICally SPEAKING COLUMN
9 CLEAR 8000,24578
10 DIM A(52) ' ARRAY OF CARDS, S
TARTS OUT AS A NEW DECK OF CARDS
11 DIM A$(13) ' THE NAMES OF EAC
H CARD (KING,QUEEN,NINE,TEN,ECT.
..
19 FOR C=1 TO 13:READ A$(C):NEXT
C
20 FOR C=1 TO 52 ' BEGIN WITH A
FRESH DECK OF CARDS IN ORDER
22 A(C)=C
24 NEXT C
30 GOSUB 1100 ' SCRAMBLE THE DEC
K
40 C=1
80 CLS:RT=0:NC=0:FORCO=1TO2:GOSU
B1000:C=C+1:NC=NC+1:RT=RT+T:NEXT
CO ' DEAL TWO
90 PRINT"YOUR TOTAL IS :";RT:IF
RT=21 THEN PRINT"YOU HAVE 21 YOU
WIN":GOTO 200 ELSE IF RT>21 THEN
PRINT"YOU BUSTED":GOTO 200
92 IF NC=5 AND RT<22 THEN PRINT"
YOU HAVE STAYED UNDER 21":PRINT"
AND HAVE FIVE CARDS, YOU WIN":GO
TO200
100 PRINT"ANOTHER CARD ?":EXEC 4
4537:D$=INKEY$
102 IF D$="Y" THEN GOSUB 1000:C=
C+1:RT=RT+T:NC=NC+1
104 GOTO 90
200 PRINT"ANOTHER HAND ?":EXEC 4
4537:D$=INKEY$::IF D$="N" THEN 8
99
202 IF C>45 THEN GOSUB 1100:GOTO
40 ELSE GOTO 80
899 END
900 REM*** CARD NAME DATA ***
910 DATA ACE,TWO,THREE,FOUR,FIVE
920 DATA SIX,SEVEN,EIGHT,NINE,TE
N
930 DATA JACK,QUEEN,KING
1000 REM*** PRINT CARD TYPE ***
1010 T=A(C)
1012 IF T<=13 THEN A$="OF HEARTS
"
1014 IF T>13 AND T<27 THEN T=T-1
3:A$="OF DIAMONDS"
1016 IF T>26 AND T<40 THEN T=T-2
6:A$="OF CLUBS"
```

```
1018 IF T>39 THEN T=T-39:A$="OF
SPADES"
1020 LOCATE 0,NC:A$=A$(T)+" "+A$
:PRINT A$
1030 IF T>10 THEN T=10
1099 RETURN
1100 REM*** SCRAMBLE DECK ***
1105 ATTR 0,0,B:PRINT"WAIT SHUFF
LING DECK":ATTR 0,0
1107 FOR C=1 TO 208
1110 R=RND(52):H=A(R):N=RND(52):
A(R)=A(N)
1120 A(N)=H:R=RND(-TIMER)
1130 NEXT C
1135 CLS
1140 RETURN
```

Dear Larry:

My handle on DELPHI is PERCH *and I have uploaded several crude programs on statistics. Since statistics rely on the ability to maneuver numbers, my question is: What is the most efficient way to maneuver numbers? I managed to do calculations on lists of numbers in programs I have uploaded, but am positive that there is a better way!*

I am still learning BASIC*, so bear with me. For example:*

```
10 INPUT"DATA NUMBER 1>";AA
20 INPUT"DATA NUMBER 2>";AB
```

My list of INPUT *statements might be as long as 20 or 30 lines, and I change accordingly* (AA,AB,AC)*. Then some type of processing must take place on each variable for instance:*

```
100 IF AA=20THEN AA=60-(XX*ZZ) ELSE
IF AA=21 THEN AA=70-(XX*ZZ) ELSE IF
AA=22 THEN AA=83-(XX*ZZ) ELSE IF
AA=23 THEN AA=101-(XX*ZZ)...
```

I have been doing this with each of 20 or 30 values. What a hassle. Then, after I have maneuvered the numbers to this point, I usually have to do more processing.

Also, how do I stop input? I may want to enter 10 values instead of 20. I can't use zero because zero has meaning in statistics.

In your May '89 column you stated, "Keep those questions coming!." I hear and I obey.

Roger I. Carlson
Tinley Park, Illinois

I begin by referring you to *The Super Extended BASIC Manual*, Chapter 33 (Page 183). Arrays are among the most useful "little ditties" computers have to offer. You can arrange your information in a logical set and sequence. The manual explains arrays quite well. I use arrays in the answer to the game of 21 question from G.F. Watson.

Chapters 34 and 35 are extremely helpful in dealing with strings and organizing data into sets (multi-dimensional arrays). I think you will find this information most helpful.

Dear Larry:

In the book supplied with my CoCo 3 by Radio Shack, it gives ROM routines which can be called by a machine language program. I have seen, for instance, in the February issue of THE RAINBOW*, a game called* Toader*. It is a* BASIC *program that calls on the ROM routine* JOYIN*. My question is: How does one call on these routines and what are the entry and exit conditions?*

Donald Kempton
Athens, Ohio

I have been working with such ROM routines for quite a while. I do very little assembly language programming, but I use the routines in BASIC quite often. Let me give you an example of how to use the ROM routines:

In order to call a ROM routine from BASIC you must find the address where it is located. The addresses given in the Color Computer manuals store the memory locations where these addresses can be found. For example, the JOYIN routines can be found at $HA00A. To find the address use this formula:

```
A=PEEK(&HA00A)*256+PEEK(&HA00B)
```

If you plan on using many ROM routines, use the following DEF FN statement:

```
DEF FNP(L)=PEEK(L)*256+PEEK(L+1)
```

This statement simulates a double peek command using DEF FN. Now, JOYIN requires that a PEEK be made to locations 15A to 15B for the joystick values. DEF FN comes in handy here, too.

```
DEF FNJOY(N)=PEEK(&H15A+N)
```

Now you have created a command that is the same as the ECB JOYSTK command. Type in the following program and see how this works:

```
10 DEF FNPEEK(L)=PEEK(L)*256+PEE
K (L+1)
20 DEF FNJOY(N)=PEEK(&H15A+N)
30 CLS:A=FNPEEK(&HA00A)
40 EXEC A:PRINT@0,FNJOY(0),FNJOY
(1),FNJOY(2),FNJOY(3)
50 GOTO 40
```

Notice how this might be to your benefit. One sure thing is that you can read just the JOYSTK(1) values without reading the JOYSTK(0) values as BASIC requires. The entry and exit conditions are listed in the manual that comes with your CoCo.

Dear Larry:

I have recently tried to convert an old program for mailing labels from tape to disk to run on my CoCo 3. The tape program I originally purchased runs fine. The changes I made to allow it to run on disk, however, do not allow me to retrieve data from the disk, and I cannot figure out how to correct it.

Kenneth A. Goldman

Start by changing all CLOAD(M) and CSAVE(M) type commands to LOAD(M) and SAVE(M) commands. All references to #-1 should be changed to 1. Make sure that when loading data you change EOF(-1) to EOF(1). This should give you all of the necessary changes in the program to allow it to operate it on disk. One problem you might have is related to memory. Disk BASIC requires more memory to operate. You might run out of memory if you have a larger database.

Questions about specific BASIC programming problems can be addressed to BASICally Speaking, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we recieve, we are unable to answer letters individually.

Questions can also be sent to Larry through the DELPHI CoCo SIG. From the CoCo SIG> prompt, pick Rainbow magazine Services, then , at the RAINBOW> prompt , type ASK (for Ask the Experts) to arrive at the EXPERTS> prompt , where you can select the "BASICally Speaking" online form, which has complete instructions.

By Marty Goodman
Rainbow Contributing Editor

Eight Levels of Gray

Marty, a long time ago you wrote an article about how to obtain eight gray levels on a CoCo 1. Can you send me a copy?

Norm Hackman
Newton, Maine

I'm afraid I've lost those circuits over the years. However, CRC now sells a gizmo allowing for 16 or more gray levels on a composite monochrome monitor when used with a CoCo 3. It's a very simple circuit that hooks to the RGB output of the CoCo 3, combines the three color signals, combines the Sync signals, then mashes together the combined sync at TTL level and the analog level video into a single NTSC type signal that can be fed into a monochrome monitor.

In theory, you can get 64 gray levels this way; in actuality, I suspect you get more like 16 or 32 levels.

A Mysterious Character

When I power up my CoCo 3, the display is offset to the left by half of a character. During a cold start, pressing CONTROL-ALT-Reset *will fix this. You wrote about a fix for this, but I've forgotton what issue. Also, my RGB monitor (a CM8) has what appears to be RFI interference more strongly after I upgraded to 512K. Can this be fixed?*

Verne Winter
Des Moines, Iowa

See the August '87 issue of "CoCo Consultations", Page 64, regarding the fix for the shifted character. RFI is often hard to fix. I suggest wrapping the cable from your CM8 around a ferrite core of the Radio Shack Cat No. 273-104 snap-together ferrite torus. Do this near where the cable plugs into the CoCo and use another torus near where the cable goes in to the monitor. Try doing the same for all other cables that hook to your CoCo (joysticks, serial cable, cassette, etc.). This may help considerably. If all else fails, consider getting the Tandy Brand of 512K upgrade board (Computer-Plus may still sell them with the DRAMs removed) since it has the best RFI shielding of all the 512K upgrade boards on the market. In other ways, however, it may not be quite as good as some of the third-party brands.

Connecting Modems

Can I connect a modem to the 4-pin serial port on the CoCo 3? Or do I need a Multi-Pak and an RS-232 pak?

Kelly Jones
West Salem, Ohio

The CoCo 3, with its faster clock-speed and timer interrupt, has allowed programmers to write terminal programs for it that use the 4-pin serial bit banger port and still support two-way (full duplex) communication at 1200 and even 2400 baud. *GregETerm*, *DELPHITerm*, *Ultimaterm*, and *Vterm* (the first three are shareware, the last is an inexpensive commercial product sold by Gimmesoft) are examples of CoCo 3 terminal programs that allow this.

So all you really need is the terminal program and a modem. Almost any modem will do, though at current prices it is not worth it to buy a 300-baud modem.

Then all you need is a cable that connects the 4-pin DIN connector of the CoCo serial port to the DB-25 connector on the modem as follows: CoCo Pin 1 to DB-25 Pin 8; CoCo Pin 3 to DB-25 Pin 7; CoCo Pin 2 to DB-25 Pin 3; CoCo Pin 4 to DB-25 Pin 2.

Trivia Fever Fix

I could not get the Trivia Fever *fix, which you published in the January '89 issue, to work. Can you help me?*

Ronald Hagel
Jackson Heights, New York

There was a typographical error in the printing of that fix, which many readers caught and corrected. Unfortunately, those unfamiliar with BASIC were baffled by it.

The first line of that fix was printed as:

```
10 DKSI$0,34,1,UH$,LH$
```

It should have read:

```
10 DSKI$0,34,1,UH$,LH$
```

Note that `DSKI$` is misspelled as `DKSI$` in the flawed version. Sorry about any inconvenience this may have caused you.

Archaic System

My CoCo 3 still prints out 22824 as its memory size, even though I upgraded it to 512K, and OS-9 recognizes the 512K. Why is this?

Suk-in Ahn
Logan Lake, British Columbia

Disk BASIC still runs in a 32K environment. This aspect of it was never changed from the original CoCo 1. In a sense, it is an archaic system. Only the `LPEEK` and `LPOKE` commands directly address memory outside of the 32K. The Hi-Res graphics screens also address memory outside of the 32K set aside for old BASIC, but those who patched Disk BASIC for the CoCo 3 did not include commands for saving such screens to disk.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P. O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we recieve, we are unable to answer letters individually.

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Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On DELPHI, Marty is the SIGop of RAINBOW*'s CoCo SIG and database manager of OS-9 Online.*

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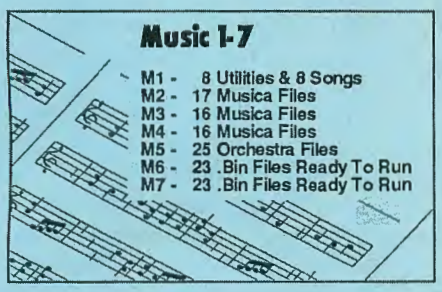

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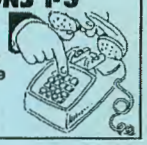

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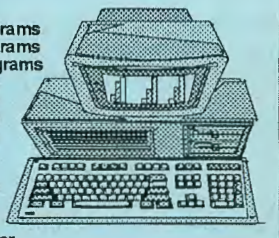

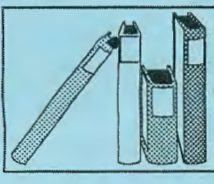

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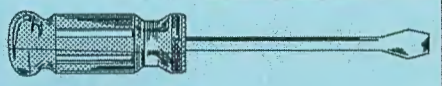

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Helping your child prepare for standardized testing

Building Reading Skills

By Steve Blyn
Rainbow Contributing Editor

There comes a time when each student must take a standardized reading test. Depending on the local school system, preparation for that day may be thorough or nill. The school system employing me takes these tests seriously and teachers are encouraged to prepare the students extensively.

There are several sets of reading skill builders used as preparation aids for these tests. I often use the Barnell Loft series of softcover *Skillbuilder* books. Each book, on a specific grade level, covers one of the following areas: working with sound, following directions, using context, locating answers, getting facts, identifying the main idea, drawing conclusions or detecting the sequence of events. The skill books are relatively inexpensive and your computer is free.

Material similar to that contained in these books can be placed within a computer program. This has two main benefits. The computer, although it contains essentially the same material, is a different means of attracting a student's interest. It also offers immediate feedback to the student as he progresses through the program.

This month's article presents a program for practicing the skill of following directions in a story. I chose to include questions for three stories on the fourth grade level. Your version will, no doubt, include many more stories and be on whatever level you decide to cover.

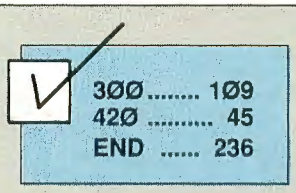
Our stories and questions are contained in a series of DATA statements, which are usually placed at the end of the program. The first portion of the data is the story, with a limit of 255 characters. While typing in the story, be careful to keep in mind the screen. The standard width is 32 characters. If you are using a screen enhancer program, keep its width in mind. Do not present material containing words that break up at the end of a line. To understand this point better, examine the data. Line 360, for example, has no space between the words "to" and "rust" because the word "to" ends a line and the word "rust" should not have a space before it to begin the next line.

The next portion gives the four questions, each containing the three answers in the same DATA portion. This is a shortcut method of entering the information. After each question comes the letter of the correct answer. The pattern is then repeated after the four questions and answers are keyed in.

Variable J indicates to the computer the number of stories entered. Be careful to change this number if you key in additional stories. Variable A keeps track of the number of correct answers in each round or story. The score is given at the conclusion of each round. The program ends after going through each of the stories.

This presents a short outline-type program for reviewing reading skill questions. Modifications and elaborations are possible for the program, so feel free to alter it to suit your students' needs. ❑

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees, and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.



The listing: FOLLOW

```
10 REM"STORIES TESTING FOLLOWING
 DIRECTIONS"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,STATEN ISLAND,NY,1989"
30 CLEAR 1000:J=3:REM* 3 STORIES
40 R$=STRING$(32,191)
50 DIM A$(J),B$(J),B1$(J),C$(J),
C1$(J),D$(J),D1$(J),E$(J),E1$(J)
60 FOR T=1 TO J:READ A$(T),B$(T)
,B1$(T),C$(T),C1$(T),D$(T),D1$(T
),E$(T),E1$(T):NEXT T
70 CLS:PLAY"CEG":A=0:R=R+1:K=K+1
:IF K>J THEN CLS:END
80 PRINT@0,A$(R):PRINTR$;
90 PRINT@288,B$(R)
100 PRINT@416,"";:INPUT X$
110 IF X$=B1$(R) THEN PRINT@425,
"CORRECT":A=A+1
120 IF X$<>B1$(R) THEN PRINT@420
,"SORRY, "B1$(R)" IS CORRECT"
130 EN$=INKEY$
140 IF EN$=CHR$(13) THEN 150 ELS
E 130
150 PRINT@416,"":PRINT@288,C$(R)
160 PRINT@416,"";:INPUT X$
170 IF X$=C1$(R) THEN PRINT@425,
"CORRECT":A=A+1
180 IF X$<>C1$(R) THEN PRINT@420
,"SORRY, "C1$(R)" IS CORRECT"
190 EN$=INKEY$
200 IF EN$=CHR$(13) THEN 210 ELS
E 190
210 PRINT@416,"":PRINT@288,D$(R)
220 PRINT@416,"";:INPUT X$
230 IF X$=D1$(R) THEN PRINT@425,
"CORRECT":A=A+1
240 IF X$<>D1$(R) THEN PRINT@420
,"SORRY, "D1$(R)" IS CORRECT"
```

```
250 EN$=INKEY$
260 IF EN$=CHR$(13) THEN 270 ELS
E 250
270 PRINT@416,"":PRINT@288,E$(R)
280 PRINT@416,"";:INPUT X$
290 IF X$=E1$(R) THEN PRINT@425,
"CORRECT":A=A+1
300 IF X$<>E1$(R) THEN PRINT@420
,"SORRY, "E1$(R)" IS CORRECT"
310 PRINT"YOU RECEIVED";A;"OUT O
F 4 RIGHT."
320 EN$=INKEY$
330 IF EN$=CHR$(13) THEN 340 ELS
E 320
340 GOTO 70
350 GOTO 350
360 DATA MANY GARAGES HAVE LIGHT
 BULBS   THAT MAY STICK IN THEIR
 SOCKETS.WEATHER CAN CAUSE THE T
HREADS TORUST.THIS CAN BE PREVEN
TED WITH A COAT OF VASELINE PUT
ONTO THE THREADS.THE BULBS WILL
THEN BE  EASY TO UNSCREW WHEN TH
EY NEED  TO BE REPLACED.
370 DATA THIS HELPS US TO ...
         A. TURN ON LIGHT BULBS
         B. TAKE OUT LIGHT BULBS
         C. FIND LIGHT BULBS,B
380 DATA A BULB MAY STICK BECAUS
E OF ... A. VASELINE
         B. THE GARAGE
         C. THE WEATHER,C
390 DATA THE TRICK IS TO COAT TH
E ...    A. THREADS
         B. GARAGE
         C. LIGHT BULBS,A
400 DATA WEATHER CAN CAUSE THE T
HREADS TOA. BREAK OFF
         B. WEAR OUT
         C. RUST,C
410 DATA HERE IS WHAT TO DO IF Y
OUR WATCHCRYSTAL EVER FALLS OUT.
 PUT THE CRYSTAL INTO YOUR REFRI
GERATOR. THE COLD WILL MAKE IT S
HRINK IN ABOUT ONE HOUR. NOW PUT
 IT BACK ONTO THE WATCH.IT WILL
FIT WELL AGAIN AS IT BEGINS TO W
ARM UP.
420 DATA THE STORY TELLS YOU TO
...      A. FREEZE THE WATCH
         B. PUT CRYSTAL IN REFRI
GERATOR  C. PUT  WATCH IN REFRIG
ERATOR,B
430 DATA THE REFRIGERATOR IS USE
D UNTIL..A. IT FREEZES
         B. ONE HOUR PASSES
         C. THE CRYSTAL FITS,B
440 DATA THE COLD MAKES THE CRYS
TAL ...  A. SHRINK
         B. LARGER
         C. FLATTEN,A
450 DATA THE REFRIGERATOR HELPS
TO ...   A. FIX BROKEN WATCH PAR
TS       B. FIX WATCH CRYSTALS T
HAT CRACKC. GET CRYSTALS BACK ON
 WATCHES,C
460 DATA TWO WORDS CAN OFTEN BE
JOINED TOFORM ONE LARGER WORD.DR
AW A LINEFROM ONE WORD ON THE LE
FT TO ONEON THE RIGHT TO MAKE A
NEW WORD.SMALL           NIGHT
         HIGH            STOP
         PLAY            GROUND
470 DATA YOU ARE ASKED TO MAKE A
 ...     A. SHORTER WORD
         B. LONGER WORD
         C. SENTENCE,B
480 DATA CONNECT THE TWO WORDS W
ITH A ...A. SPACE
         B. LINE
         C. COMPOUND WORD,B
490 DATA WHICH IS RIGHT?
         A. SMALL ----- NIGHT
         B. HIGH ------ STOP
         C. PLAY ------ GROUND,C
500 DATA THE EXAMPLE REALLY SHOW
S US     A. THREE WORDS
         B. SIX WORDS
         C. SEVEN WORDS,C
501 REM"PLAYGROUND IS THE SEVENT
H WORD"
```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The big scoop on OS-9

OS-9 SURVIVAL TRAINING

BY JEFFREY S. PARKER

Face it. You have been afraid of it for years. You've heard so much about all the power (and complexity), you are afraid to even touch the dusty old Level I books. But who can you tell? Afraid of OS-9? How many times have you ducked OS-9 questions at CoCo Club meetings, or mumbled vague replies to excited, shining-faced OS-9ers? Isn't it about time you took your rightful place and stopped running? Aren't you the least bit intrigued by all that power?

Relax. I can help you. It isn't impossible to learn about OS-9. Imagine, a fabulously powerful and versatile operating system that rivals those on giant mainframe computers — running on one of the world's most inexpensive and easiest-to-use computers. So, get comfortable as you read this article. We're going to take a look at what OS-9 is all about.

For a scenario: It all started harmlessly enough. You went into a Radio Shack store and bought a Color Computer with 64K, but the salesman said you can't use all 64K unless you have OS-9. Okay. You came back and paid your $80 for an excitingly gray and multicolored-striped box.

You opened the package, found the books and disks, opened the purple *Getting Started With OS-9* manual, and if you were very determined (because you had been told repeatedly how powerful OS-9 is), you managed to get it up and running... sort of.

But you weren't a programmer, and there weren't many programs for this powerful system, and you were not interested in complicated operating systems (weak or powerful), so up on the shelf it went, proudly displayed, but never used.

For some, possibly as few as 10 percent of the total community, this was not the case. Digging into the red *OS-9 Commands* manual and staying up far too late at night, a few adventurous souls studied and learned the editor and assembler. The real power and flexibility of OS-9 became apparent to those who were even the tiniest bit familiar with UNIX, and other multiuser operating systems.

The ideas started to come together then, and what had previously been frustration became production and versatility.

What CoCo users didn't realize was that OS-9 had already been around for quite a while. It was newly introduced to CoCo because Radio Shack felt, at the time, that a powerful and flexible operating system

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was needed for their TRS-80 Color Computer. OS-9 was already established and running in 6809 business computers around the world when it came to CoCo.

In a way, because Microware released OS-9 for a world of professional programmers, engineers and developers, it is not particularly surprising that a dichotomy resulted — that of the OS-9 users and the non-OS-9 users.

Over the years, OS-9 and the Color Computer have both changed substantially. Many would say that it is about time some *real* applications for OS-9 showed up. (Actually, as we will discover, the applications have been there all along; it is more a problem of who knew about them than a lack of software). Many say at last we have some programs running under OS-9 that make sense and are relatively easy to use. But there are those who disagree, maintaining that OS-9 is still too rigorous and complicated, and that it is designed for the programmer, not the average user.

Are they right? What makes OS-9 the most talked-about operating system in the Color Computer Community? What do you need to run OS-9? In addition to answering those questions, I'll provide you an extensive look at applications.

Down to Basics

OS-9 stands for Operating System 9. It is an operating system, not a language. The best way to conceptualize this is that an operating system gives the computer its personality — and its arms, legs, eyes, ears and brain, if you will. It literally tells the computer what it is, and then connects it to the outside world, which means you, the user, and any peripheral equipment, like printers and disk drives. If you could break open an operating system to see what makes it tick, you would see hundreds of short little programs, all designed to make the computer store and retrieve information, organize and sort files, even manage the system memory.

Without some kind of operating system under which the applications run, the computer is nothing but bits of electronic circuits, metal and plastic. This is where words you might have come across, like Kernel, `IOMAN`, `RBFMAN`, `Pipeman`, tees and daughter processes, come into play. These are just a few of the different elements that make up an operating system like OS-9. Someone out there is undoubtably saying, "But you can program in OS-9. Doesn't that mean it's a language?"

The answer to that question is no. OS-9 contains certain commands and utilities that basically serve to let the user communicate information within different areas of the operating system (through a program called the *shell*). Programming also refers to the operating system's command language. You can program or instruct the operating system to perform tasks for you by "talking" to it in its command language.

The Art of Mastering OS-9

Mastering any new language, operating system, sport or musical instrument all have something in common. They require study, research, an investment of time for learning, practice, patience and, above all, the drive to succeed. OS-9 is no exception.

One reason why OS-9 is so powerful is its ability to do several tasks simultaneously. This is called *multitasking*. In the world of computers as a whole, this is not so fantastic, but for all the CoCo users, this is quite amazing. OS-9 picks up where the computer itself leaves off, and not only gives him or her an ability to do several tasks simultaneously or concurrently, it also gives the user the ability to run several different computers (or terminals) simultaneously. To some people this may not seem so important, but for someone who needs to do several tasks in rapid succession or at the same time it is extremely important. The user who needs to print a document while editing another or working on a spreadsheet is a good example. On the CoCo 3, pressing the SHIFT and BREAK or CTRL-C keys simultaneously moves a task or procedure into the background, allowing the user to continue with another program or job.

Another reason why the operating system is called powerful is its ability to direct, redirect and accept files and keyboard input and output data generated by the computer to any device the operating system recognizes (actually, several at once), to derive

computer-generated data, and use it for input in another program. This is called a *Unified I/O Theory*. It's a mouthful, but try and imagine a CoCo as an octopus, with each arm being a printer, modem, keyboard or screen, hard drive, RAM disk, etc. The CoCo interacts with these devices simultaneously.

Now consider the CoCo running RS-DOS and its own BASIC language. How many things can you do at once? Can RS-DOS filter a file to have it completely changed before being printed or stored on disk? Can it open eight windows at once? Not likely. If it can, it cannot perform the myriad of multiprogramming tasks OS-9 can. (Few MS-DOS users have reason to be programming in DOS. MS-DOS, by the way, is just another Disk Operating System, with a slightly different orientation than OS-9, but is remarkably similar in some respects.)

Actually, you need to know very little about OS-9 to use it extensively. Let's take a look at some of the differences in OS-9 and what they mean to you, the user.

Years ago, when Radio Shack introduced OS-9 for the CoCo, there was only Level I OS-9, because most of the software development computers and business computers had only 64K of memory (RAM) available. New releases of OS-9 were created by Microware as computer technology progressed. Not long after OS-9 Level I was in its heyday for the CoCo, Level II was introduced, but not for the CoCo. That would come later. Along these lines, Microware was busy developing OS-9 and, in a joint venture with Motorola Corporation, BASIC09. Soon to come would be OS-9/68K (OSK) for the Motorola 68000-based computer systems then being developed. Also, Professional OS-9 for software developers and Industrial OS-9 for industry were being introduced. Industrial OS-9 was being used especially for industrial robotics control.

There are a lot of OS-9 computers out there! Many manufacturers make custom machines with 6809 CPUs like the CoCo has, or even 68008, 68020 or 68010 chips, for more power and speed. Hitachi Corporation even makes a chip called the 6309, which works like the 6809, only about five times as fast. Along with these powerful computers are hundreds of hardware products, from memory expansion to controllers for robots, to Input/Output ports, and more.

To complicate matters, there are single-board computers, like the CoCo, with one main board, or "motherboard," as it is called. There are also computers like the MS-DOS machines, which are "bus" type, and operate in part with the attachment of cards (circuit boards with specific functions) onto this bus. *Bus* stands for information flow into and out of the CPU and main memory (RAM). This means that you can attach an OS-9 card to a bus-type computer and have a machine fully capable of running OS-9.

OS-9 is now running on many well-known computer brands, in addition to the Color Computer. It is running on the Atari ST series, Apple, Amiga and IBM-compatible (such as the Tandy 1000 series) computers. Digital Equipment Corporation even manufactures OS-9 boards for their huge VAX computers in Japan.

The Microware *OS-9 Sourcebook*

Microware Systems Corporation, the developer and licenser of OS-9, publishes a book each year called *The OS-9 Sourcebook* (available free from Microware Systems Corporation, 1900 N.W. 114th Street, Des Moines, Iowa 50322).

While the book should be a complete source of information on all OS-9 products, there is a shocking lack of information about some very major suppliers of OS-9 products. Among the absentees is Tandy Corporation. Not a single piece of hardware or software from Tandy for OS-9 is listed, nor is Apple, Atari or other computer manufacturers. It does list a huge volume of hardware and software suppliers, by company name, by category of product, and by type of software. There are even cross-referenced indexes to help you easily find the product and merchant you want.

Readers can find out about most Color

THE CAST OF CHARACTERS FOUND IN OS-9:

The Kernel: The law when it comes to how things are done in OS-9. It handles input, output, memory management—all the basic decisions needed to keep an operating system operating.

`IOMAN`: The Input/Output manager. It is responsible for traffic control, handling all the requests for input and output from devices like disk drives.

`Clock`: Gives you the time of day, and handles all interupts from the 60-cycle powerline to make it seem like many things are happening at once.

`RBF`**(man)**: Manages all random files and directory information on any device that stores information in blocks of data.

`SCF`**(man)**: Managing information sent, one character at a time.

`Pipeman` and `the Piper`: Handles another type of traffic control: that which runs between processes running under OS-9. Uses the piper to transfer information and handle all communications up and down the pipeline.

`Shell`: Listens to all the commands given at the keyboard, then "tells" them to the Kernel in its own language.

`Printer`: You guessed it, all it ever does is type.

`/p`: Describes the printer.

`/d0,/d1`: Two disk drives, the first and second in that order.

`/h0`: A hard drive, very fast and retentive when it comes to lots of information.

`/r0`: The only one faster than the hard drive, though not as capacious, is RAM Drive 0. Of course, it has trouble retaining information. Every time you turn the computer on, it's forgotten what it "knew" the last time you were there.

ACIA: This is the semaphore manager to the outside world, Asynchronous Communications Interface Adapter is the full name, but is most often called ACIA or RS-232.

PIA: Stands for Parallel Interface Adapter. This manager is responsible for running the two-way streets in and out of the computer at the same time, like a parallel printer.

`CCDISK`, `CC3DISK`: These make sure that the disk drives are orderly.

`CCIO`, `CC3IO`, : These mind the hardware store inside the computer, making sure the keyboard and screen are working cooperatively with the SCF Manager.

`/m1`, `/m2`: Modems.

`/term`: You, the user at the console.

`/t1` **to**`/t3`: Three other termninals (not you) connected through a CIA.

RS-232: If this is not there to speak to the SCF Manager on behalf of the terminals, nobody gets their MOTDs.

MOTD: Message Of The Day: What you see when you log onto an OS-9 Computer system from a remote terminal. Also, a newsletter published by the OS-9 Users Group.

Window Writer

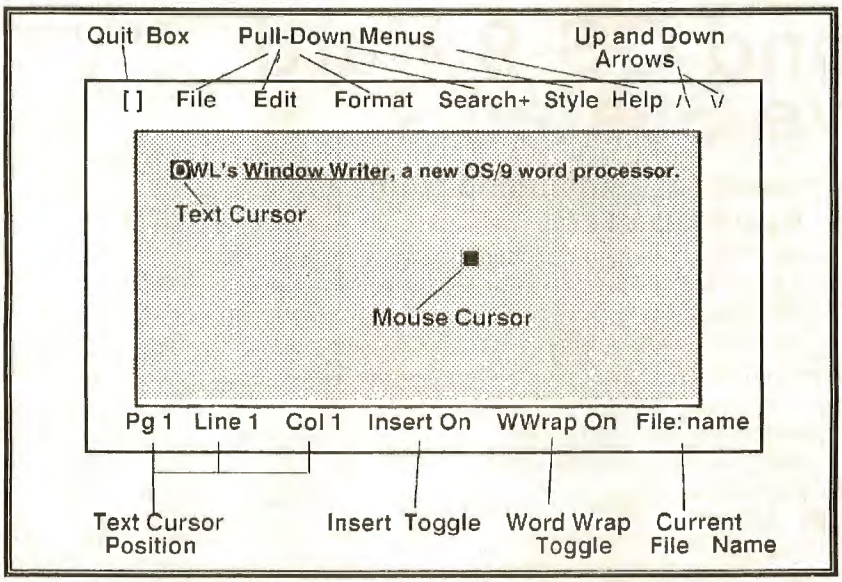
We believe this is the best word processor available for OS/9, and possibly the most advanced Color Computer word processor ever. A fully modern word processor in every way!

WINDOW WRITER NOW AVAILABLE WITH SPELLING CHECKER!

More Versatile and Powerful. OS/9 Allows you Freedom and Power. The mouse and pull-down menus give you speed and ease of use.

Multi-Tasks

Window Writer is the first Color Computer word processor which takes full advantage of OS/9. The result is a word processor which is fully as modern and professional in action as those previously available only for the IBM and Mac. The operating system allows true multi-tasking with other programs or itself. Not limited to just printing one file and editing another. You can print one file in one window while you edit files in other windows. At the same time you can be running a small program in another window. You can cut and paste between sections of files in different windows.



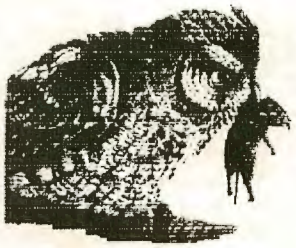
Pull Down Menus and Help Screens

A full selection of pull down menus and detailed help screens make learning easy and are only a key stroke (or mouse click) away. All menus and help screens can be user configured for everything including menu colors and contents. You don't like the color of a menu? You think one menu item should be listed differently? Change them!

The menus and help screens can be reached by cursor keys or the mouse (or joystick) or can be accessed by control keys.

Hi-Res Display

Window Writer uses an **80-column monitor display** screen for clarity. As shown in the above screen drawing, you can quickly see how to access the menus and help screens. You can determine the current position by page, line number, and column. The mouse can use this section to quickly change to a specific page or line in the file. The text insert and word wrap toggles also are indicated and changeable with the mouse button.



OWL's Efficient Mouse Useage (Makes editing a snap!)

Ram Disk

A RAM disk is set up in **Window Writer** to make full use of all or a user specified portion of the memory on the 512K CoCo 3. On the 128K CoCo a smaller RAM disk is set up to still allow use of all available memory for file editing. For use of all features, a 512K machine is required.

The RAM disk is used for storage of the file(s) being edited, for the clipboard for cut and paste, and as a print spooler for the file being printed. **Window Writer's** clipboard can be saved to disk or pasted into any file being edited because files use the same clipboard memory. The RAM disk also can be used with other OS/9 programs.

Mail-Merge

With **Window Writer** you can create form letters and send them out to a list of addresses in an address file. First names or other information can be added to "personalize" these letters.

Editing

Like most modern word processors, with **Window Writer** there is always more than one way to access any editing feature. You can access editing by menus using mouse, "keyboard mouse", or through control keys. Full help screens are quickly available for all editing features. A help screen can be left visible while needed and then quickly removed to get back to full screen editing.

One nice feature is the price:

only $59.

For the DynaSpell Spelling Checker by Dale Puckett:

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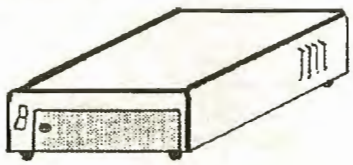
We have now been supplying CoCo hard drive systems and parts for more than 3 years. This is the longest history in the CoCo market of any system. Some other advertisers are stating that they have one of the most reliable systems for the CoCo *with all of 4 months history in the CoCo hard drive market*! We have reached our position in the hard drive market by providing our customers with a quality product that they (and we) can be proud to own and use.

Because of many requests for a lower price system in kit form, we are now selling a kit of all parts at a significant discount compared to our regular prices. We recommend this kit (or any kits offered by any other supplier) only to those who have experience in electronic assembly and OS-9.

We have **LR Tech** and **Burke & Burke**

For OS-9 Levels 1 and 2



10 Meg.	20 Meg.	40 Meg.	80 Meg. (2 X 40 Meg.)
System Prices: (Includes Hard Drive, Controller, LR Tech Interface, Software. Fully assembled and tested.)			
$469.	**$599.**	**$725.**	**$1,069.**
Kit Prices: (LR Tech System as above but not assembled or tested.)			
$419.	**$549.**	**$659.**	**$ 999.**
Kit Prices: (As above but using Burke & Burke bus adapter)			
(na)	**$489.**	**$609.** (lower prices)	
30 Meg Kit:	**$539.** (Lowest prices anywhere)		

OWL Hard Drive BASIC 3

There have been several ads in this magazine about BASIC for Color Computer hard drive systems. These ads sometimes only tell a part of the story. Our BASIC system price includes **assembly, testing,** and **3-day burn-in** period. We do not require a Multi-pak to operate.

Our hard drive systems are fast, reliable, and reasonable in price. This has been proven by hundreds of users over the past 3 years. We do not have to turn off error checking for speed. We achieve high speed BASIC from a unique indexing method.

The table below will summarize some of the key points about our BASIC hard drive system and the B&B system. We believe that we have the best BASIC interface for CoCo hard drives available.

BASIC Hard Drive Systems*

Feature	OWL	B&B
Drive Portion Available at One Time	Entire	Partial (4 sections)
User Sets BASIC/OS-9 Partitions	YES	Yes
Add to Existing OS-9 Drive Without Reformat	YES	No(?)
Drives 0-3 Hard/Floppy	YES	No
Built in Park	YES	No
Speed*	FAST	Fast

*All feature details are believed to be true at time of writing and are subject to change. We believe that our BASIC hard drives are the fastest due to our indexing method, but both systems are fast and we sell both. On ours all BASIC commands work including DSKINI, DSKI$, and DSKO$.

Prices: With/Without Hard Drive

$35./$79.

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the Color Computer Frontier

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The Highest Quality for Years of Service

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Drive 0 systems complete with drive, controller, legal DOS, cable, case, power supply, and manual

Drive 1 Systems (Half Height, Double Sided, Direct Drives) **$129.** (Same but Single sided) **$115.**

New 3.5", 720K Drives for OS-9 with case & Power Supply **$179.**

Drive 1 Systems have drive, case, power supply. (You may require optional cable and/or DOS chip to use)

Special for 0/1 Combos (Drives 0,1,2,3) $295.

HALF- HEIGHT DRIVE UPGRADES FOR RS HORIZONTAL CASES

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Computer OS-9 products by reading THE RAINBOW each month. *The OS-9 Sourcebook* is an excellent reference for those looking for computer boards, equipment and software not found in THE RAINBOW.

Table 1 shows a listing of a small sampling of hardware and software vendors from the Microware *OS-9 Sourcebook*. These vendors have something in common in that they all provide hardware or software for OS-9 that runs on a 6809 chip, which means it can likely be made to run on or work with a CoCo, if it is not actually being manufactured for the CoCo.

The CoCo 3 and OS-9

Why all this fuss about OS-9 Level II? Isn't Level I good enough? Sad to say, for all those users who invested in OS-9 Level I, this is not the case! OS-9 Level II is like a Jaguar compared to a Volkswagen when it comes to operating systems. And why not? The CoCo 3 far surpasses its tried-and-true predecessors in memory, graphics, speed and functionality. While it is true that the newer machine is downwardly compatible, meaning that it can still run most software that was made for the original old battleship-gray CoCos, shouldn't we be asking why we would want to run software that is seven or eight years old?

This is also the case with OS-9 Level II. Why use Level I when Level II is so much more advanced, and so inexpensive to obtain? Of course there are always exceptions to the rule. If you are interested in OS-9 only on an occasional basis, if you have no serious need for Level II, if you are content and familiar with Level I, and it is running your applications fine, then why upgrade? As with all things, the difference depends on the needs of the individual user in each and every case. OS-9 Level II requires the capabilities of a CoCo 3. If you do not need or want a CoCo 3, then you may not need Level II. OS-9 Level II requires 64K just to hold the operating system.

Imagine, one window with a high-resolution screen requires 32K. You are fast running out of memory on a 128K CoCo 3 already. If you are a serious user, you will need 512K RAM. Some of the beauty and magic (and power) of OS-9 Level II on the CoCo is that with *Multi-Vue*, or just running several different windows, you can be using the equivalent of seven different computers, simultaneously, with the press of the CLEAR key. Each window is active or interactive with the others as you choose, and the effect can be like seven different computers — or like one ultra-sophisticated computer, if you choose. This is far beyond the capabilities of the CoCo 1 or 2. Multiple disk drives, hard drives, RAM disks, terminals and modems with double the horsepower from the CPU, can all run off a single CoCo. And when you have finished upgrading to 512K, if you are a serious user, a hard drive *is* in your future.

Naturally, if you get used to an analog RGB or CM-8 monitor — even for a short period of time — it is almost impossible to go back to a TV or a composite monitor. I do not recommend even trying one unless you want to get very serious about buying one. Of course, with the CoCo 3 you can use them both at once, with no adapter required. And if you miss your trusty TV set, plug that in too.

What You Need to Know to Run OS-9

Everyday in America, millions of people go to work, turn on their computers, and begin their productive days. Some are more productive than others, that's true, but the point here is that all those millions of secretaries, receptionists, switchboard operators, keypunch operators, dentists, clergymen and steel workers are not engineers or programmers either, and neither do you have to be.

Whether it is MS-DOS, OS-9, UNIX, XENIX or OS/400, it is an operating system, it has to be loaded into a computer's main memory, and then an application has to run under it. Most people turn on the computer, are greeted by a menu, or go straight into word processing, electronic mail, or accounts receivable, which they have learned how to activate and operate. Mostly, they know the names of their disk drives, and how to format a floppy disk, and some basic commands in DOS or in their applications.

You who have struggled with dirty connectors and Multi-Paks suddenly parting from the computer while it's running; You who have browsed RAINBOWfests, stood up for CoCo at Commodore 64 meetings, tackled desktop publishing, spreadsheets and DELPHI; can't you spend a few hours learning that Drive 0 is now called `/d0`? Of course you can!

Now, at last, in the past year, we see examples and samples, tutorials, the *Start OS-9* program and tutorial, *The OS-9 Solution*, and the excellent *Complete Rainbow Guide to OS-9 Level I* and *Complete Rainbow Guide to OS-9 Level II Volume 1: A Beginners Guide to Windows*. RAINBOW Magazine is a resource as well, and an important one.

Don't be Intimidated by OS-9

The basics to run nearly any program under OS-9 can be learned in as little as a few hours. If you want to know more, you can spend from then until you retire. But if you just want to run programs, and have some competency at more than typing in `DOS`, then a few hours should do the trick for learning about user drives and pathnames, command syntax, basic commands like `Copy` and `Format`, and the like. You couldn't learn the whole nine yards, but enough to really get rolling and be successful.

The best way to pursue this course is probably *The OS-9 Level II* manual from Tandy. The "Getting Started" section is really not bad for beginners. A little rigorous, but manageable. Failing that, *The Complete Rainbow Guide to OS-9 Level II, Volume 1: A Beginners Guide to Windows* or *Start OS-9* by Paul K. Ward (Kenneth-Leigh Enterprises) would be the next best bets. *Start OS-9* is the kind of tutorial system that has been needed in the OS-9 community for years. While this excellent system of tutorials is geared specifically for the CoCo, it should be regarded as a necessary volume in any beginning OS-9 user's text and software library. It should be parked right next to the two *Complete Rainbow Guides to OS-9*, for Level I and Level II, by Dale Puckett and Peter Dibble. Anyone who wants to, armed with these resources and *The Tandy OS-9 Level II* manual, can now be up and running, guaranteed.

There is a unique phenomenon that takes place when you start working with OS-9. After a while, once you have begun to take control of OS-9, you begin to want to know more and more. Excitement and fascination set in, and you want to get back to the CoCo to boot up OS-9 and try something new.

Tandy and OS-9

Tandy made the choice to bring OS-9 Level II to the Color Computer 3 when it announced the new CoCo in July of 1986. For those of us at the Waldorf in New York City, it was a day of excitement and stunning surprises from Tandy. One of the more exciting moments was watching a Color Computer 3 beat out a new Tandy 1000 SX for speed.

In some ways, when Microware Systems Corporation approached Tandy Corporation about OS-9 for the original CoCo and then for the CoCo 3, it was history in the making. It changed the course of OS-9 in the world forever, and OS-9, in some ways, is still shaping our world today.

Since announcing OS-9 for the CoCo, Tandy has been its staunch supporter and developer. Tandy has published many titles under OS-9, some even contracted from independent developers in the CoCo Community. Even before the CoCo 3 was announced, Tandy was throwing its considerable corporate weight into the major product releases and revisions. Among them was the announcement of *DeskMate* for the

CoCo. Remember, today's standards are quite different from those of 1986.

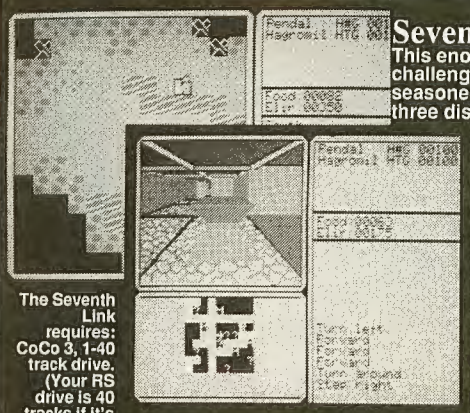
In December of 1986 came the long-awaited *DeskMate 3*, and with it, OS-9 Level II, *The OS-9 Level II Development System*, and *Multi-Vue*, the windowing environment with icons *et al* close behind. These were exciting times for the Color Computer — Tandy began to contract with major software manufacturers like Epyx, who published fabulous Lucasfilm games like *Koronis Rift*, *Rescue on Fractalus* and *Rogue*. Ah, the good old days, trying to get `gfx` linked in memory for high-resolution *Rogue* games!

It was clear, even this early on, that OS-9 Level II would fly high. Programs like *DynaStar* for the CoCo 3, *The Wiz*, *Koronis Rift* and *DeskMate 3* all made their debuts, some as quickly as the May 1987 Chicago RAINBOWfest, just a few short months after Level II's official entry into the CoCo market.

By 1988, Tandy had decided that wherever and whenever possible, new releases for the Color Computer, like *Phantomgraph*, would be released under OS-9. They see OS-9 as the future of the CoCo, and have adhered most strictly to this policy. With many manufacturers fast producing software for OS-9 Level II, it seems as though

The publications available to help the OS-9 user and programmer.

New For The CoCo 3



The Seventh Link

This enormous epic will challenge even the most seasoned adventurer. It's a three disc monster with spectacular 3D dungeons filled with creatures, ladders, flooded rooms, chests and pits. You must create a brave character, be he fighter, thief or magician, and adventure through the wilds of Elira, battling monsters and pirates, searching towns and castles, sailing uncharted waters, and braving the dim depths of the underground.

The Seventh Link requires: CoCo 3, 1-40 track drive. (Your RS drive is 40 tracks if it's not an old grey one)

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Studio Works

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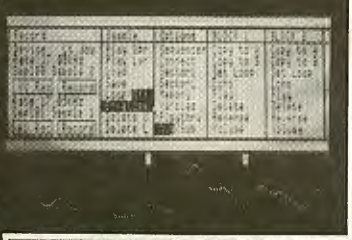
With cable:$54 US/$64 CDN
Without :$39 US/$49 CDN
Requires: 128k CoCo 3, 1 drive and a mouse or joystick.
(*512k CoCo's only)



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THE MANY FACES OF OS-9

For the CoCo user, there are really only a few choices when it comes to OS-9, and some of these choices depend on your hardware setup; that is, the type of CoCo and peripheral equipment you have. In fact, if you have a CoCo 1 or 2, and have 64K of memory, you are limited to OS-9 Level I.

There are several versions of OS-9 Level I. The most widely-known and -used by CoCoists are releases 1.00.01 and 2.00.01. (See Figure 1 below for minimum system requirements.) The differences between these versions include upgraded graphics capability, hard drive support, and some "bells and whistles" that make OS-9 Level I a little easier and more convenient to live with. In early OS-9 days, Level I was the only version available anywhere for any computer.

Level II users must have 128K of RAM to run OS-9, and as you may surmise, this is where the CoCo 3 comes in. The CoCo 3 comes with 128K RAM standard, just enough to support important elements like windows, extended graphics and the *Multi-Vue* operating environment. OS-9 Level II is really "shoe-horned" into the 128K machines, and if you are at all considering becoming a serious user, it is strongly suggested that you upgrade to 512K. While it is possible to operate OS-9 from a single disk drive, at least one more drive is strongly suggested for any real use of OS-9 — the bigger the drive the better. If you are making a hobby of OS-9, you will probably need a hard drive before you know it. See Figure 1.

	Level I	Level II
Requires 64K RAM	YES	NO[1]
Requires 128K RAM	NO	YES
Requires CoCo 3	NO	YES
Supports 7 Windows	NO	YES
Utilizes 512K	NO[2]	YES
Advanced Graphics	NO[3]	YES
Runs *Multi-Vue*	NO	YES
One Disk Drive Required	YES[8]	YES[8]
Supports Hard Disk	NO[4]	YES
Supports Double-Sided Disk	NO[4]	YES
Supports 40-Track Disks	NO[4]	YES
Supports 80-Track Drives	NO[4]	YES

	Level I	Level II
Configuration Menu	NO[4]	YES
Enhanced Command Set	NO	YES
Self-Booting With DOS Command	YES	YES
Higher Processing Speed	NO	YES
Supports 2 Modem Ports	NO[4]	YES
Prints at 9600 Baud	NO[9]	YES
Supports Multiple Hi-Res Displays	NO	YES
Easy-to-understand Manuals	NO[5]	YES[6]
Supports Analog RGB Monitors	NO	YES[7]
Supports Composite Monitors	NO[7]	YES

Footnotes:

1. OS-9 Level II requires 128K minimum to operate.

2. Hardware is available to upgrade to 512K, which might then be utilized by OS-9 in 64K blocks.

3. There is some support for advanced graphics in later versions of OS-9 Level I such as Level I version 2.00.01. This is limited by the hardware of the CoCo itself, not specifically by OS-9.

4. Software is available such as *SDisk* by D.P. Johnson and other utilities from third party vendors to support device drivers to use other than single-sided double-density 35-track drives, and other devices such as hard drives, modem packs, speech synthesizers, etc. There is some limited support for more than standard support in OS-9 Level I Version 2.00.01.

5. Most users would argue that these manuals are understandable only to a software engineer with a degree in programming. Some might disagree that the manuals are user-hostile.

6. Most users agree that the OS-9 Level II manuals, while still quite rigorous, particularly to the novice, are usable and understandable to the user, making the manuals to Level II user-understandable, not quite user-friendly.

7. Hardware limitation of CoCo 1 and 2.

8. You can run OS-9 on one disk drive, but a minimum of two is strongly suggested. More serious users will likely need a hard drive as well.

9. OS-9 Level I Version 1.00.01 prints at a maximum rate of 2400 baud. ❑

Figure 1: OS-9 Level I vs. OS-9 Level II

Tandy has ensured this place for the Color Computer. They are throwing in all their support to it, and we know the CoCo will be around for a long time to come. Of course, OS-9 users can relax and breathe easier, because long after the CoCos are gone (if they ever go), OS-9 will still be there.

A Rainbow of Colorful Applications

OS-9 is exciting, new, and on the forefront of what is to come. But what good is any of that if you can't get the computer to work for you? What is needed is the right tool for the right job, and with OS-9 you can be assured of finding exactly what you need. Word processors, spreadsheets, communications, databases and high-level languages are all there for the asking.

One of the things that makes OS-9 so powerful is its ability to use available tools. That is to say, if someone has already written a program that plays "The Star Spangled Banner," you do not have to reinvent the wheel by writing it again for incorporation into your own patriotic program. You may be able to utilize the program like taking a book out of a library.

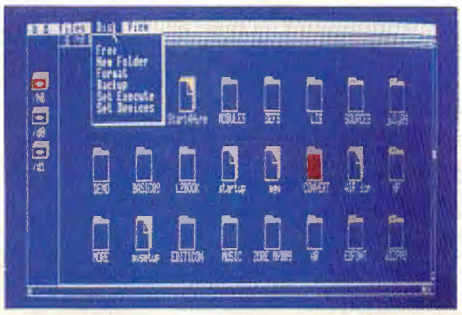
Another powerful feature of OS-9 is that within a relatively short period of time, a user can learn how to make his or her own ideas work with a minimum of programming effort. For new users, this is not as important as finding software to get the job done for you now, not when you have learned enough to do it yourself.

The following is an extensive list of software applications available to the CoCo user. The list is comprised entirely of products and companies advertised in THE RAINBOW. (Products highly recommended for new users are preceded by an asterisk.)

Tandy Corporation

OS-9 Level I and OS-9 Level II operating systems: Tandy has licensed OS-9 from the original manufacturer, Microware Systems Corporation. OS-9 runs on 6809 computers like the CoCo 1, 2 and 3, and a globe-spanning array of other computers, including the 68000 series computers.

Multi-Vue: This is an excellent windowing system designed to take advantage of the capabilities of OS-9 Level II windows and the CoCo 3. It has a major shortfall when used on a 128K system, in that you can keep only one Lo-Res window open at a time. If you are serious about *Multi-Vue* and OS-9, you must have 512K to get good use of the program. With a combination of 512K RAM and multiple drives or a hard disk, this is a great way to use the CoCo to its full potential, by running a number of different programs simultaneously in separate windows (see photo below).



OS-9 Development System: This is a series of software tools, bundled together and sold as a package called development tools from Tandy. They are neither the best, fastest, strongest, nor fullest-featured, but they can get the job done. The system includes an interactive debugger for testing programs and accessing the CoCo's memory; a screen editor (SCRED) for editing text, but this has too few formatting commands for use as a serious word processor; and a Relocating Macro Assembler (RMA), which functions as a macro assembler and linkage editor. RMA lets you write, test and then assemble separate parts of the program. Utilities include Make, which helps keep track of programs and files that need to be updated because of system changes; Touch, which updates the modification date of files; and a virtual disk or RAM disk driver for high-speed storage in RAM — just don't forget to save the information on the RAM disk before shutting off the system. Lastly, there is a set of 12 commands for OS-9 that make life a little easier when programming.

OS-9 Pascal Version 2.0: This high-level, structured computer language was originally written to provide simple solutions to complex problems, and to actually teach programming. The OS-9 version is very faithful to industry standard, and has a native source code translator that can run programs at four to five times the speed of the compiler using P-code methods. This version cannot teach you Pascal, but does include references for learning it. Pascal is not as popular as C, or some of the other languages that now make code (programs) easier to transfer and translate between computer systems of different types.

OS-9 C Compiler: This is a programmer's language. It is one of the most popular and powerful programming languages available today. It produces programs that are very easy to move to computer systems of different types. C works in terrific combination with the 6809 (CoCo) and OS-9 (like UNIX), since all three were essentially made for each other. It is not an instruction manual, but a reference manual (not for beginners).

T/S Word, *T/S Edit*, *T/S Spell*: This versatile set of three programs makes a good, solid word processing trio for everyday use. The heart of these three separately sold programs is *T/S Edit* (also available under RS-DOS), which is a screen-editor type program. Don't expect miracles from this package, but it can handle the basics well. *T/S Word* is a formatting system that works on any OS-9 text file, although it is specifically geared for *T/S Edit* files. It is a graphically-oriented program, which shows you what your printed pages will look like, and then allows you to print or edit them. It is interesting, very easy to use, and sophisticated enough for general purpose everyday use. *T/S Spell* also works with any OS-9 text file, and spell-checks it for you. *T/S Spell* has a full-featured correction capability against a 100,000-word master dictionary and a quick dictionary of more commonly used words. The combination makes for a relatively fast, effective spell checker. This program requires a little knowledge about OS-9 pathnames and command formats.

* *DeskMate*: This integrated set of programs for the CoCo 1, 2 or 3 was what all the rage was about four years ago, when it was introduced for the CoCo. It was an instant hit running under OS-9, and turned the attentions of many users towards OS-9 for the first time. *DeskMate* is versatile and easy to learn and use with a mouse and icons. It has calculator, filer, telecom, text, paint and spreadsheet programs to work with. They are all bare bones as far as programs are concerned, but can make a good introduction to OS-9, or if your needs are very simple and straightforward make for a very easy-to-use little package. Don't count on any serious text or number crunching or graphics masterpieces. It does include an excellent manual, one of the best for OS-9 applications.

* *DeskMate 3*: This is a rewrite of *DeskMate* to take advantage of the CoCo 3's upgraded capabilities.

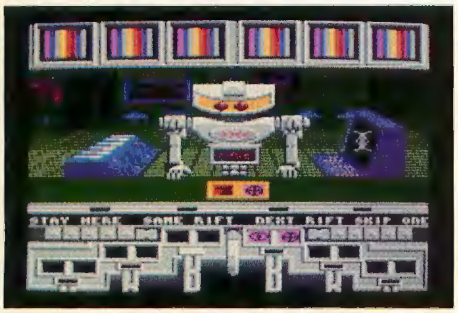
* *Phantomgraph*: This package allows the graphing of data, either input from the keyboard or from a spreadsheet file (like *DynaCalc*). It provides good graphing capabilities for the CoCo 3, and a good demonstration of OS-9.

DynaCalc: This is the be all, do all and end all of OS-9 spreadsheets. Watch out, *Lotus*

1-2-3! A comprehensive manual focuses on program use, not OS-9. Once the system is configured and set up correctly, users (familiar with spreadsheets) will have no trouble. Novices, be patient, you can learn this more rigorous program with some diligence. It is a powerful spreadsheet implementation and well worth obtaining.

OS-9 Profile: This database management system is easy to learn and use, partial thanks to a well-written manual. It is a powerful and flexible database management system for OS-9, likely to be all the database most users will ever need. Nine different types of screen design and numerous report formats make this a versatile package.

* *Biosphere*: A simulation of an ecological system in a future setting. This is actually a quite realistic, well-designed and elegant simulation, with good graphics — an excellent value.



* *Koronis Rift*, and *Rescue on Fractalus*: If you like high-powered graphics, a good challenge and fast action, these two games are for you. In *Koronis Rift* (see photo above), you are looting hulks full of futuristic weapons and tools for survival, while being shot at by nasty guardian saucers. In *Fractalus*, you are trying to rescue a downed space pilot in similar perilous situations. Both are fun arcade-style strategy games, and are excellent demonstrations of OS-9 Level II (CoCo 3) graphics. Great for beginners, who want to have fun with OS-9.

* *Rogue*: This is an implementation of an old favorite game. With OS-9 Level II graphics it is challenging and enjoyable as a combination maze/dungeon style game.

* *Tandy Home Publisher*: This low-end desktop publishing system from Tandy would actually be very good for an introduction to OS-9 and productivity. This is a fairly simple-to-learn and -use program for creating integrated text and graphics (newsletters) on a page. *THP* has a number of different graphics, fonts and styles to work with. It does, however, expect text to be generated by another editor under OS-9, although you can enter text directly into *THP*.

Note: This is a good sampling of programs available from Tandy, not a complete list of OS-9 titles available.

Frank Hogg Laboratory

Sculptor: The most powerful software system made for OS-9. It is a 4GL (Fourth Generation Language), SQL (System Query Language) and an application generator, database system and programming language, all rolled into one. Once you know it, it is extremely easy to use as a programming language, and you will be able to write programs in about one-tenth of the time you could write the same thing in C. This is a very serious development system. It is not for novices. *Sculptor* runs on a 512K CoCo 3 with floppy drives, but a hard drive is strongly recommended. On sale for $199.95 ($60 for upgrade to Version 1.16). If you want to pick a language to learn, *Sculptor* is it. Programs that run on the CoCo are directly transportable to PC or other computers (modified at runtime).

DynaStar/DynaSpell: In my opinion, *DynaStar* is the best, most serious word processor under OS-9. It is very similar to *WordStar* in command format, has pull-down menus and Help screen. A good 80-column screen (in `/w7` or whichever screen you want) is easy to install, and you can format text and use many diverse printers. Bold, double-strike and underline are all supported with *WordStar* work-alike commands. *DynaStar* ($99.95) has a mail-merge feature, 29 configurable macros, and edits files larger than memory. Now that is word processing! *DynaSpell* ($75 or $25 with *DynaStar* purchase) is a spellchecker for *DynaStar* or any text under OS-9. It has a 20,000-word dictionary, which is surprisingly small, but is generally considered the best spelling checker for the CoCo 3 running OS-9. Written by Dale Puckett.

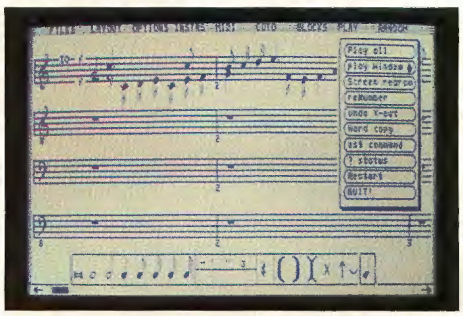
The Wiz: Unquestionably one of the finest OS-9 terminal programs available. Bill Brady, the program's author (and editor of *MOTD*), is a programming ace when it comes to OS-9. This program, although difficult to install for the novice, is most rewarding in its operation. Windows for dialog, system messages, conference mode, up/downloads, shell commands—*The Wiz* has it all. For the CoCo 3 only. $59.95, including free *WizPro* disk.

Inside OS-9 Level II: This authoritative and comprehensive look inside OS-9 Level II for the CoCo, by Kevin Darling, is not for the novice. This 200 plus-page book ($19.95), published by FHL, is only for those interested in the bits and bytes and memory registers that actually comprise OS-9 Level II, and how they work to make the operating system function.

Second City Software

* *Check-09 MV Version 2.0*: This handy, easy-to-use, versatile program runs under *Multi-Vue* to balance your checkbook. It works well, is easy to install, and even includes an editor now to enable adjustments to be made after the fact when needed. It even includes ATM transactions for your records. This is the first program I have seen under OS-9 that actually makes doing financial work fun ($25.95).

* *The OS-9 Solution*: This easy-to-install and -run program replaces 20 of the most commonly used commands under OS-9 Level I or II. A menu format allows you to type only the first letter of a command, and a file stack pointer on the screen points to the file that the command will act upon. Other commands check free disk space, format disks, etc. This is a great program for novices because it allows them to interact directly with the shell by providing Help screens and good documentation. *The Solution* works under both OS-9 Level I and Level II, however, in its current release, some aspects of *The Solution* do not work under Level II ($24.95).



* *Ultimuse III* (see photo above): This program is one of the best examples I've seen of what OS-9 Level II can really do. The program is designed to edit and play music scores through a MIDI keyboard synthesizer. It is the *only* example of a program of this type running under OS-9 that I have seen. *Ultimuse III* uses windows and a mouse for control. There is careful, thorough documentation, and even a tutorial for the novice user to install the program quickly and easily. The documentation carefully explains all terms, and shows

how they might be used. The tutorial is excellent, because it takes you from the "in the package" stage to the "up and running" stage, quickly and easily. If you follow the directions, you can't miss. The music quality is exceptional, and the editing feature provides a means to access all the elements from vocal to violin, and tells the user how to use them to make wonderful music. This is a must for music lovers!

Alpha Software Technologies

* *Presto Partner*: This new release is a RAM-resident alarm, calendar, phone dialer and notepad. It operates in the background until you call it, and is relatively well-mannered with other OS-9 programs. When the alarm sounds, the screen on the CoCo turns red and starts flashing, and a low but aggravating beeping sound occurs, until you invoke *Presto Partner* with the CLEAR and ALT keys. A quicker way to shut off the alarm would be nice. ($29.95) Requires 512K and Level II. Can be installed to *Multi-Vue*, but no instructions are included.

* *The Zapper*: This program is easy to install and run, but unfortunately, is better at displaying files a sector at a time than recovering lost files. Its recovery system is a sector-by-sector viewing of a file, and recovering if possible, that depends on the user's eyesight, more than anything else. A file can also be saved by viewing a piece of it with the Find option, and then backing up to the file header to begin saving it. This can get rather tedious, as you can imagine. Still, a good package, and worth the money. For Level I or II ($19.95).

* *Warp One*: An easy-to-install and -use terminal system for OS-9 Level II and the 512K CoCo, this neat little communications program gives you some sophisticated features like X- and Y-modem file transfer, as well as capture, autodial, chat mode, online timer and macros that you can edit and send just by pressing the F2 key. Good for all your telecommunications needs. Not as sophisticated as *The Wiz*, but still quite good.

* *Multi-Menu*: A menuing system for OS-9 Level II that lets you design and edit your own menus. There are submenus, and this is a pull-down type menu system, which will run any command put into it. A must for the beginner. Easily installed in *Multi-Vue*, *Multi-Menu* is accessed by clicking on the menu icon from the *Multi-Vue* screen ($19.95).

* *Disk Manager Tree*: Another excellent tool for the beginning OS-9er. It simplifies creating, deleting and changing directories and files, and presents them with a graphical display (like a tree). The program is easy to install, and there are installation instructions for *Multi-Vue*. One thing I did notice is that if you get ahead of yourself using "Type Ahead," it could be possible to start deleting a directory in its entirety by pressing the D and Y key combination. Another failsafe should be put in to prevent this ($29.95).

OS-9 Level II BBS: This software, now in its third release as Version 3.0, is becoming a very sophisticated BBS system. The software is actually groups of OS-9 commands put together in such a way as to create a powerful BBS system with conferencing modes, up and download utilities, support for ASCII capture and for X- and Y-modem transfer, and more. It has clearly been modeled in some ways after DELPHI and the authors have done a good job simulating a DELPHI-like environment under OS-9. This is a real high-performance board

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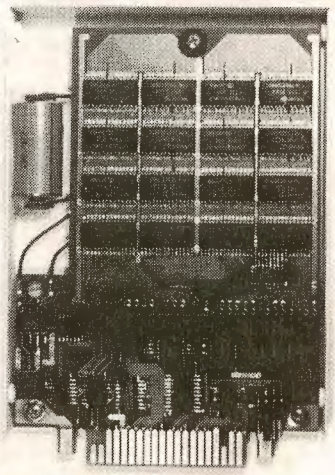

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Table 1: Vendors from Microware's *OS-9 Sourcebook*

Did you think OS-9 was only for the CoCo, and only available here at home? Well, think again.

It is also not just the software of which we speak. OS-9 runs on myriads of computer systems, and has numerous versions. There is OS-9 Level I, II, OS-9/68000, OS-9 Professional, and OS-9 Industrial.

All of the manufacturers listed under "Hardware" build OS-9 systems that run exclusively OS-9! Apple computers, the Atari ST series, even Tandy MS-DOS computers, and any other compatibles can run OS-9 as well, with the installation of a 6809 or 68000 processor board. Some computers are designed to run OS-9 and MS-DOS plugs into them, not vice-versa. (For information on the difference between OS-9 Level II and OS-9 Level I see Figure 1.)

Software vendors:

Clearbrook Software Group, Inc.
Box 8000, Suite 499
Sumas, Washington 98295
604-853-9118
Erina, Serina, for system mode debugging, *MSF* (MS-DOS File Transfer) and many other titles for productivity and software development.

Computer Systems Center
36 Four Seasons Center #332
Chesterfield, MI 63017
314-576-5020
DynaCalc for OS-9, an excellent, powerful and versatile spreadsheet program.

Computer Systems Consultants
1454 Latta Lane N.W.
Conyers, GA 30207
404-483-4570
Super Sleuth, Cmodem, cross assemblers and debugging simulators for applications, development and productivity.

Trend Computer Systems
828-A Dodsworth
Covina, CA 91724
818-331-4114
CNC: machine shop estimating software.

Specialty Electronics
909 North Cleveland
Enid, OK 73703
405-233-1632
Accounts Payable, Accounts Receivable, books.

Southeast Media Div C. P. I.
5900 Cassandra Smith Rd.
Hixson, TN 37343
615-842-4600
Stylograph/Merge/Spell, Sculptor 4GL, Solve, Virtual Terminal, high-level programming languages and more for OS-9.

Plus Five Computer Services
765 Westwood Drive
St. Louis, MO 63105
314-725-9492
MUMPS, a character string manipulation language.

Windrush Micro Systems, Ltd.
Worstead Labs
North Walsham, Norfolk NR28 9SA
England
0692-404086
Screen Editor III (screen/text editor) and many other applications.

LLoyd I/O
P.O. Box 30945
Portland, OR 97230
800-227-3719
CRASMB, CRASMB 16.32 (mnemonic addressing and mode handling) for software development.

Gimpel Software
3207 Hogarth Lane
Collegeville, PA 19426
215-584-4261
Generic *Lint* (diagnostic facility for the C language) and other programming tools.

H. C. Anderson Computer, A/S
Englandsvej 380
DK-2770 Kastrup
Denmark
451-524-404
Cad Finance One (G/L, budgeting, P&L's, etc.).

Hardware Vendors:

AAA Chicago Computer Center
120 Chestnut lane
Wheeling, IL 60090
312-459-0450
Elektra-series computers.

Compcontrol B.V.
Stratumsedijk 31
Postbus /P.O. Box 193
5600 AD Eindhoven, Holland
31-40-124955
CCS systems and CC board level CPU, storage, comm hardware.

Data Comp Division C.P.I.
5900 Cassandra Smith Rd.
Hixson, TN 37343
615-842-4600
Mustang 68K computers.

DEC
8-2-52 Nankohigashi
Suminoe-KU, Osaka 559
Japan
0723-37-1101
SP-series computer for software development and VME (Versa Module European) CPU boards.

EKF Elektronik GmbH
Weidekamp Str. 1A
D-4700 Hamm 1
West Germany
02381-12630
68K computers and board level programming-oriented products.

Fairlight Instruments
15-19 Boundary Street
Rushcutters Bay, N.S.W 2011
Australia
(02) 331 6333
Fairlight Series II CMI for audio and music production.

GESPAC SA
3, Chemin des Aulx
1228 Plan-Les-Ouates, Geneva
Switzerland
(22) 713 400
Gescomp software development system and board level CPUs, I/O boards, communications ports, and more.

H. C. Andersen Computer A/S
Englandsvej 380
DK-2770 Kastrup
Denmark
45 1 52 44 04
Dragon 200 OS-9 Level I system.

Matrix
1203 New Hope Road
Raleigh, N C 27610
(919) 833-2000
6809 and 68000 software development systems and numerous board level products.

M.I.I.
Les 3 Fontaines
B. P. 110
95110 Cergy Pontoise, France
30 735225
MS-series systems and GMI-series board level products.

PEP Modular Computers GmbH
Am Klosterwald 4, 8950 Kaufbeuren
West Germany
08341-81001
68K systems and board level products.

Robcon OY
P.O. Box 46
SF-02771 Espoo
Finland
(3580) 85911
Board level 68K CPU and I/O products.

Syntel Microsystems
Queens Mill Road
Huddersfield HD1 3PG
England
0484 535101
HS6000 Computers, board level systems and controllers.

Windrush Micro Systems
Worstead Labs
North Walsham, Norfolk NR28 9SA
England
0692-404086
Omega computer systems and numerous board level products.

XYZ Electronics Inc.
RR 12 Box 322
Indianapolis, Indiana 46236
(317) 335-2128
System 7 Computer for software development, numerous board levels.

with security levels and enough utilities to make anyone serious about a BBS take notice. Some of its elegance comes from the ability to split users into different levels of access. It stays true to OS-9 formats. Requires 512K and OS-9 Level II. Includes comprehensive installation instructions. Not for the novice user ($29.95).

Microtech Consultants, Inc.

XWord ($69.95), *XMerge* ($24.95), *XSpell* ($39.95): Three programs for a formidable word processing trio. They are designed to work with and complement one another, and they accomplish this reasonably well. *XWord* is the core of the text-editing system. This full screen editor is not set up like *DynaStar*, but does have its own online help. Combined with *XMerge* and *XSpell*, it makes a fairly complete package. The spellchecker, at 40,000 words, is twice the size of the *DynaSpell* checker. However, it does not automatically replace a misspelled word. It is up to the user to correct the misspelling with his own attempt at the correct word. This series of programs highlights the capability of OS-9 to filter files. Not recommended for the novice.

D. P. Johnson

D. P. Johnson Company has long been a supporter of OS-9 on the CoCo. Johnson was first bringing out OS-9 to MS-DOS file transfer utilities five years ago, before anyone else. Now the company has grown some, but D.P. Johnson keeps producing the same kind of reasonably priced, high-quality software.

SDisk3 : Designed to replace the CC3DISK module in the OS-9 Boot file. This utility package is designed basically to let you set up your drives for your system the way you want them set up. Several utility programs on the market from other companies require that *SDisk3* drivers be present in memory to operate. An automated procedure also helps create a bootable disk with the new device descriptors, and several other utilities are included on the disk. A must for even the casual user. Can be used by a novice, but rigorous. For Level II only.

SDisk and *Bootfix*: Same basic idea, but for making bootable 40- and 80-track disks under Level I OS-9 (*SDisk* $29.95, *SDisk* and *Bootfix* $35.95, *SDisk3* $29.95).

* *MSF* (MS-DOS file transfer): This program requires *SDisk3* to operate. Central commands are for copying, renaming, directory, remove directory and attributes. This is a complete, easy-to-install and -run MS-DOS file transfer manager ($45).

* *PC-XFER* (MS-DOS file transfer): This program requires *SDisk3* to operate. Central commands are for copying, renaming, directory, remove directory and attributes. This is a complete, easy-to-install and -run MS-DOS file transfer manager ($45).

FORTH09: This is a powerful implementation of FORTH for OS-9. One of the most powerful features of this high-level language is that any programs or modules written in FORTH do not have to be compiled. They can be saved as executable machine language modules. This version, by D.P. Johnson, tries to stay as close as possible to the FORTH-83 standard, and pretty much does, although there are some differences in words (object names). This is largely due to the split functionality of OS-9, where data and mapping is done separately. Nevertheless, Dan Johnson has stuck very close to the standard without limiting and restricting OS-9, and this makes an excellent implementation of FORTH under OS-9 ($150).

Magus Systems Engineering

4Most: This is a package of four utility programs for OS-9. They are powerful invocations of OS-9 to be sure, and will run both on Level I and Level II machines. With Level II, the Shell command that replaces the standard shell will not load in all its supplemental programs to memory. It also takes up a little more space, so with 128K machines, getting everything you want in there will be tight. 512K users, relax. The new shell gives use of wildcard characters (*'s and ?'s), and has parameter passing. CP is a utility that makes it easier to copy multiple files, sort them and will copy by time. MV makes it easy to move files around, and Print gives paginated, formatted print to the printer ($24.95). Could be used by an advanced beginner.

Sugar Software

* *OS-9 Calligrapher* for Level I or II: This program serves as a filter to generate the most fantastic and varied fonts you can imagine. Either from keyboard input, or with a file generated by any OS-9 word processor or text editor, *OS-9 Calligrapher* makes beautiful calligraphy out of your words. It will even do labels, and most anything else you can throw at it. It costs only $24.95, and has dozens of fonts that can be bought for it inexpensively (25 to 30 fonts at $29.95 per disk; specials available). This is easy to load on any OS-9 machine, and easy to run as well. *The OS-9 Font Massager* ($19.95) is about as easy to run. It allows you to modify your fonts in

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any way you choose, and can even completely generate new fonts. It will do graphics as well, since the graphics are bit mapped, and that means you can draw an icon, font, or virtually anything you want. These two offerings from Sugar Software make working with OS-9 enjoyble and rewarding.

Granite Computer Systems

* *GCS File Transfer Utilities*: These utilities require the D. P. Johnson *SDisk3* driver to operate. You can get the *FTU* package under *Multi-Vue* ($54.95) or standard for ($44.95). Novices should get the *Multi-Vue* version. It is relatively easy to load and run. This is a comprehensive file-transfer system for transfers between Flex, OS-9, MS-DOS and RS-DOS. This is the only package available that will handle all those formats and transfers and handle them in *Multi-Vue*. If you are just starting out in MS-DOS or in OS-9 and have files to transfer between operating systems, or if you are an experienced user with file transfer requirements, *GCS FTU* is without a doubt the way to go.

Burke & Burke

* *R.S.B.*: This could be the ultimate bridge to get all you RS-DOS potatoes into OS-9 without hurting you unduly. This is an amazing implementation of Radio Shack BASIC under the auspices of the power of OS-9 Level II. If you know BASIC, you have very little to do besides boot up and run programs. You will learn more about OS-9 as you go, somewhat serendipitously, due to the change some commands go through to make allowances for the operating system. Transferring back and forth is easy and straightforward as you "OS-9ify" your disks for the transfer. You are guided step-by-step through the installation and setup process, so there is little chance of failure. One caution: This will not teach you BASIC. You must learn through the books that come with the computer, or from THE RAINBOW. *R.S.B.* comes with an instructional manual for the software, not the language.

* *PertASCII*: This scrabble-like game under OS-9 would make a terrific ice-breaker for those wishing to get into OS-9 relatively painlessly and still have fun. This multi-user word game can be played with others on your system, users calling you on a modem, or solitaire against the computer (very difficult to beat). You are given a three-minute round to make words from random letters. There is a 15,000-word dictionary that the computer uses to score with as well. Players may join or leave at the beginning of a round. Warning: If you thought *Boggle* was bad, this one is more addictive! Requires 512K and OS-9 Level II ($19.95).

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Kenneth-Leigh Enterprises

*** *Start OS-9*: This is the book and disk tutorial we have all been waiting for. Paul K. Ward, OS-9 consultant and programmer, has written a tremendous tutorial and disk companion that not only helps people learn about OS-9, but also gives them some real applications and windows to work with. In a step by step, plain English style, Paul Ward leads people into the operating system they have feared most. Jargon, slang and needed vocabulary are provided throughout the 14-day, 10-tutorial book and companion disk package, and if you follow the tutorials and keep your head on straight, in two weeks you will know OS-9. Also included with this package is "Start Basic09" by Dale Puckett as an appendix to *Start OS-9*, and a number of other informative and eductional articles on hard disks, telecomputing and more. Paul Ward might just get voted CoCo Man of the Year for his contribution to the world of OS-9 and the CoCo Community ($32.95).

Falsoft, Inc.

*** *The Complete Rainbow Guide to OS-9* and *The Complete Rainbow Guide to OS-9 Level II, Volume I: A Beginners Guide to Windows*: With their companion disks, these RAINBOW-produced books are the last word in tutorial and reference for OS-9 on the CoCo. Written by Dale Puckett and Peter Dibble, these books complement and enhance any other work, and are sure to get you on the road to success with OS-9. Do not think of these books as an either/or to Paul Ward's *Start OS-9*; but a companion guide. (These books cost $19.95 each. The two-disk set for OS-9 is $31, the single disk for Level II is $19.95.)

Now What?

Now we have looked at OS-9, and I certainly hope you will take the plunge to learn more about it, because OS-9 is an important part of the future. It is being used around the world.

In Japan, especially, there is a tremendous amount of robotics controlled by OS-9. In England, they control synthesizers, and in Australia they bring OS-9 to the Amiga computer.

Here in America, OS-9 is used by Hughes, Boeing Aircraft, NASA, Honeywell and North American Rockwell. It is used in the Space Shuttle missions, and is probably in your GM car or truck somewhere, or had something to do with its manufacturing.

This may not be as far-fetched as it sounds (Hughes is a division of General Motors). Right now, Sony and North American Phillips Corporation are working on a joint venture involving a CD-I (Compact Disc-Interactive) machine with a computer bus adapter on the back of it. The heart of the system is OS-9/68K, in ROM, and you can bet when it comes out this Christmas (rumored at less than a $1,000 a piece), OS-9 will leap ahead again. And wherever OS-9 goes, CoCo goes too.

CD-I, from all predictions, will be the next great development for home entertainment, the arts and computer technology. What will Tandy do about that? They have always been innovative forerunners; might we dare guess at a 68000-based machine? All we can do is wait and see.

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RAINBOWfest is a **great opportunity** for commercial programmers **to show off new and innovative products** for **the first time. Somerset, New Jersey is the show** to get information on capabilities for the CoCo, along with a terrific selection of the latest CoCo software. In exhibit after exhibit, there will be demonstrations, opportunities to experiment with software and hardware, and special RAINBOWfest prices.

Set your own pace between visiting exhibits and attending the valuable, free seminars on all aspects of your CoCo—from improving BASIC skills to working with the sophisticated OS-9 operating system.

Many people who write for THE RAINBOW—as well as those who are written about—are there to meet you and answer questions. You'll also meet lots of other people who share your interest in the Color Computer. It's a person-to-person event and a tremendous learning experience in a fun and relaxed atmosphere.

As an additional treat for CoCo Kids of all ages, we've invited frisky feline CoCo Cat to join us for the show. RAINBOWfest has something for everyone in the family!

If you missed the fun at our last RAINBOWfest in Chicago, why don't you make plans now to join us in Somerset? For members of the family who don't share your affinity for CoCo, there are many other attractions in the Somerset area.

The Somerset Hilton — Somerset, New Jersey, offers special rates for RAINBOWfest. **The show opens Friday evening** with a session from 7 p.m. to 10 p.m. It's a daytime show Saturday — The CoCo Community Breakfast (separate ticket required) is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs until 6 p.m. On Sunday, the exhibit hall opens at 11 a.m. and closes at 3 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a reservation form so you can get a special room rate.

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COCO COMMUNITY BREAKFAST

Dale Puckett - RAINBOW Contributing Editor

Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP.

Mr. Puckett will talk about the people involved in the ongoing development of OS-9 and milestones in OS-9: Crazy things which happened in its development, mistakes, highlights and its future.

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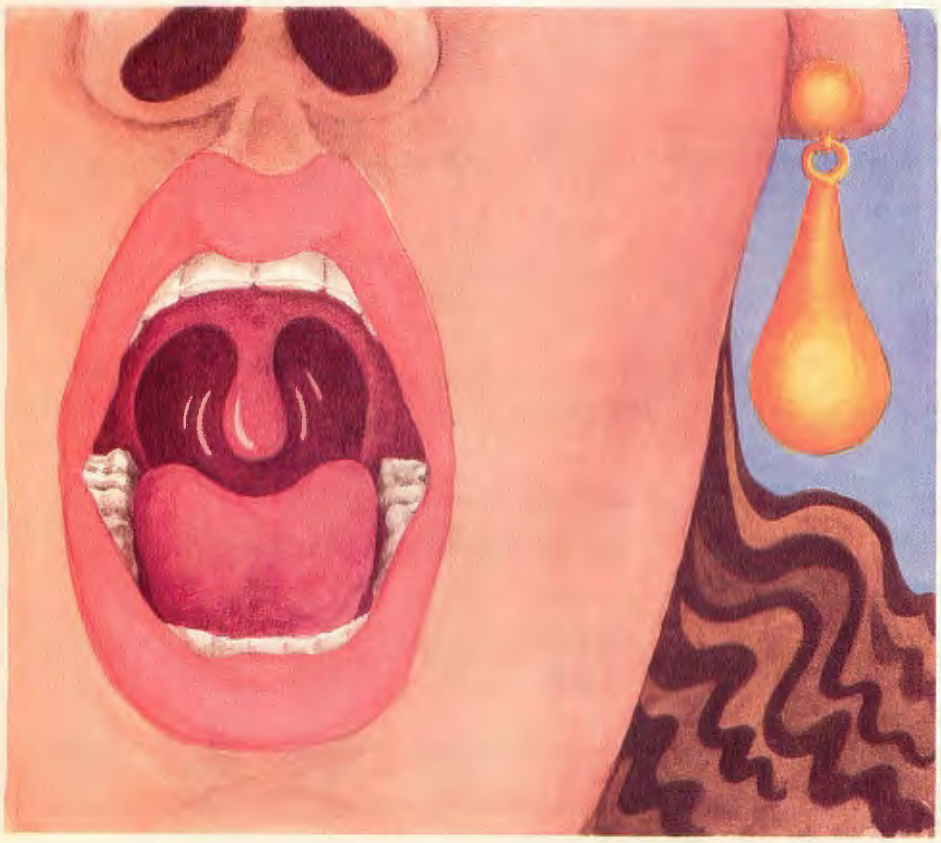
Put another nickel in . . .

The Nickelodeon

By William G. Budenholzer



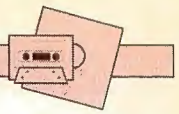
Sing along? That's what they wanted to do. So, after typing a few hundred DATA statements, the CoCo was playing some familiar tunes. A touch of CoCo's colorful low-resolution graphics offered some visual interest, but it needed more, a lot more.

It was difficult to manually compile the long lists of numbers needed for the SOUND command. It also needed words. I tried saving notes on tape and the words were put on screen to coincide with the notes, but it wasn't user-friendly. Extended Color BASIC's PLAY command was the inspiration for a song editor.

The graphics develop into a piano resembling an old upright, with space for the words, as in a player piano. A one-line routine centers the words in this space. The editor has two modes of operation, the first mode allows direct entry of the words and notes using Extended BASIC's PLAY elements. The second mode allows you to use the computer's keyboard as a one octave musical keyboard. Both modes support various editor functions such as Insert and Delete.

Overture

To more easily explain how to use the editor, first key in the program, then save and run it. When the main menu appears, press BREAK and type N=30:GOTO600. Then press ENTER. This should return you to the main menu.



This menu offers various options, most of which are self-explanatory in operation. Select Editor by pressing 1. Editor has two modes of operation, the first of which is the absolute editor. Press 1 to access this mode. The screen prompts you with the current line number. Enter CHK, (The comma causes the editor to play and display each line of the song used during the introduction.). The characters on the left are the same as those used for Extended BASIC's PLAY function. Those on the right are the words displayed on the piano. This shows the way a song is entered into the absolute editor. At the prompt you may use any of PLAY's valid characters, followed by a comma, and then the word or syllable corresponding to that note.

There are a few minor restrictions. You must use a space to separate the letters L and O and the value associated with them. This is necessary for the editor to keep track of their values. Do not use L+, L-, O+, or O-, because the editor cannot track these. Words should be in lower-case for appearance sake. The program initially sets the values for V at 31, L at 2, O at 2, and T at 2.

If you should miss a note/word combination, enter INS,. This allows you to insert the missing note; the editor will request a line number and after entering the line number will ask for the note/word combination to be inserted.

To delete a line, type DEL, and press ENTER. Then enter the line number to be deleted, when requested. The Insert and Delete can be aborted by responding with 0 at the line request.

To check a song's progress type CHK, and press ENTER. This displays the song and plays the music. Entering the command END, returns you to the edit menu.

All commands must be followed by a comma to satisfy the input.

Glissando

The keyboard editor should be easier to use for those familiar with a musical instrument keyboard. Selecting Option 2 on the edit menu starts the keyboard editor. Both editor modes are compatible, and you can switch between them at any time. Going from one menu or function to the next doesn't alter your song in any way.

Figure 1 is a set of labels for the keyboard editor. These can be photocopied, cut out and attached to the front of the keys on your keyboard as shown. The letters above the labels indicate to which keys these labels should be attached. Use one of the stick-type glues since these won't drip and damage your keyboard.

Figure 1 illustrates how the keyboard is set up. The two middle rows are used as a piano keyboard. Row A has the natural notes, starting with C on the A key, extending to B on the J key. Row Q has the black or sharp notes. Some of these and other keys are used to access various functions in the editor. The functions have been printed above the keys to indicate that the SHIFT key must be pressed while selecting a function. The function keys make it much easier to compose a song.

To insert a note, simply press SHIFT and I, then the program requests a line number. Respond with the number of the new line and enter the note as usual. To delete a line, press SHIFT and D, then the program asks for the number of the line to be deleted. The program does a search of the song to keep the values of L and O correct when inserting and deleting.

To change a note's length, simply press SHIFT and L. Then press SHIFT and + to increase the length, or SHIFT and - to decrease the length. Changing the octave works the same way. Press SHIFT and O, then + or - as above, to increase or decrease the octave value.

Pressing SHIFT and T allows the program to request a new value for the tempo.

Rests are an important part of music, and they have been accommodated by pressing SHIFT and P. A pause equal to the current value of L is inserted in the song after the last note. This position was selected to avoid a blank screen while playing a pause.

SHIFT-C allows the user to check a song's progress. SHIFT-N resets the note counter to start a new song. The last command, SHIFT-E, ends the editing session and returns the user to the edit menu.

Crescendo

The program was built up using a modular approach. Most of the functions are in subroutines. There really isn't much structure, but some control of the program during development was necessary. Using subroutines also allowed movement of the routines to improve smooth operation and reduce delay times between notes when a song is actually being played.

After the copyright information, the program does the necessary clears of string and graphics space, then jumps to the Initialization routine at Line 890. Arrays N$ and K are used to convert keyboard input into the notes while in the keyboard editor. Array S$ contains the notes in the song and Array W$ has the words.

Once the program is initialized, it branches to the PLAY subroutine at Line 70. Subroutine 660 draws the piano on the screen. The PRINT@ statement in Line 70 centers the words in the piano. Line 80 resets the PLAY statement and branches to the main menu at Line 610. Variable X is a switch used to automatically reset the note counter, Variable N is used after the greeting is played.

From the main menu the program can branch to the editor at Line 90 to the Save routine at Line 530; to Line 560 to load a song from disk; or to Line 930, where BASIC is reinitialized (string space is reset to 200 bytes) and the program ends.

The edit menu at Line 90 has branches to Line 110 for the absolute editor, Line 320 for the keyboard editor, and Line 740 for the abridged directions.

Line 120 contains the INPUT statement for the absolute editor. This line also has most of the tests for the various functions available in this mode. Line 130 plays the input, places the notes and words into their appropriate arrays, and increments the note counter. Variable F is used to steer the program to the needed function. Line 160 starts the Delete routine. The subroutine at 180 through 200 searches through the song when deleting or inserting, to keep the values associated with O and L in line with the song. Line 210 actually does the moving of data in the array during a delete.

When inserting, Line 240 takes over, and asks for the number of the new line, then it opens the appropriate space and accepts the note/word combination to be inserted.

When checking a song, a branch to the subroutine at Line 280 occurs. The New command has its subroutine at Line 300.

The keyboard editor starts at Line 320. Line 320 sets the computer to the upper-/lower-case mode. This is necessary to allow the keys to take on two separate functions and to make it easier to enter the words in reverse video. Line 330 steers the program to the Input subroutine at Line 340. Line 340 does all the housekeeping to accept an input, and Line 350 does all of the work required to calculate the correct note and insert it into the S$ array. Line 360 accepts the word and increments the note counter.

Line 220 provides the subroutine calls according to the selected function. This line also provides some of the controls when inserting.

In the keyboard mode, the Insert function works differently in that there is no separate input route. The subroutine at Line 260 first opens the necessary space for the

insert, and then goes to the normal Input subroutine for the note and word to be inserted. This is a refinement over previous versions of the program; originally, the user had to enter data for the note and word as in Absolute mode. I decided that this required too much concentration of the user to be considered easy-to-use. Once the note and word are entered, the program checks the values of L and O to make sure that it is reporting the correct value for these variables.

The Delete function uses the same subroutine as in the Absolute mode, and operates in exactly the same way. The Check and New subroutines are also the same.

Pressing the SHIFT key and the L key takes the program to the Length subroutine at Line 380. This subroutine places the letter L on the screen to indicate the mode and then waits for the + or - keys to be pressed. It then calculates the correct value for L, converts the value into string form, and saves it in L$ to be inserted into S$ at the appropriate time. The Octave function starts at Line 420 and works similarly. Line 470 sets the tempo. This simple subroutine requests the new value for the tempo and puts it into a string to be inserted into S$.

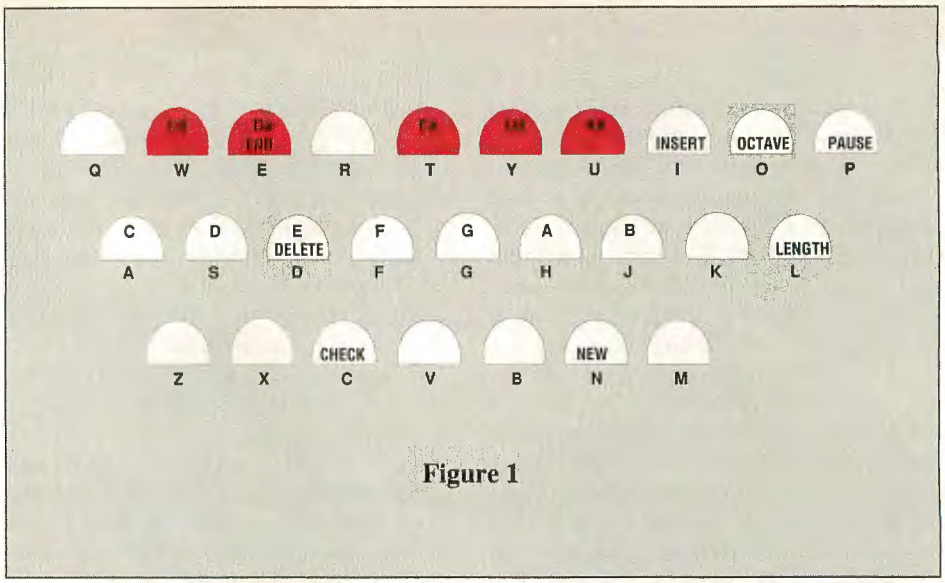


Figure 1

Line 490 resets the computer to the upper-case mode and exits the keyboard editor to the edit menu.

CODA

The individual subroutines are not really that complicated, and make the development of this program easier. I use long lines to conserve memory, and try to keep the subroutines all in the same line to isolate them.

(Questions or comments concerning this article may be addressed to the author at 7115 Lanham, St. Louis, MO 63143. Please enclose an SASE when requesting a reply.)

Editors Note: Listing 2 is replaced on this month's RAINBOW ON TAPE with the Nickelodeon program already modified for cassette. The filename is NICKEL-C.

150	6	680	46
290	184	770	26
450	3	830	76
600	245	END	71

Listing 1: NICKEL-D

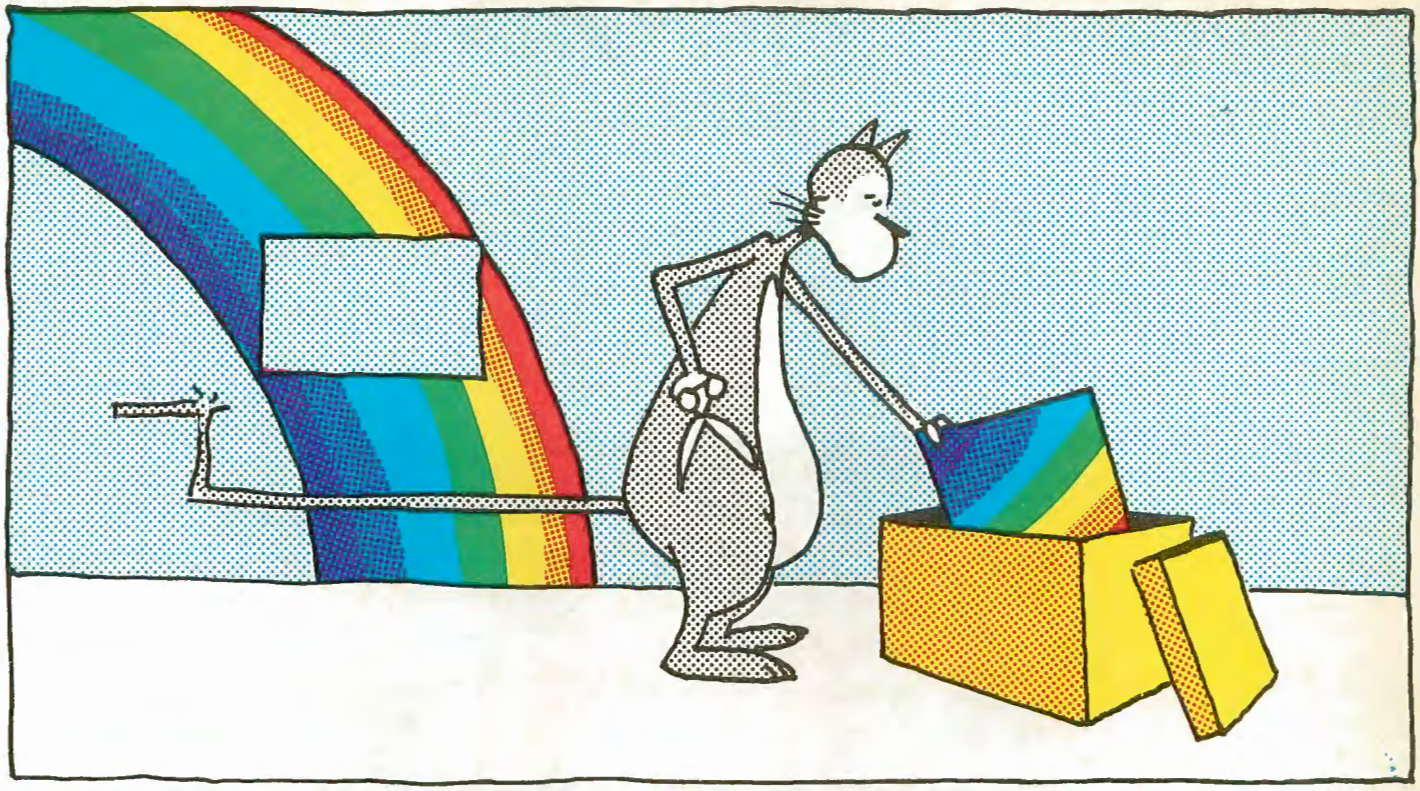
```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 REM NICKOLODEON 4.0
20 REM COPYRIGHT (C) 1983,1988
30 REM BILL BUDENHOLZER
40 REM****SET UP-1
50 PCLEAR1:CLS0:CLEAR1000:GOTO89
0
60 REM*****PLAY SONG
70 GOSUB660:FORI=1 TON-1:PRINT@1
36,B$;:PRINT@(144-INT(LEN(W$(I))
)/2),W$(I);:PLAYS$(I):NEXT
80 PLAY"V31L202":FORI=1TO1000:NE
XT:IFX=1 THENN=1:X=0:GOTO610ELSE
GOTO610
90 CLS:PRINT@9,P$:PRINT@74,"EDIT
 MENU":PRINT@135,"1) EDIT ABSOLU
TE MODE":PRINT@167,"2) EDIT KEYB
OARD MODE":PRINT@199,"3) INSTRUC
TIONS":GOSUB630:IFS$="M" THEN610
ELSES=VAL(S$):IFS<1 ORS>3 THEN90
ELSE ONS GOTO110,320,740
100 REM*****ABSOLUTE EDITOR
110 CLS:PRINT@9,P$:PRINT
120 F=0:PRINTN;:INPUTS$,W$:IFS$=
"DEL" THENF=1ELSEIFS$="INS" THEN
F=2ELSEIFS$="CHK" THENF=3ELSEIFS
$="END" THENS$(N)="":W$(N)="end"
:GOTO90
130 IFS$="NEW" THENF=4ELSEIFF TH
EN140ELSEPLAYS$:S$(N)=S$:W$(N)=W
$:N=N+1:GOTO120
140 ONF GOSUB160,240,280,300:GOT
O120
150 REM*****DELETE
160 PRINT:INPUT"ENTER LINE #";LN
:IFLN=0 THENRETURNELSEGOSUB210:G
OSUB180:RETURN
170 REM*****SEARCH 'L' & 'O'
180 L=2:O=2:FORI=1 TON-1:E=INSTR
(S$(I),"L"):IFE THENIFINSTR(S$(I
),"1") THENL=VAL(MID$(S$(I),E+2,
2))ELSEL=VAL(MID$(S$(I),E+2,1))
190 E=INSTR(S$(I),"O"):IFE THENO
=VAL(MID$(S$(I),E+2,1))
200 NEXTI:RETURN
210 FORI=LN TON:S$(I)=S$(I+1):W$
(I)=W$(I+1):NEXTI:N=N-1:RETURN
220 ONF GOSUB250,160,280,300,420
```

```
,380,490,460,470:IFIN THEN340ELS
E330
230 REM*****INSERT
240 PRINT:INPUT"ENTER LINE #";LN
:IFLN=0 THENRETURNELSEFORI=N+1 T
OLN STEP-1:S$(I)=S$(I-1):W$(I)=W
$(I-1):NEXT:N=N+1:INPUT"NOTE, WO
RD";S$(LN),W$(LN):RETURN
250 IN=1:PRINT:INPUT"ENTER LINE
#";LN:IFLN=0 THENRETURN
260 FORI=N+1 TOLN STEP-1:S$(I)=S
$(I-1):W$(I)=W$(I-1):NEXT:N=N+1:
TN=N:N=LN:GOSUB340:GOSUB180:IN=0
:N=TN:RETURN
270 REM*****CHECK
280 PRINT:PLAY"V31L2O2T2":FORI=1
 TON-1:PRINTI;:PRINTS$(I),W$(I):
PLAYS$(I):NEXT:RETURN
290 REM*****NEW SONG
300 PRINT:PLAY"L2O2T2":N=1:O=2:L
=2:S$(1)="":W$(1)="":RETURN
310 REM*****KEYBOARD EDITOR
320 CLS:POKE282,0
330 GOSUB340:GOTO330
340 F=0:PRINTN;"L"L;"O"O;"?";:GO
SUB510:IFA$="L" THENF=6ELSEIFA$=
"O" THENF=5ELSEIFA$="I" THENF=1E
LSEIFA$="D" THENF=2ELSEIFA$="C"
THENF=3ELSEIFA$="N" THENF=4ELSEI
FA$="E" THENF=7ELSEIFA$="P" THEN
F=8ELSEIFA$="T" THENF=9
350 IFF THEN220ELSEIFA$<"a" THEN
PRINT:RETURNELSES$=N$(K(ASC(A$)-
96)):IFS$="" THENPRINT:RETURNELS
ES$(N)=T$+L$+O$+S$:PRINTCHR$(8);
S$(N);:PLAYS$(N):L$="":O$="":T$=
""
360 INPUT" WORD";W$(N):N=N+1:RET
URN
370 REM***** 'L'
380 PRINTCHR$(8);"L";:GOSUB510:I
FA$="+" THENIFL=1 THENL=2ELSEL=L
*2
390 IFA$="-" THENIFL>1 THENL=L/2
ELSEL=1
400 IFL>16 THENL=16
410 L$="L"+STR$(L):PRINTL:RETURN
420 PRINTCHR$(8);"O";:GOSUB510:I
FA$="+" THENO=O+1:IFO>5 THENO=5
430 IFA$="=" THENO=O-1:IFO<1 THE
NO=1
440 O$="O"+STR$(O):PRINTO:RETURN
450 REM*****PAUSE
460 PRINTCHR$(8);"P";L:E$="P"+ST
R$(L):PLAYE$:S$(N-1)=S$(N-1)+E$:
E$="":RETURN
470 PRINT:INPUT"INPUT NEW TEMPO"
;T$:IFT$="" THENRETURNELSET$="T"
+T$:RETURN
480 REM*****END
490 POKE282,255:S$(N)="":W$(N)="
end":GOTO90
500 REM*****INKEY$
510 A$=INKEY$:IFA$="" THEN510ELS
ERETURN
520 REM*****SAVE SONG
530 CLS:PRINT@9,P$:PRINT:PRINT"
 ENTER SONG NAME";:INPUTSN$:CLS:
PRINT@9,P$:PRINT:PRINT"  SAVING
SONG":OPEN"O",#1,SN$:FORI=1 TON:
WRITE#1,S$(I),W$(I):NEXT
540 CLOSE#1:GOTO610
550 REM*****LOAD SONG
560 N=1:CLS:PRINT@9,P$:PRINT:PRI
NT"  ENTER SONG NAME";:INPUTSN$:
CLS:PRINT@9,P$:PRINT:PRINT"  LOA
DING SONG"
570 OPEN"I",#1,SN$
580 IFEOF(1) THEN590ELSEINPUT#1,
S$(N),W$(N):PRINTW$(N);:N=N-1:GO
TO580
590 CLOSE#1:GOTO610
600 REM*****MAIN MENU
610 CLS:PRINT@9,P$:PRINT@74,"MAI
N MENU":PRINT@135,"1) EDIT SONG"
:PRINT@167,"2) SAVE SONG":PRINT@
199,"3) LOAD SONG":PRINT@231,"4)
 PLAY SONG":PRINT@263,"5) RETURN
 TO BASIC":GOSUB640:S=VAL(S$):IF
S<1 ORS>5 THEN610ELSE ONS GOTO90
,530,560,70,930
620 REM*****SELECT
630 PRINT@418,"PRESS <M> TO RETU
RN TO MAIN     MENU"
640 PRINT@482,"SELECTION?";:GOSU
B510:S$=A$:RETURN
650 REM*****DRAW PIANO
660 CLS0:FORI=7TO56:SET(I,4,1):N
EXTI:FORI=8TO55:SET(I,14,1):NEXT
I:FORI=8TO55:SET(I,15,1):NEXTI:F
ORI=8TO55:SET(I,24,1):SET(I,25,1
):NEXTI:FORI=4TO26:SET(8,I,1):NE
XTI:FORI=4TO26:SET(55,I,1):NEXTI
:FORI=16TO26:SET(9,I,1):NEXTI
665 FOR I=18TO25:SET(10,I,1):NEX
T1
670 FORI=18TO25:SET(53,I,1):NEXT
I:FORI=16TO26:SET(54,I,1):NEXTI:
FORI=14T049:SET(I,6,1):NEXTI:FOR
I=6TO11:SET(49,I,1):NEXTI:FORI=4
9TO14STEP-1:SET(I,11,1):NEXTI:FO
RI=11TO6STEP-1:SET(14,I,1):NEXTI
:FORI=10TO53:SET(I,16,5):NEXTI:J
=10:K=14:GOSUB690
680 J=22:K=J+4:GOSUB690:J=34:K=J
+4:GOSUB690:J=46:K=J+4:GOSUB690:
SET(55,15,1):FORI=29TO33STEP2:SE
T(I,26,2):NEXTI:PRINT@138,"nicke
lodeon";:FORI=1TO1000:NEXTI:PLAY
"V31L2O2T2":RETURN
690 FORI=J TOK STEP2:RESET(1,15)
:NEXTI
```

```
700 J=J+7:K=K+5
710 FORI=J TOK STEP2:RESET(I,15)
:NEXTI
720 RETURN
730 REM*****INSTRUCTIONS
740 CLS:PRINT@9,P$:PRINT:PRINTTA
B(9)"ABSOLUTE MODE":PRINT:PRINT"
ABSOLUTE MODE ALLOWS YOU TO
ENTER A SONG USING EXTENDED
BASIC'S PLAY STRING COMMANDS.
THE EDITOR PROMPTS WITH THE CUR-
RENT NOTE NUMBER, THEN ASKS FOR"
750 PRINT"THE PLAY STRING AND TH
E WORD TO BE DISPLAYED ON THE PI
ANO. ENTERTHE INFORMATION USING
THE FOL-  LOWING  FORMAT:":PRINT
"  string,word<ENTER>":GOSUB870:
PRINT"FOR APPEARENCE SAKE ENTER
THE   WORD IN LOWER CASE MODE (R
EVERSEVIDEO)."
760 PRINT"SEE EXAMPLE BELOW.":PR
INT:PRINT"1 ? L 8A,word<ENTER>":
PRINT"2 ? O 3BP8,word<ENTER>":PR
INT:PRINT"** NOTE THE SPACE FOLL
OWING THE 'L' AND 'O' IS NECESSA
RY FOR THEEDITOR TO WORK PROPERL
Y. **"
770 GOSUB870:PRINT"THE EDITOR AL
SO ACCEPTS THE FOL-LOWING COMMAN
DS:":PRINT
780 PRINT"  INS  ALLOWS INSERTIO
N OF NOTE":PRINT"  DEL  DELETES
NOTE":PRINT"  CHK  CHECKS SONG":
PRINT"  NEW  RESETS NOTE COUNTER
":PRINT"  END  RETURNS TO MENU":
GOSUB870
790 BL$=CHR$(133)+STRING$(15," "
)+CHR$(138):PRINT:PRINTTAB(9)"KE
YBOARD MODE":PRINTTAB(6);STRING$
(17,140):PRINTTAB(6);BL$:PRINTTA
B(6)CHR$(133)"  w e   t y u  "CH
R$(138):PRINTTAB(6)CHR$(133)" a
s d f g h j "CHR$(138):PRINTTAB(
6)BL$
800 PRINTTAB(6)STRING$(17,131):P
RINT:PRINT"KEYBOARD MODE ALLOWS
YOU TO USE THE KEYBOARD AS PIANO
 KEYBOARD. THE KEYS INDICATED AB
OVE CORRES-POND TO THE KEYS ON A
 PIANO.":GOSUB870
810 PRINT:PRINT"PRESSING <A> GIV
ES A 'C' NOTE   PRESSING <W> GIV
ES A 'C#' NOTE.":PRINT"EDIT FUNC
TIONS INCLUDE:":PRINT:PRINT"  <O
>  CHANGES OCTAVE":PRINT"  <L>
CHANGES LENGTH":PRINT"  <I>  ALL
OWS INSERT":PRINT"  <D>  ALLOWS
DELETE"
820 PRINT"  <C>  CHECKS SONG":PR
INT"  <N>  RESETS NOTE COUNTER":
PRINT"  <P>  INSERTS A REST(PAUS
E)":PRINT"  <E>  RETURNS TO MENU
":PRINT"  <T>  ALLOWS TEMPO CHAN
GE":GOSUB870
830 PRINT:PRINT"USE <+> AND <->
AFTER <L> AND   <O> TO INCREASE
OR DECREASE     LENGTH AND OCTAV
E.":PRINT
840 PRINT" **  YOU MUST PRESS <S
HIFT> AND THE KEY CODE, TO ACCES
S ANY COM-MAND. **":PRINT:PRINT"
INSERT AND DELETE ASK FOR A LINE
NUMBER. ENTER THE NUMBER OF THE
LINE TO BE INSERTED OR DELETED."
:GOSUB870
850 GOTO90
860 REM*****ENTER
870 PRINT@482,"PRESS <ENTER> TO
CONTINUE";:INPUTX:CLS:PRINT@9,P$
:RETURN
880 REM*****SET UP-2
890 DIMS$(100),W$(100),N$(12),K(
25):PLAY"V31L202":B$=STRING$(16,
128):P$="NICKELODEON":X=1:N=1:L=
2:O=2:FORI=1TO12:READN$(I):NEXT:
FORI=1TO25:READK(I):NEXT:DATAC,C
#,D,D#,E,F,F#,G,G#,A,A#,B,1,0,0,
5,4,6,8,10,0,12,0,0,0,0,0,0,0,0,
3,7,11,0,2,0,9
900 FORN=1TO29:READS$(N),W$(N):N
EXT:N=30:GOTO70
910 DATAL 80 3A,put,B,a,A,noth,L
 8B,er,L 16A,nic,L 8B,kel,AP8,in
,F#,in,G,the,F#,nic,G,kel,L 16F#
,o,L 8G,de,F#P8,on,E,all,F#,i,E,
ev,F#,er,E,want,F#,from,E,you,F#
,is,E,mu,D,sic,E,mu,D,sic,E,mu,D
,sic,,end
920 REM*****END
930 CLEAR200:END
```

Listing 2:

```
520 REM*****SAVE SONG
530 CLS:PRINT@9,P$:PRINT:PRINT"
 POSITION TAPE":GOSUB870:PRINT:P
RINT"  PRESS PLAY AND RECORD":GO
SUB870:PRINT:PRINT"  ENTER SONG
NAME";:INPUTSN$:CLS:PRINT@9,P$:P
RINT:PRINT"  SAVING SONG":OPEN"O
",#-1,SN$:FORI=1 TON:PRINT#-1,S$
(I),W$(I):NEXT
540 CLOSE#-1:GOTO610
550 REM*****LOAD SONG
560 N=1:CLS:PRINT@9,P$:PRINT:PRI
NT"  ENTER SONG NAME";:INPUTSN$:
CLS:PRINT@9,P$:PRINT:PRINT"  LOA
DING SONG"
570 OPEN"I",#-1,SN$
580 IFEOF(-1) THEN590ELSEINPUT#-
1,S$(N),W$(N):PRINTW$(N);:N=N+1:
GOTO580
590 CLOSE#-1:GOTO610
```



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Software CoCo 3

King's Quest III—
An Animated Adventure Extravaganza

First, the bad news: *King's Quest III* requires 512K. Now that that's out of the way, let's get to the good stuff! *King's Quest III* from Sierra On-Line is a graphics Adventure game that is certain to knock your socks off! As Gwydion, you are a young slave boy seeking to free yourself from the evil wizard Manannan and discover your true destiny. Along the way you must battle giant spiders, find magical items, weave spells and defend yourself from a host of dangerous people and critters.

Now this might not sound like anything new. After all, Adventures have been around for years. What makes this one so special? Let's take a look.

The graphics in *King's Quest III* are as breathtaking as they are extensive. Each screen conveys not only the contents of interest in solving the game, but an entire mood appropriate to the setting. From the lavishly ornate wizard's bedroom to the shabby robber's hideout, from the dank cave of the oracle to the sparkling streams and waterfalls of the countryside, the meticulous attention to color and detail succeeds in drawing you right into the story. You can almost feel the cool grass of the forest and the parched sands of the desert.

The already excellent graphics are further enhanced by animation. The water in the waterfall actually falls! Birds and chipmunks move in the trees, the dog wags its tail, and the shopkeeper dusts his shelves. Gwydion, of course, also moves throughout the story, directed either by arrow keys or joystick. Some scenes even require a strong dose of video game skills in order to maneuver past deadly obstacles.

In many games extensive graphics have also meant a skimpy game scenario. The big advantage of text-only Adventures used to be their greater complexity and scope. In *King's Quest III*, though, there are four major settings: the wizard's house, the countryside of Llewdor, the pirate ship and the kingdom of Daventry. Each is fraught with puzzles and perils easily the equal of other entire games I have played.

Humor is another ingredient no decent Adventure should be without. But while some games play everything for laughs and get old quickly, *King's Quest III* is delightfully effective in using humor often enough to keep the game funny without smothering you in dumb gags. There is also a nice blend of visual and descriptive humor. Being thrown out of the Three Bears' house by

Papa Bear left me quite unable to continue for several minutes until my mirth subsided!

The real attraction of Adventure games, though, is the challenge of solving puzzles. Gwydion is faced with a seemingly endless stream of them. Some are simple, some require careful thought, and others I'm still wrestling with after several weeks of play! Fortunately for folks like me, the simple ones are sprinkled throughout the game, thus providing occasional ego boosters.

In order to provide all of this fun, *King's Quest III* comes on not one disk, nor even two, but on *five* double-sided disks. Disk 1, Side 1 contains a stripped-down version of OS-9 to access the game. Once you load and run the game you are asked to push the joystick button if you are using a joystick and then to turn over the disk. Side 2 presents the credits, followed by a complete introduction to the game. This can be skipped simply by pressing the space bar, and from that point on the game is played entirely from the remaining four disks.

While the game is in progress you have access to a number of pull-down menus. The "Sierra" menu tells you "about" the program (authorship, copyright notice). Also on this menu is a help function, which tells you how to use the controls, but gives no game hints. The File menu provides functions for saving and restoring a game, restarting and quitting. Under "Action" you can check your inventory or look at an object you're carrying. The "Special" menu enables you to alternate between joystick and keyboard control, toggle the sound or game clock on or off, or pause the game. Finally, the "Speed" menu is used to control how quickly Gwydion moves on the screen.

The documentation accompanying *King's Quest III* is clear, complete and concise. A reference card provides thorough instructions for making backups of the disks (they are not copy-protected), formatting a save disk and installing the game on a hard drive. It also covers saving and restoring a game, troubleshooting hints and a summary of game commands.

In addition to the reference card, a game booklet contains the story of Manannan, the evil wizard, and how you came to be his slave. Following this tale are some tips for beginning Adventurers, and, finally, sev-

Scanning the Sierra Scene

Now in its tenth year, with nearly 200 employees, Sierra On-Line, Inc., is one of those entrepreneurial success stories. Ken Williams was a mainframe computer programmer. Wife Roberta had ideas for stories. Working out of their kitchen, they combined their talents and produced *Mystery House*, the first of many computer games their fledgling company would produce.

With Ken as president and Roberta as executive officer and primary designer, the company grew. In 1984, the first installment of *King's Quest* was released. There are now four games in that series (*King's Quest IV: The Perils of Rosella* has not as yet been translated for the CoCo), which have collectively sold over one million copies. Sierra went public in October of last year, and in March reported revenues for the past fiscal year of over $20.9 million.

Although Sierra's product line does include a word processor and a home money management program, the bulk of its products continue to be games. According to Kirk Green, Sierra's public relations director, it can take up to two years from original idea to shipping a finished product, although nine months to a year is more typical. A development team of four to 10 people will include designers, musicians, programmers and artists.

"It's a lot like making a movie," says Green. "A lot of people work on separate pieces, and you really don't have anything until it's all done." This analogy is consistent with the company's basic direction, which he describes as "edging toward interactive films using a computer."

The team will generally develop a program initially under MS-DOS, and then port it to other machines. One new product due out in one to two months, though, is a telecommunications package running under Tandy's *DeskMate* interface. It's name? *Sierra's On-Line*.

❑

It's Not Easy Being a Wizard's Slave

"Go clean my office!"

Not so much as an "if you please." Such is my introduction to Manannan, the resident wizard in *King's Quest III*. Now, I've been around a lot of wizards in my day. Some are great wanderers who appear in times of darkest peril to help noble dwarves and elves overcome terrible evils. Others live like hermits, practicing their arts and perhaps taking on a single apprentice to carry on their work. I've met wizards outcast and bitter, wealthy and respected, rich and poor, invincible and helpless. But never before have I met one as intentionally rude as this bozo.

Clean his office. All right, I suppose I'd better. All I have to do is find it, and then figure out how to clean it. First step must be to go in the front door. *Hmmm.* A hallway. Stairs go up, doors straight ahead and to the right. I'll try going right.

Oops. I'm in the dining room. The further door must then be the kitchen. Not the office, but I'll take a quick peek. Yep. Oh, hey, food! I'll just grab a quick bite before . . .uh oh, there he is again, appearing in a puff of smoke. Doesn't this guy ever walk?

"When I give an order, I expect it to be obeyed! *You'd better spend some time in your room."*

Poof!

Locked in my room? What a sorehead. Well, it could be worse. At least I'm still alive. And now I have time to explore my room. Yuk. Dirty cot, lumpy pillow, broken chest of drawers. What a life. I must be a real twit to live like. . .huh? The door just opened. I guess my sentence is up. I'll look around here later.

I walk out of my dingy room into an upstairs hallway. That doesn't look like an office through that door, but it might be worth a look. I go in and find the wizard's bedroom. What a palace! This guy lives like a king, while I sleep in squalor just down the. . .

"You don't belong in here without permission! Now I have to teach you a lesson!"

Poof!

Wha. . .?! The lousy jerk turned me into a *snail*! Oh, this is disgusting! It takes sooo long to get anywhere, and I'm all slimy. Ugh! I hope this doesn't last too long. I seem to remember a cat hanging around that looked hungry enough to eat almost anything. . . .

Whew, I'm myself again. He must not be such a powerful wizard after all. Definite attitude problem, though. Before I

leave his bedroom. I'll take a quick look in that dresser. Looks like a drawer I might be able to get into. Paydirt — A bottle of "Rose Petal Essence"! It's a cinch that stinker doesn't use this for cologne. It might be magic. I'll just stick it in my pocket and get out of here.

Down the stairs I go. Back to the front hall. This time I'll take the door straight ahead. Must be the office. It is. Maybe I could use the essence to clean the office for me? No dice. Magic must not work for me. I guess the feather duster lying on that cabinet has my name on it.

"You'll make no magic around me, *Gwydion!"*

Zap!

He reduced me to ashes. My life is over already. Rude. Very rude. ❑

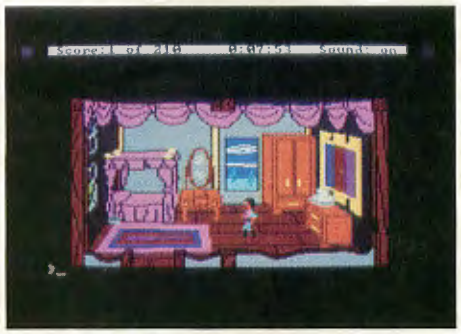
eral pages of magic spells. These last pages are actually excerpts from *The Sorcery of Old*, Manannan's book of magic, and are crucial for solving the game.

In addition to quality documentation, Sierra provides the down-and-out gamer with a 24-hour game hint hotline. This phone number puts you in contact with a sophisticated series of recorded menus, which can be traversed with a touch-tone phone in order to get some very useful clues about specific puzzles in the game. The hint line will give you a maximum of two hints per call, preventing anyone from clogging the line for hours on end.

If you have only a rotary dial phone, you must call the hotline during regular (Pacific time) business hours and wait for someone to help you. I found the line to be very busy during those hours, but at night I was able to get through quite easily. I won't tell you how many times I called for hints, but I will admit this: I listened to some hints about things I haven't even seen yet in three weeks of play. I used to think I was a decent Adventurer, but I'm still struggling with this one!

There are only a few minor negative comments I can make about *King's Quest III*. When using the joystick to access the pull-down menus, I find it very difficult to position the cursor on the desired option. Also, there are some situations in which I find myself rephrasing the same command several different ways before achieving the desired result.

The single most annoying thing about *King's Quest III*, though, as you may have guessed, is having to swap disks in and out, and turn them over, in the middle of play. If you are fortunate enough to have a hard disk (I'm not), you can eliminate this problem, but otherwise you are stuck with it. This is not a fair gripe, of course, since without all that data this would be just another game. However, it can be horribly aggravating. If you bump the joystick while waiting for a new screen to load from disk, for example, you can actually end up swapping disks three times to move one screen.



Minor gripes notwithstanding, *King's Quest III* is a stellar program. In one amazing factor, it outshines every other computer game I have ever played. That factor is realism. It seems silly to talk of realism in context with wizards, medusas and the Three Bears, but the game has realistic depth in several dimensions. The wizard is an evil meany, but he sleeps, eats and uses a chamber pot (which poor Gwydion is forced to empty!). There is noticeably more physical effort in negotiating the steep mountain paths than in wandering through the forest. When walking past the large mirror in the wizard's bedroom, Gwydion's reflection is perfectly rendered.

These and many other details help to draw the player into the story in a way usually reserved for books and movies. My hat is off to Roberta Williams and the folks at Sierra On-Line. This is one grand Adventure!

(Sierra On-Line, Inc., dist. by Tandy Corporation, 1700 One Tandy Center, Fort Worth, TX 76102; $34.95: Available in Radio Shack stores nationwide or through Tandy Express Order, No. 26-3285 at 800-321-3133)

—Jim K. Issel

Hardware CoCo 1, 2 & 3

CoCo Stereo Headphone— For Private Listening Pleasure

The CoCo Stereo Headphone Amplifier is designed to take sound from the CoCo's cassette port and amplify it so that it can be heard through "Walkman"-type headphones. It works with both machine language and BASIC programs, and with all models of the CoCo.

The package comes with a Radio Shack AC adapter (Cat. No. 273-1431 A) that supplies the 9-volt power supply required by the amplifier, but headphones are not included. The amplifier unit is packaged in a dark gray plastic-and-metal case, professionally made and labeled. It has an input plug for the AC adapter, an audio input cable (consisting of a 1½-foot cable with a standard cassette port plug attached to the end), two toggle switches on the face (which allow for control of the stereo effect and volume control), and also two stereo headphone jacks that accept 1/8th-inch stereo plugs.

The first toggle switch, labeled "Low Pass Filter," toggles either on or off. When on, the switch causes the amplifier for the left headphone speaker to kill any sounds above a certain level; this creates a stereo effect of sorts. If this switch is toggled off, all sounds are directed to both sides of the headphones.

The second toggle switch on the amplifier, for control of volume level, can be toggled either high or low. This lets you adjust for sound levels that may vary from program to program. In most cases I found that the low setting on the volume switch supplied more than adequate sound to the headphones. However, I would rather that the toggle had been a knob: At times the sound was too loud, and I was unable to lower the volume to a comfortable level.

The documentation, which comes on one sheet of paper, offers hookup instructions and a short type-in stereo demo routine. Installation is easy: Just plug the amplifier into the CoCo's cassette port, plug the power supply into the amplifier, plug the power supply into an AC socket, then plug in the headphones. It should be noted that two pairs of headphones can be used at the same time.

For cassette users the documentation includes a method of altering the plug for cassette-based systems. Users solder the unit directly into the cassette's cable so that unplugging becomes unnecessary.

I tested the amplifier unit with my Sony stereo headphones and several arcade-type games. I also listened to many of my wife's musical arrangements (written with *Musica*). I found that the music sounds better through the monitor's speaker than it does through the headphones. But I also found that music listened to through the headphones sounds much better with the Low Pass Filter toggle switch in the OFF position (stereo effect off).

With most arcade games the amplifier produces a sound that, though similar to that produced by the monitor's speaker, is

rather unique. The "surround sound" effect you get while playing your favorite arcade game — along with the increased volume — may actually increase your score. You become more aware of the sound, and your response time to the visual effects prompted by sound is lowered.

Overall, I was a little disappointed with the quality of sound. There seems to be a loss in clarity, and some background hum can be heard through the headphones. As far as using the amplifier with music, I feel too much fidelity is lost.

However, if your computer area happens to be in the family room or somewhere else where noise from arcade games bothers family members, you may find a perfect solution in the CoCo Stereo Headphone Amplifier. You can have nice, loud, surround-sound arcade action without disturbing someone who is reading or watching TV.

(Mike Forrest, 2501 Summer Tree Lane, #1096, Arlington, TX 76006, 817-860-3885; $39.95)

—Dan Hagarty

Software CoCo 1, 2 & 3

Lock Master— Padlocks Your Disks

Lock Master, from Right Brothers Software, is a machine-language program that works as its name might suggest. It locks a disk (with or without a password) so that the directory can no longer be read by the DIR routine; therefore, no program can be loaded from the disk. It also makes the routines think the disk is full, preventing the disk from being written to by SAVE or SAVEM.

The program works on any CoCo with at least one disk drive. It comes with a short, three-page manual that is easy to read and understand. You should have it read, the disk backed up, the program copied and your first disk locked in about 10 minutes. *Lock Master* is an auto-executing program, so all you have to do is load the program. If you choose to employ a password, you can use any characters (printable or not) except the numbers 0 through 3, because *Lock Master* interprets these as drive change requests. If you try to change to a drive that does not exist, the program returns an error and does a warm start.

The program does its magic by filling the unallocated granules in the file allocation table (FAT) with Hex 4Fs, so that the granules appear to be allocated. Next it takes the directory entries, encrypts them and copies them to the second 16 bytes (which are not used) of the 32 bytes used for each entry, leaving zeroes in the first 16 bytes. When the routines look at the directory entries, they don't see any because only the first byte is examined to see if it contains a letter.

Because of this, when a DIR command is given on a locked disk, nothing gets printed — the disk appears to be empty, and it would be easy to reformat or back up over the disk by accident, destroying its contents. To help prevent this, *Lock Master* lets you copy a special file to the disk before locking; after locking, the DIR command reveals the lone file of LOCKED.BIN on the disk. This feature also makes it easier to unlock the disk because you need only insert it in a drive and enter LOADM "LOCKED". Another idea to help prevent accidental erasures is to put labels on all locked disks.

There are a few problems with the program, but they are relatively minor and don't detract from the overall quality.

The first problem is that after you lock or unlock a disk the program does a warm start. This is only a problem if you want to lock or unlock several disks at a time, and it is more a problem with convenience than with the program itself.

Next, if you already use a program of some kind that backs up the directory track to another track, *Lock Master* will not lock the backup directory. In this case the protection given is minimal against someone with a disk editor and knowledge of where the backed-up directory is located. Since *Lock Master* has no way of knowing the location of the copy, it can't be expected to lock it. I simply mention this because it isn't mentioned in the documentation.

Finally, the documentation states that "it is impossible to break the protection, even with a 'disk zapper.' " First off, nothing is impossible; some things are just highly unlikely, especially where computers are concerned. While most "disk zappers" are not designed to break the protection *Lock Master* gives, with disk editors it is possible — especially when accompanied by a little human ingenuity.

The encryption used by *Lock Master* is a fairly straightforward substitution cipher, and once the cipher is broken the disk editor can be used to replace the directory entries. The breaking of the cipher, however, may prove to be more difficult and time-consuming than the relative value of the information gained from the disk. While technically the statement in the documentation is probably true, it implies a higher degree of security from unauthorized use than it actually has, although the security it does offer is high in relative terms.

In conclusion, *Lock Master* is well-constructed and will probably provide as much protection as the normal CoCo user would need (unless he or she is trying to protect state secrets). Considering the overall quality and ease of use, the price is fairly reasonable. I look forward to seeing more products from Right Brothers in the future.

(Right Brothers Software, 1173 Niagara St., Denver, CO 80220, 303-377-3409; $14.95 plus $2 S/H)

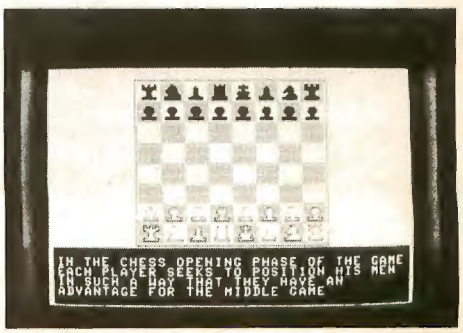
—Chris Hyde

Software CoCo 3

Chess Made Easy— Your First Piece of Chess Pie

This is not another computer chess game at all, but rather the first of what I hope could be a line of chess tutorials from a new software supplier. I believe this tutorial will aid even the youngest of "students" who show an interest in the game of chess. And what a way for a retiree to launch a new interest!

Chess Made Easy provides that necessary "crawling before walking" process that teaches the student all she or he needs to know to start playing chess, but with a big difference: You don't have to pore over dull books and lifeless diagrams for your basics. You see the moves onscreen. *Chess Made Easy* is a visually stimulating study that graphically demonstrates the chess pieces in fundamental board placement and movement. It takes the student through a number of routines, then asks questions based on what it has just shown.



Lesson 1 covers board layout and basic board notation.

Lesson 2 gives the value of each piece (relative to other pieces), its board placement and direction(s) of movement. It also

looks at two special moves, castling and *en passant* capture.

The next lesson is somewhat more detailed, covering chess notation (for record keeping), demonstrated with actual onscreen moves.

The desired result, *winning*, is the aim of the game as presented in Lesson 4.

An aside: Chess is very often referred to as a battle, the board as a battleground and the pieces as soldiers in an army. History shows that many famous military commanders and tacticians were avid chess players. The development of the game spans several centuries.

Back to the lesson at hand. Lessons 5, 6 and 7 discuss in some detail, again with graphic examples, various moves in what may be described as the opening, middle and closing phases of the game. In each case, well-known ploys are given. Learn to try out the Sicilian Defense, the Skewer Attack and ways to checkmate or to at least stalemate if you are, perish the thought, losing.

By the time you have studied these lessons, maybe with a reference manual and chessboard at your side, you should be able to play your first game with either a human opponent or an electronic one.

Program operation is simple and straightforward. There is no manual to cling to because the program is *all* menu-driven with onscreen text in large, easy-to-read characters, regardless of monitor type.

I have viewed *Chess Made Easy* with a TV and a Hi-Res monitor capable of composite, RGB and monochrome green modes. It looks good in all modes, even with the artifacts found on the television, though the high resolution tends to crowd the graphics close to the left side of the TV.

A little "quirk" was noted in operation, however, that depends on what viewing mode you are in. When you choose a lesson number, you are prompted for the type of monitor, to press C for composite monitor/TV or R for RGB.

When C is selected and a lesson is finished, the program loops back to the main menu; no problem. However, when R is selected and the lesson completed, the program seems to start a return to the main menu, but then locks up on a blank screen. No real problem here either if you don't mind entering `RUN "CHESS.BAS"` again. Also, you can simply type and enter any desired lessons such as `LOAD"LESSON2"`, then run, without going through the menus.

I found CoCo Chess/Ware's program informative, helpful and quite user-friendly with a very nominal cost.

It definitely has to improve my standing in the chess world, which is that of an unknown with ranking somewhere between never having beaten my sons-in-law and gloating over a couple of easy-level computer chess game wins. *Chess Made Easy*, where were you when I needed you?

(Aftamonow Software, 46 Howe St., Milford, CT 06460, 203-878-3602; $20)

—Jim Franklin

Software

CoCo 1, 2 & 3

Disk Doctor— Blocking Out the Bad Sectors

Disk Doctor is a disk repair utility that runs with *Hyper-I/O* on your CoCo 1, 2 or 3, requiring at least 64K of RAM. It is written in BASIC and machine language and runs with the command `RUN "DOCTOR"` after *Hyper-I/O* has been loaded. *Disk Doctor* is used to locate and block out defective sectors on your hard drive as well as on your floppy disks. We all have experienced defective disks and I/O errors. *Disk Doctor* serves as an effective tool to prevent such errors, and it is easy to use.

The program starts by presenting a colorful title page and then prompting the user to enter the device name of the disk to be checked. If you wanted to check one of *Hyper-I/O*'s Mass Storage Areas, you would enter `/HO/A`, where `A` is one of the MSAs to be checked. To check a floppy, you would just enter `/DO`. The computer begins checking all of the sectors of the specified device, displaying the current track number so you know at a glance what the computer is doing. If it finds a defective sector, the track, sector and granule are shown onscreen.

Because *Disk Doctor* only reads the disk when checking for sector errors, it can be used on any disks — including those with data on them — but it cannot check a disk that has not been formatted. Once the disk test is complete, you are given the option of blocking out any defective sectors found. This is done by making the granules that relate to the defective sectors in the GAT (Granule Allocation Table) appear to be full. This method prevents blocked-out sectors from being written to in the future, and so prevents disk crashes and I/O errors.

As each sector is processed you will see the granule number followed by one of three messages:

1. Blocked Out — this means that the program has successfully blocked out the defective sector as well as its related granule on the disk.

2. Already in Use — this means that the granule containing the defective sector already has data written in it and, as a result, cannot be blocked out.

3. Directory Error — this means that Track 17 has a bad sector and the computer can't block it out. Some salvage procedures are described in *Disk Doctor*'s three-page manual.

If you like, you can even generate a hard copy of the test results for each disk checked. This printout includes the defective track, sector and granule as well as the date checked and the disk name — a handy record that can be kept for reference.

Disk Doctor is a welcome utility, especially for hard drive users with *Hyper-I/O*. It does its job quickly and easily and is very reasonably priced. Besides, anyone who lives in Cocoa Beach must know what he's doing.

(KB Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931, 407-799-3253; $17.95 plus $1.50 S/H)

—Robert Gray

Hardware

HD-1— Feature-Packed Hard Drive

Howard Medical has a package deal for you if you're in the market for a hard drive for your CoCo. With the price of hard drives continually coming down, it's a good time to evaluate the possibility of adding a hard drive to your CoCo setup. The package I received consisted of a Seagate ST-225 20-Meg half-height hard drive housed in a case with power supply and fan.

Also included was the XT-RTC hard drive interface made by Burke & Burke. "RTC" refers to an on-board, quartz crystal, controlled real-time lithium battery backup clock, which is optional. The term "XT" refers to the PC compatibility of the hard drive as well as the interface board. This feature alone, in my opinion, makes the package an attractive deal. If you were ever to purchase an MS-DOS compatible such as a Tandy 1000, you would already own a hard drive and interface card that plugs directly into it.

The XT board plugs into the CoCo interface board, and these two boards are housed

in a case that plugs directly into your Multi-Pak Interface. A flat ribbon cable couples the hard drive to the interface board. At first glance, I thought the interface housing looked a little strange since it was smaller at one end than the other. After close examination, though, I found that Burke & Burke was wise to design it this way, because it allows the case to fit into the Multi-Pak slot without the hard drive interface card having to be modified. If such a modification were made, the case could be parallel at both ends, but the card would not be directly compatible in a PC. Burke & Burke has done its homework in this area, and the result is a hard drive package that's easy to install and use.

The CoCo XT Color Computer hard disk interface provides these important features:

- adaptation of DTC5150 hard disk controller for use in CoCo 1, 2 or 3
- controller support for one or two hard drives of any configuration up to 1024 cylinders and 16 read/write heads (120 megabytes)
- installation directly in any Multi-Pak slot
- a direct microprocessor interface (CoCo XT) that is 30 percent faster than other SASI/SCSI Color Computer hard disk systems I've seen
- compatibility with all versions of CoCo OS-9 Level I or II

It's a joy to be able to run all of my favorite programs by simply changing directories on the hard drive — it eliminates the hassle of swapping floppy disks.

A floppy disk accompanying the CoCo XT package allows you to create hard drive device descriptors. And, if you like, you can even configure the hard drive to become the default drive. A "park" utility protects the read/write heads during transportation of the hard drive.

While many CoCo users are fearful of hard drives because they appear to be "too complicated," I can assure you that this is not the case at all. Howard Medical has developed an easy, step-by-step approach to formatting and configuring the hard drive so you can get it up and running right out of the box in a matter of minutes.

While we're discussing complexity, let me also add that if you'd rather not have to run your hard drive under OS-9, there is also available a software package written by Burke & Burke called *Hyper-I/O*. This nifty program allows you to boot your hard drive using Radio Shack's Disk Operating System under BASIC and configure your hard drive any way you like.

You will need a minimum of 64K RAM to use *Hyper-I/O*. I set mine up in a manner Burke & Burke calls MSAs or Mass Storage Areas, which treats your hard drive like hundreds of floppy disks. An MSA may be as large as 3,000,000 bytes or as small as 2000 bytes. The size depends on how you configure the hard drive in terms of tracks and sectors. The number of MSAs depends on how many device descriptors you set up. The *Hyper-I/O* software provides nine device descriptors, each of which may be used to describe a single MSA up to 26. Since each descriptor can handle as many as 26 MSAs, *Hyper-I/O* can access over 100 hard disk directories using just four of the device descriptors.

Hyper-I/O is menu-driven and contains several utilities that make it very easy to use. I especially like *Hyper-I/O* and the MSA feature it offers because I prefer to run my CoCo under Disk BASIC. I've got all

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my favorite games, utilities, educational and telecommunications programs set up under their own directories, so all I have to do is open the appropriate directory with a command like this: `OPEN DRIVE 0,"/H0/G"`. The `G` is where I have my games stored and `H0` is the device descriptor used to tell the computer to look on the hard drive.

Typing `DIR` displays all the files in directory G just as Disk BASIC does, except that a line appears at the top of the directory listing that shows you which drive and directory it's reading. Simply run or load the file as you usually do. Under *Hyper-I/O* you can still access your floppies, so it's the best of both worlds.

Assuming that you want to run your hard drive under OS-9, you will need the following:

two blank floppies
OS-9 System Master disk
CoCo XT manual
CoCo XT disk
OS-9 operating system manual

With the computer and Multi-Pak turned off, insert the hard drive interface into Slot 3 of the Multi-Pak. Howard Medical has already configured the XT disk to use Slot 3, but you can change this if you like. Next, you will make a backup copy of your OS-9 System Master and copy some files onto the backup. A few more steps are included in the step-by-step instructions that results in a new boot disk you will use whenever you run your hard drive under OS-9.

The instructions provided are for OS-9 Level II and a CoCo 3, but you can use similar steps for Level I and a CoCo 1 or 2. If you are currently running OS-9, you will have no trouble setting up your hard drive boot disk. If you are new to OS-9, you must be careful as you follow these steps: I found some instructions in the OS-9 Level II manual that were not totally accurate. I had to ask a friend of mine who is familiar with Level II to help out.

Once you have created your new boot disk, the system operates flawlessly. People at Howard Medical are available to handle your technical questions. I called a couple of times and found them quite happy to help. A comprehensive 54-page instruction manual covering all hardware and software aspects of the Burke & Burke controller is provided and contains a wealth of technical information in addition to the details you need to further customize the system beyond what Howard Medical has provided.

I've been using this system for several months now and have not had any problems with it at all. It's a joy to be able to run all of my favorite programs by simply changing directories on the hard drive — it eliminates the hassle of swapping floppy disks. I own a PC compatible with a hard drive, and the access speed of the Howard Medical's HD-1 CoCo hard drive is every bit as fast, if not faster, than that of my PC. The hardware is of topnotch, no-shortcut quality, using LSIs and state-of-the art surface-mount circuit-board technology with gold-plated card contacts. With this hard drive and Burke & Burke's interface and software, CoCo users can fully utilize the power of a hard disk system with the added benefit of already having a PC-compatible hard drive and interface if they ever decide to step over to a PC.

(Howard Medical Co., 1690 N. Elston, Chicago, IL 60622, 312-278-1440; $499 for 20-Meg, $598 for 40-Meg)

—Robert Gray

Software OS-9 Level I & II

PertASCII— Word Game or Verbal Abuse?

PertASCII is a multiplayer word game offered by Burke & Burke for the Color Computer 1, 2 or 3 using OS-9 Level I or II with at least 64K of memory and one disk drive. You may not recognize the name, but you'll recognize the game. Your CoCo selects a group of random letters from the alphabet and displays them on the screen. The race is on. Try to make as many unique words as you can from the given letters. Scoring is based on the length and number of words found. The first one to 5000 wins.

Maybe *PertASCII* doesn't sound like much, but quite a bit is going on behind the scenes. Foremost is the capability for up to 15 players to play simultaneously. More than two players requires a 512K CoCo 3, but one or two players can play on either a 64K or 128K CoCo. Multiplayer, in this sense, means that each user must have his own computer. *PertASCII* functions as a BBS of sorts, permitting players on different terminals to communicate via their modems, all playing the same game together.

PertASCII includes a 40-page owners manual that details the rules and scoring and gives directions for installing the program on a hard disk system. The instructions were easy to follow and the installation procedure worked flawlessly. I only wish I'd read the instructions before trying to do it myself. I probably could have saved myself several hours of pensive head-scratching.

If you prefer solitary games or just don't have friends, a very special feature of the game is its ability to participate as one of the players. It comes with a 3500-word dictionary that the computer uses as its database. In the manual, Burke & Burke states that most people have a 10,000-word vocabulary. I'm not an avid player of word games, but I thought of myself as having fair English skills and a decent vocabulary. With this in mind, I thought I'd be able to give the CoCo a good run for its money. Not so. This is where the humiliation began. I won only one game. In many I was routed. This is just what I needed after a rough day at work. I was grateful for being alone when I played it. Later I was able to scoff at the failures of unsuspecting others whom I introduced to *PertASCII*.

One caution concerning the computer's ability to participate is that during play the computer must access the dictionary file. Therefore, those lacking a RAM disk, hard disk or no-halt controller may find keyboard response a bit slow because of floppy disk operations the computer must perform as it races through its dictionary file, finding words you never even thought of.

Another notable feature of *PertASCII* is that it provides for the review and challenge of any doubtful words. If you're a trusting soul, let me warn you in advance that *PertASCII* tries to slip in a bogus word here and there. So keep a sharp eye on the CoCo's list of words at the end of each round. Which leads me to a minor criticism: You can't pause during a game. You and the computer are locked in mortal combat. I imagine, though, that a pause feature would interfere with the operation of multiplayer games, and games don't last that long anyway.

Most game designers would have been satisfied at this point, but not the people at Burke & Burke. They include a separate utilities disk that permits hard disk and larger floppy drive systems to incorporate a larger dictionary. Among the utilities included are the following: `AddPert` and `DelPert`, which allow words to be added to or deleted from the dictionary; `AllWords`, which displays all the words in the dictionary; `CHKPert`, which looks up words and lists those not found in the dictionary; and `DiceWords`, which displays all the words in the dictionary that can be formed from a specific list of letters.

The ruthless manner in which *PertASCII* demolishes its opposition can be softened by editing an environment file that is part of the game system. The environment file can be edited with any word processor

difficulty. Even at the lowest level, I had trouble and pushed my troops too hard. It's a good thing that this is only a game, or I'm afraid that the good old United States of America would be populated with lots of red flags!

(SPORTSware, 1251 S. Reynolds Road, Suite 414, Toledo, OH 43615, 419-389-1515; $21)

—David Miller

Software OS-9 Level II

Nine-Times— An On-Disk OS-9 Magazine

OS-9 enthusiasts will be interested to know that there's a new magazine on disk devoted to the OS-9 operating system. It's called *Nine-Times*, and it's published six times a year. The magazine requires the use of a CoCo 3, 128K or 512K RAM, and OS-9 Level II. A joystick or mouse is recommended, but the program will work with the keyboard arrow keys using information provided in the four-page printed instructions. *Nine-Times* can also be installed onto a hard drive if you have one.

Running the magazine is fairly straightforward, assuming you have some operating knowledge of OS-9 Level II. 512K users will find it a lot easier than will 128K users, who must go through several steps to make room for *Nine-Times*.

If you have 512K, all you have to do for starters is merge the `STDFonts` and `STDPtrs` files contained in the `SYS` directory on your OS-9 master disk. You will also have to load the `RunB`, `SYSCall` and `Inkey` modules from the `CMDS` directory of your `BASIC09` config disk. Then after loading in any of the window screens other than the standard 32-column screen, you enter at the prompt: `OS9:mag`. After a few seconds the colorful Hi-Res main screen of *Nine-Times* appears.

Nine-Times uses the familiar point-and-shoot technique for selection of its options: Print Files, Departments, Articles and Programs. Each selection results in a pull-down menu with a list of various options available. Selecting Print Files lets you send text files to a printer if you have one hooked up. Departments has several files that tell you all about advertising rates in the magazine, subscription information, ordering back issues and similar information. The Articles selection contains various newsworthy items of interest, as well as tutorial programming examples. This is also the section of the magazine in which you will find editorial comments. Selecting Programs results in a listing of programs available in that issue of the magazine.

Making a selection of a program listed gives you a preview of what the program does and how to execute it, but you have to run the program outside of the *Nine-Times* magazine environment. I think it would be a nice feature to be able to run the programs from within the magazine framework, but, as it is, you can exit the magazine to get back to the OS-9 prompt. Because *Nine-Times* is memory-resident, you can simply type `runb magazine` to get back into the magazine environment. The review issue contained an assortment of 10 ready-to-run OS-9 utility programs. They all worked fine and are currently enjoying a spot on my hard drive.

Nine-Times is just the kind of software the OS-9 community needs. If OS-9 is to become a more popular operating environment, then it must also lend itself to becoming a little more user-friendly. *Nine-Times* is certainly that. The on-disk magazine is a nice idea, and editor Jordan Tsvetkoff is to be commended for such a well-designed program.

(JWT Enterprises, 5755 Lockwood Blvd., Youngstown, OH 44512, 216-758-7694; $34.95 per year for six issues)

—Jerry Semones

Software CoCo 1, 2 & 3

Roots— The Basics of Assembly Language

One of the things that keeps most people from programming in assembly language is the amount of work it takes to do very simple tasks. To print "hello" on the screen in BASIC, one merely types `PRINT "HELLO"`. In assembly language, doing the same thing requires many lines of code. That's why GSW Software has written *Roots*. *Roots* is an assembly language source code file that contains over 100 routines that take care of everything from disk and cassette I/O to reading the joystick ports to clearing the screen. Most of the routines will work on any Color Computer, but some will work only on the CoCo 3.

Roots comes on a disk that contains two files, `ROOTS.ASM` and `FONT.DAT`. The file `ROOTS.ASM` is an ASCII file containing the assembly source code. `FONT.DAT` is a font file containing a font for printing text on high-resolution graphics screens. Theoretically, the programmer who wants to use some of the routines from *Roots* just puts a line in his program that instructs his assembler to include the `ROOTS.ASM` source code. Then whenever he wants to use one of the routines, he sets up the required conditions and calls the routine with a `JSR` routine. For instance, to clear the CoCo 2 text screen to black, the following two lines are required:

```
LDA  #0
JSR CLSA
```

When I program, I use the C compiler and RMA under OS-9. However, before I purchased OS-9, I used *Color Disk EDTASM* for my assembly language programming. So, I pulled it off the shelf and shook off the dust. *EDTASM* would not load or include `ROOTS.ASM`. Every time I tried to load it I would get a bad line number error. I booted OS-9 and did some checking. As I mentioned earlier, `ROOTS.ASM` is a straight ASCII file. *EDTASM* has its lines strictly formatted with line numbers and tab characters. After deciphering *EDTASM*'s file format, I wrote a program to convert `ROOTS.ASM` to an *EDTASM* file. Once this was done, the file loaded and assembled perfectly. I then set out to write some programs.

I have a natural bent toward graphics, so I attempted to write a graphics program. Almost immediately I had problems. It seems to me that many of the CoCo 3 graphics routines were written specifically for a 128K CoCo. Since my CoCo has 512K, this caused problems. The routines would not allow me to set up the graphics screens where I wanted them, and would only clear them if they were within the 64K address space of the program. From my examination of the code, I believe they would work in 128K, but I had to modify them so they would do what I wanted them to do. The other routines I tried worked fine. The manual documents them quite well, so any programmer should be able to change things to suit his own tastes.

I found *Roots* to be a well-designed package. The 35-page manual provides complete descriptions of all the routines and variables used in the source code file, and also instructions for calling them. I recommend that the author include an *EDTASM* version of the file because I'm sure many people still use it. Also, the routines such as `LPEEK`, `LPOKE`, `LPUT`, `LGET`, etc., should be generalized to 512K. Aside from these criticisms, I thought *Roots* was very helpful and a great timesaver. If you plan to program in assembly under Disk `BASIC`, this is for you.

(GSW Software, 8345 Glenwood, Overland Park, KS 66212, 913-341-3411; $25)

—Robert L. Marsa

or OS-9's `Edit` command. The environment file lets the user set the time within which the players must find their words. The longer the time, the better chance you have to catch up to the computer. It also lets you handicap the computer by causing it to skip some of the words it may find in its dictionary, thus reducing its total count of words found.

By way of final notes, knowing how to type works to your advantage in this game. For most, however, this won't be a problem because the hard part is finding the words, not typing them. Also, the round time can be adjusted to compensate for hunt-and-peckers. Lastly, because of its multiuser design, *PertASCII* does not utilize graphics — so don't expect "Wheel of Fortune" type glitz.

Attention OS-9ers out there. This game is absolute proof that OS-9 can do things that are unrelated to work and business. Take a break. Playing *PertASCII* takes only a few minutes, and you're a better person for it. Start it up in another window so you won't feel guilty.

(Burke & Burke, P.O. Box 58342, Renton, WA 98058, 800-237-2409; $19.95 plus $3 S/H)

—Ernest F. Zore

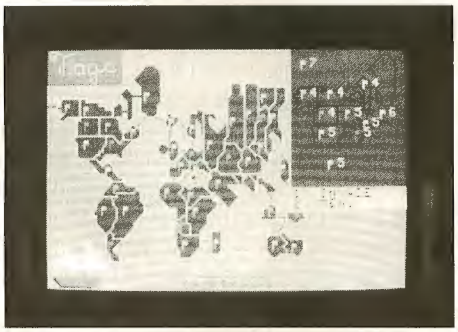
Software CoCo 3

CC3 Flags— Conquering the World

CC3Flags is a spinoff for one or more players of a popular military strategic board game. It comes on an unprotected disk and requires a CoCo 3, a disk drive and either a color composite or an RGB monitor. Although it plays best with a joystick, you can use the keyboard arrow keys. The game screen shows a somewhat crude but colorful representation of a world map. To the right of this map are various menus that let you zoom in on the continents of interest.

The object of *CC3Flags* is to conquer the world by occupying all of the territories. In order to do this, you must defeat the other players in combat for each territory. At the end of each turn, you receive additional troops based on the number or territories and continents that you control. Your ability to win depends on your use of force and strategic placement of troops.

From the menu you choose the specific continent in which you want to wage war. That continent will be displayed as a "zoomed" picture and show the flags representing the players. After selecting Invade from the menu, you select the country you want to attack by highlighting your flag.



You must have a minimum of two armies in a country in order to attack an adjacent country. You can continue to attack other countries until you run out of armies, but obviously this is not advisable. It's best to periodically reinforce your troops using an available menu option.

To successfully defeat your opponents you will need to practice good military strategy. Reckless attacks will almost always end in your defeat. It is vital that you control the entire continent before you move to others, otherwise your opponents will be able to reinforce their armies and invade your territories. You must also be careful of the placement of your armies once you have secured a continent. You want to mass your armies and then conduct a border crossing. In some instances you will find that just sheer numbers at a border will deter your opponent from attacking you.

As you can see, *CC3Flags* is filled with endless opportunities and strategies. If you like the board game *Risk*, you will enjoy *CC3Flags*. It's a game that can be played at your own leisure and at increasing levels of

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Received and Certified

The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, *your assurance that we have seen the product and have ascertained that it is what it purports to be.*

4-D Chess, a 3-D chess game with a time element. Users can "time out" their pieces for strategic effect. Comes on disk for the CoCo 3. *Microcom Software, 2900 Monroe Ave., Rochester, NY 14618, (800) 654-5244; $24.95 plus $3 S/H.*

CAR, the "Computerized Auto Record," a program that sets up a disk file for keeping track of automobile maintenance and costs. It reminds users when to change the oil, and rotate the tires, etc. Requires a CoCo 1, 2 or 3 with at least 64K ECB. *E.Z. Friendly, 118 Corlies Ave., Poughkeepsie, NY 12601, (914) 485-8150; $9.95 plus $1.50 S/H.*

CEBBS, a "CoCo Electronic Bulletin Board System" that runs on a CoCo 3, requiring an RS-232 pack, a Multi-Pak or Y-cable, at least one disk drive, and an auto-answer modem with a DTR lead. Features compatibility with *Hyper-I/O* and includes a 45-page manual. *KB Enterprises, 435 Brightwaters Drive, Cocoa Beach, FL 32931, (407) 799-3253; $59.95 plus $1.50 S/H. Also distributed by Microcom Software.*

Color Schematic Designer, an interactive schematics/CAD program for the CoCo 3 that features a workspace larger than the screen, pull-down menus, three circuit layers and three fonts. Requires a CoCo 3 and a disk drive. *Microcom Software, 2900 Monroe Ave., Rochester, NY 14618, (800) 654-5244; $39.95 plus $3 S/H.*

Donut Dilemma, an arcade game rewritten to support the CoCo 3. The player must fend off menacing, bouncing donuts and travel up through 10 bakery levels to throw the switch on "Antonio's Donut Factory." On disk for CoCos 1, 2 and 3. *Game Point Software, P.O. Box 6907, Burbank, CA 91510, (818) 566-3571; $19.95.*

Extended ADOS-3, a CoCo 3 enhanced DOS that shares space with *ADOS-3* in a 16K EPROM and adds the following: a 512K RAM disk; a menu utility for file execution; wildcard `COPY` and `KILL` commands; file dating; key repeat; block move/copy of BASIC lines; text screen dumps and more. For 128K/512K CoCo 3s with *ADOS-3. SpectroSystems, 11111 N. Kendall Drive., Miami, FL 33176, (305) 274-3899; $39.95 for disk, $64.95 with* ADOS-3, *$2 S/H.*

Font/Icon Editors, a utility disk of icon and font editors for Cer-Comp's *Window* software. Includes *IconEdit* (for creation and editing of icons — comes with a set of 16 icons) and *FontEdit* (for creating and editing character fonts). Comes on disk for the CoCo 3. Requires *Window Master. Cer-Comp, 5566 Ricochet Ave., Las Vegas, NV 89110, (702) 452-0632; $19.95 plus $3 S/H.*

KJV on Disk #39, the books of James, I Peter, II Peter, and I, II and III John of the King James version of the Bible on disk in ASCII files for the CoCo 1, 2 and 3. *BDS Software, P.O. Box 485, Glenview, IL 60025, (312) 998-1656; $3 S/H.*

Master DIR, a directory database program that lets the user create a master directory file of over 2200 disk directories from as many as 250 disks. Requires a CoCo 3 and a disk drive. *SPORTSware, 1251 S. Reynolds Road, Suite 414, Toledo, OH 43615, (419) 389-1515; $18.*

MC-1 Mini Controller, a floppy disk controller that works on CoCos 1, 2 and 3 with or without a Multi-Pak. Features a 24/28-pin socket, a switch for selecting between DOSs if a DOS pin is installed, and gold-plated edge connectors. *C.R.C. Computers, 11 Boul. des Laurentides, Laval, Quebec, Canada H7G 2S3, (514) 967-0195; $75.*

Omni Utility 2.0, an update of the disk utility featuring support for multiple drives, capability for backing up a section of a disk as opposed to a whole disk at a time, and the ability to compare two files to see if they are exact duplicates. On disk for the CoCo 3. *GSW Software, 8345 Glenwood, Overland Park, KS 66212, (913) 341-3411; $20.*

Revenge of the Mutant Miners, a version of the *Mutant Miners* arcade game written for the CoCo 3 and a disk drive; joystick required. Players travel up 10 levels of mines, using ladders, transporters and springboards, avoiding mutants all the while. *JR & JR Softstuff, P.O. Box 118, Lompoc, CA 93438, (805) 735-3889; $19.95 plus $3 S/H.*

The Seventh Link, an epic Adventure in which the player must guide a party of travellers as they try to save their homeworld of Elira from destruction. Features scrolling-screen graphics, dungeons, sea journeys and battles with monsters. On disk for the CoCo 3. *Oblique Triad, 32 Church St., Georgetown, Ontario, Canada L7G 2A7, (416) 877-8149; $38 U.S., $48 Cdn.*

Slots & Cards, a computerized trip to the gaming tables of Vegas. Players can try their luck at five slot machines, four video card games (including Blackjack and Five-Card Draw) and keno. Features color graphics and comes in a three-disk set for CoCos 1, 2 and 3. *MichTron, 576 S. Telegraph, Pontiac, MI 48053, (313) 334-5700; $39.95.*

Snake Pit, a one- or two-player "wormy"-type game on disk for CoCos 1, 2 and 3. Players try to block off each other's snake without running into walls or snake bodies. *Game Point Software, P.O. Box 6907, Burbank, CA 91510, (818) 566-3571; $19.95.*

◆F **SofScrn**, an ML text enhancement utility (40- and 80-column) that lets users design non-destructive text screens, offering control of the destructive carriage return and cursor. Users can print to or erase from screen without clearing other data. On disk for the CoCo 3. *W. Lee Pearson, P.O. Box 2319, Owensboro, KY 42302, (502) 684-5680; $14.95 plus $2.50 S/H.*

Window Master V.2.21, an upgrade of a windowing environment under Disk BASIC. Features include support for multiple fonts and up to 31 windows. New features include a revamped calendar program, graphics demos, and a configuration program. Requires a 128K or 512K CoCo 3, a disk drive, a Hi-Res Interface, and a joystick or a mouse. *Cer-Comp, Ltd., 5566 Ricochet Ave., Las Vegas, NV 89110, (702) 452-0632; $69.95 plus $3 S/H.*

◆F **First product received from this company**

The *Seal of Certification* is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the program does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.

—Lauren Willoughby

A technique for creative ventures

The Art of Graphics Characters

By Joseph Kolar
Rainbow Contributing Editor

There is more than one way to skin a cat, and more than one way to create the graphics characters CHR$(128) through CHR$(143), which we produced in the last tutorial.

Two things inspired this lesson. First, I wondered if the program could be tightened up and made shorter. If so, how? Secondly, creating our set doesn't confine us to the 16 traditional shapes in the set. Practice is required to master GET/PUT, but as you become familiar with it, you will choose this technique for creative ventures.

Look at Listing 1. It is a variant of Listing 2 from the last lesson. If you saved it, load it and do some deleting to put it into shape for this tutorial. If you didn't save it, start typing!

Delete lines 700 through 900, 210, 250, 290, 310, 330, 350, DRAW lines and the mating GET lines, 410, 450, 490, 510, 530 and 550.

Type EDIT2 and press ENTER. Type 40 and press the space bar until the cursor is under the comma after H(2). Then press H (to chop off the line) and type B1(2),D1(2),I(2),J(2) and press ENTER. It is easier when deleting individual lines to key in the line number to be deleted and press ENTER.

You may mask or unmask Line 999, your utility, whenever you want during this session. If the cross-hairs bug you, mask Line 60.

Turn your attention to the GET lines beginning with Line 400. The variables that constructed A1, C1, E1, F1, G1 and H1 are gone. Ignore the variables I and J for now. There is an alternate way to create the six deleted shapes, by using PRESET after the mate to be created.

Add the test line: 700 PUT(64,48)-(72,60),A,PSET. Then run the program. Type EDIT700, press ENTER and X to end. Backspace three spaces to get under the S, and type RESET and press ENTER to change PSET to PRESET. Then run the program. We changed CHR$(128) to CHR$(143). The best method to create a blank is to skip the area and print nothing. Another way to set these two characters will be introduced in the next tutorial.

Change Line 700 to end ,B,PSET. Then run the program. Add Line 710: 710 PUT(192-48)-(200,60),B,PRESET. Then run the program.

Note the two different renditions of B. The reverse image lost something in the translation; the color-filled parts have priority, and PRESET changed them to blanks. The balance of the graphics character was color-filled. That's why we didn't delete B1. We need it to make an accurate representation of CHR$(134).

Change Line 710 to end ,B1,PSET. Then run the program. Add these lines:

```
720 PUT(64,144)-(72,156),C,PSET
730 PUT(192,144)-(200,156),C,PRESET
```

Then run the program.

This pair, CHR$(131) and CHR$(140), come out fairly well. The distortion is there but is small enough to be inconsequential.

Change the variables in lines 720 and 730 to D. Then run the program. Here is a bad replication. Since there are only eight spaces on the horizontal, Line 720 paints four lines and leaves four blank. In the reverse image, it seems as if five are blank and three painted. Mask Line 999 to see it properly. Then run the program. It is too obvious, so substitute in Line 730, D1,PSET for D,PRESET and run the program again.

Change the variable in Line 700 to E and change Line 710 to end, E,PRESET and run the program. CHR$(132) is narrow, as predicted, in the upper-left quadrant, but acceptable.

In succession, change the variables in lines 700 through 710 to F,G,H. Then run the program.

When you have viewed them all and feel them to be adequate, Table 1 shows the variable endings to create the characters.

Delete lines 700 through 730. Here is a challenge. Using the PRESET variables, E, F, G and H, butt the four units against each other to make a cross. It is elongated due to the nature of the graphic set, which was made in a 2:3 ratio, (narrower than long). Also, we have a narrow section due to using PRESET. (There are ways to get an accurate representation, but it is an involved process. You may want to cogitate and try to solve the problem.)

To demonstrate creating new shapes to augment a normal complement of graphics characters, I decided to create two diagonal characters. Key in lines 360, 380, 560 and 580 from Listing 1.

To check Variable I, key in Line 720 and run the program. Next, key in Line 750 and run the program. Note that the mates are slightly different.

To check Variable J, key in Line 730 and run the program. Then key in Line 760 and run the program. The PRESET I and J characters are slightly smaller because of the previously encountered mating distortion.

We will now make a design from these newly-developed diagonals. To better understand it, use real graph-paper to plot what each line adds to the program.

CHR$	(128)	A,PSET	CHR$(143)	reserve blank space
	(137)	B,PSET	(134)	B1, PSET
	(131)	C,PSET	(140)	C1, PSET
	(133)	D,PSET	(138)	D1, PSET
	(139)	E,PSET	(132)	E1, PRESET
	(142)	F,PSET	(129)	F1, PRESET
	(141)	G,PSET	(130)	G1, PRESET
	(135)	H,PSET	(136)	H1, PRESET

Florida-based Joseph Kolar is a veteran writer and programmer who specializes in introducing beginners to the powers of the Color Computer.

I used each quad-ruled square to represent a single graphics character. Each box was slashed and colored to reflect the part of the design placed in that area. Coordinates were marked along the perimeter so the upper left-hand coordinates could be plucked out.

Key in lines 700, 710, 740 and 770 through 830. Then run the program. Just to see what happens add `K(90)` to Line 2. Now enter the following lines:

```
840 GET(96,48)-(160,96),K,G
841 PUT(96,96)-(160,144),K,PSET
```

Then run the program. A `GET` was made out of the mess created in lines 700 through 830. My plan was to put it on upside-down, so I wouldn't have to key in lines 840 through 980. I failed, but now know that I can save a `PUT`, and with an appropriate `GET` and `DIM`, it can be placed elsewhere on the screen.

Remove `,K(90)` from Line 2 and delete lines 840 and 841. Key in lines 840 through 980 and run the program.

Unless you are looking for detail, you are not likely to notice that the design needs color in the middle. Key in Line 990 and run.

We can use curliques at the four 90-degree angle corners. Usually, I would move lines 999 and 1000 to a higher number to make room, without destroying the tutorial format. The lines were bypassed. Key in lines 995 and 2000 through 2100 to add the four elements and run the program.

To get a variation, change the ends of lines 2000 through 2030 to read respectively `B`, `B1`, `B`, `B1`, all four `PRESET`. Then run the program.

You are encouraged to play with this program after you save it and then take a break.

In Listing 1 we tightened up a program — that is, shortened it, not necessarily made it simpler. The idea was to tighten-up the graphics character set. What other interesting shapes can we create?

If you glance at Listing 2, you'll notice a familiar format. Load in the first listing. Delete lines 200 through 995 and Line 2000 and rekey Line 2 from Listing 2.

Line 200 is a diamond made using only the M option. Line 210 is a hexagon and Line 220 is a couple of bars. Use graph-paper to rough out the designs.

Key in lines 200 through 630 and run the program. The three designs are displayed side-by-side. You can see why CoCo's designers didn't include graphics boxes using diagonal lines. Nevertheless, the designs are interesting and provide grist for our graphics mill.

Change lines 610 through 630 from `PSET` to `PRESET` and run. It's not very impressive. We have three designs to use as elements in a design.

In Line 699, we chose a set of starting coordinates (`80,80`), which do not coincide with the `PRINT@` utility.

If you want to be consistent, pick any set of coordinates that begin at the upper left-hand intersection of a selected graphics box.

The beauty of using the (x,y) system is that, at any time, a design consisting of many program lines may be maneuvered to a new location by changing the value of one or both of the variables in a single program line.

Key in Line 700 and run the program. Around the four sides of this shape, we add the other units. List Line 700. The starting coordinates are (x,y). We know each design element occupies an 8-by-12 matrix. In order to place a design above the one that begins at (x,y) the horizontal coordinate remains the same. The vertical coordinate must move 12 spaces up.

The rule is: From the point of origin, a movement down or to the right is positive, (plus, or +). If the movement from the point

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of origin is up or to the left, it is negative, (minus or -). If *y*, the vertical coordinate is up 12 units, it follows that *y*=*y*-12. The starting coordinates are (*x*,*y*-12). To determine the ending coordinates, we add to *x*,*y*-12 plus +8,+12=*x*+8,*y*-12+12=*y* or (*x*+8,*y*), the ending coordinates. Key in Line 710 and run the program.

The rules don't change in midstream. Regardless of positive or negative starting coordinates, we must always add the offset to get the ending coordinates.

Key in Line 720. From its contents, can you tell where it will be located in relationship to the central element? Take a considered guess, then run the program.

Remember, every location is based on *x*,*y* as defined in Line 699 — not the last program line written.

Since the box is directly underneath the box beginning at (*x*,*y*), *x* remains unchanged, coordinate *y* must begin 12 units in a down (positive) direction, or *y*=*y*+12, (*x*,*y*+12). The offset, +8,+12 is added to get the ending pair of coordinates, *x*+8; *y*+12+12=*y*+24; or (*x*+8, *y*+24).

Key in Line 730. Where do you expect to see it located? Run the program. We intend to place this element to the left of the centerpiece. Our rule tells us that left from the point of origin is negative.

From the point of origin, (*x*,*y*), we set *x* to *x*-8, to allow for the eight space width. It occupies the same row as the central unit, so *y* remains unchanged (*x*-8,*y*). The offset is added, +8,+12; -8+8=0 so *x*=*x*; *y*=*y*+12, or (*x*,*y*+12), the ending coordinates.

Key in Line 740. The element falls to the right of the central unit, a positive direction. To allow for the width of the central element, *x* must begin at *x*+8. We add +8 to get the end value, *x*+26. Again, the *y* values remain unchanged. They can be extracted from any previous line along the same row, *y* and *y*+12 or (*x*+8,*y*)-(*x*+16,*y*+12). Then run the program.

Change the values of Line 699 to a value less than or equal to *x*=232:*y*=168. Then run the program.

Design time! Rekey Line `699 X=24 Y=168`. We have moved the entire five unit design. Now run the program.

What is the least value you can change *x* to? A clue is in the error message ?FC ERROR in 730.

Something in Line 730 is rejected, so the error must be in a line that provides data to Line 730. The variables *x*,*y*, and *I* are the prime suspects. I checked the line that provides *x*,*y* values first, and am sure *I* is alright. It worked previously, meaning `DIM`, `DRAW` and `GET` lines with *I* are operational. `LIST699` provides the initial value of *x*,*y*.

CoCo demands that *x*=8 or higher. Referring to Line 730, I see that if *x*=7, then 7-8=-1, or off the screen.

Rekey Line 699 as `X=8:Y=168:`, then run the program. Add `FOR X=16 TO 232 STEP 24`. Add Line 750 as `NEXT` and run the program again. There is a nice row at the bottom — our design is three graphics characters wide, or 24 units. The Step 24 allows ten 24 unit sections to be placed in the row in succession. To get an assist from the utility to get the values for the `FOR/NEXT` loop, unmask Line 999. Beginning at eight on the horizontal balances the design units. Manually counting the spaces, 10 designs will fit. I wanted the horizontal starting coordinate of the 10th design on the row. Each design is 24 units wide. Nine full units occupy 216 spaces plus 16 units offset equals 232, the starting horizontal coordinate of the 10th design.

We might as well make a nested `FOR/NEXT` loop and give *y* a workout. Add at the end of Line 699 `:FOR Y=24 to 132 STEP 32` and rekey Line 750 as `NEXTY,X` and `DEL610-630`. Then run the program.

Unless you looked carefully, you may not notice a mistake. The entire panel is well-centered, forced to balance, and the length of the three vertical boxes is 36, not 32.

Change Line 699 so `STEP32` becomes `STEP36`. Then run the program. The design is O.K., but not the vertical centering. One way to solve the problem is a two-step maneuver. First, we add another row of designs.

In Line 699, change `132` to `168`. Run the program and verify that the row is properly placed. We saw the empty top row. To center it vertically, move up to halve the empty row. Since we are going up, (the rule says negative), we divide the length of the box, 12-by-2. It is a negative direction so it is -6. Adjust Line 699 from `24` to `18` in the *y* loop. Then run the program.

By trial and error I determined the values to make a large box. Key in the line `760 COLOR4:LINE(34,4)(233,148),PRESET,BF`. Then run the program. You probably don't expect this when starting with the test display of the three graphics characters. It makes a nice title panel, so save it.

❑

Listing 1: `DIAMOND1`

```
0 'LISTING1
1 CLEAR500
2 DIM A(2),B(2),C(2),D(2),E(2),F
(2),G(2),H(2),B1(2),D1(2),I(2),J
(2)
3 GOTO199
10 PMODE3,1:PCLS:SCREEN1,0
20 A$="R64D3L64D3":B$=A$+A$+A$+A
$
30 C$="S4D191R8U191R8":D$=C$+C$+
C$+C$
40 DRAW"S16C4BM0,0"+B$+B$+B$
50 DRAW"BM0,0"+D$+D$+D$+D$:DRAWD
$
60 DRAW"C2BM128,0D96NL128NR128D9
6C4"
99 GOTO99
199 PMODE3,1:PCLS
200 DRAW"BM0,0R8D12L8U12":PAINT(
2,2),4,4
220 DRAW"BM20,0BR4R4D6L8D6R4U12"
:PAINT(26,2),4,4:PAINT(22,8),4,4
230 DRAW"BM30,0R4D12R4U6L8U6":PA
INT(32,2),4,4:PAINT(36,8),4,4
240 DRAW"BM40,0R8D6L8U6":PAINT(4
2,2),4,4
260 DRAW"BM60,0R4D12L4U12":PAINT
(62,2),4,4
270 DRAW"BM70,0BR4R4D12L4U12":PA
INT(76,2),4,4
280 DRAW"BM80,0BR4R4D6L4U6":PAIN
T(86,2),4,4
300 DRAW"BM100,0BD12BR4R4U6L4D6"
:PAINT(106,8),4,4
320 DRAW"BM120,0BD6R4D6L4U6":PAI
NT(122,8),4,4
340 DRAW"BM140,0R4D6L4U6":PAINT(
142,2),4,4
```

```
360 DRAW"BM160,0R8M-8,12U12":PAI
NT(162,2),4,4
380 DRAW"BM180,0R8D12M-8,-12":PA
INT(186,2),4,4
400 GET(0,0)-(8,12),A,G
420 GET(20,0)-(28,12),B,G
430 GET(30,0)-(38,12),B1,G
440 GET(40,0)-(48,12),C,G
460 GET(60,0)-(68,12),D,G
470 GET(70,0)-(78,12),D1,G
480 GET(80,0)-(88,12),E,G
500 GET(100,0)-(108,12),F,G
520 GET(120,0)-(128,12),G,G
540 GET(140,0)-(148,12),H,G
560 GET(160,0)-(168,12),I,G
580 GET(180,0)-(188,12),J,G
600 PCLS:SCREEN1,0
700 PUT(120,48)-(128,60),I,PRESE
T
710 PUT(128,48)-(136,60),J,PRESE
T
720 PUT(120,60)-(128,72),I,PSET
730 PUT(128,60)-(136,72),J,PSET
740 PUT(112,72)-(120,84),I,PSET
750 PUT(120,72)-(128,84),I,PRESE
T
760 PUT(128,72)-(136,84),J,PRESE
T
770 PUT(136,72)-(144,84),J,PSET
780 PUT(96,84)-(104,96),I,PRESET
790 PUT(104,84)-(112,96),I,PSET
800 PUT(112,84)-(120,96),I,PRESE
T
810 PUT(136,84)-(144,96),J,PRESE
T
820 PUT(144,84)-(152,96),J,PSET
830 PUT(152,84)-(160,96),J,PRESE
T
840 '*******HORIZ. PLANE******
850 PUT(96,96)-(104,108),J,PSET
860 PUT(104,96)-(112,108),J,PRES
ET
870 PUT(112,96)-(120,108),J,PSET
880 PUT(136,96)-(144,108), I,PSE
T
890 PUT(144,96)-(152,108),I,PRES
ET
900 PUT(152,96)-(160,108),I,PSET
910 PUT(112,108)-(120,120),J,PRE
SET
920 PUT(120,108)-(128,120),J,PSE
T
930 PUT(128,108)-(136,120),I,PSE
T
940 PUT(136,108)-(144,120),I,PRE
SET
950 PUT(120,120)-(128,132),J,PRE
SET
960 PUT(128,120)-(136,132),I,PRE
SET
970 PUT(120,132)-(128,144),J,PSE
T
980 PUT(128,132)-(136,144),I,PSE
T
990 PUT(126,90)-(134,102),D,PSET
995 GOTO2000
999 'GOTO20
1000 GOTO1000
2000 PUT(104,60)-(112,72),B1,PSE
T
2010 PUT(144,60)-(152,72),B,PSET
2020 PUT(104,120)-(112,132),B,PS
ET
2030 PUT(144,120)-(152,132),B1,P
SET
2100 GOTO999
```

Listing 2: DIAMOND2

```
0 'LISTING2
1 CLEAR500
2 DIM K(2),L(2),M(2)
3 GOTO199
10 PMODE3,1:PCLS:SCREEN1,0
20 A$="R64D3L64D3":B$=A$+A$+A$+A
$
30 C$="S4D191R8U191R8":D$=C$+C$+
C$+C$
40 DRAW"S16C4BM0,0"+B$+B$+B$
50 DRAW"BM0,0"+D$+D$+D$+D$:DRAWD
$
60 DRAW"C2BM128,0D96NL128NR128D9
6C4"
99 GOTO99
199 PMODE3,1:PCLS
200 DRAW"BM200,0BR4M+4,6M-4,6M-4
,-6M+4,-6":PAINT(204,2),4,4
210 DRAW"BM220,0BD4E4F4D4G4H4U4"
:PAINT(224,2),4,4
220 DRAW"BM240,0R8D4NL8D4NL8D4L8
U12":PAINT(242,6),4,4
400 GET(200,0)-(208,12),K,G
410 GET(220,0)-(228,12),L,G
420 GET(240,0)-(248,12),M,G
600 PCLS:SCREEN1,0
610 PUT(128,96)-(136,108),K,PSET
620 PUT(144,96)-(152,108),L,PSET
630 PUT(160,96)-(168,108),M,PSET
699 X=80:Y=80
700 PUT(X,Y)-(X+8,Y+12),M,PRESET
710 PUT(X,Y-12)-(X+8,Y),K,PSET
720 PUT(X,Y+12)-(X+8,Y+24),K,PSE
T
730 PUT(X-8,Y)-(X,Y+12),L,PSET
740 PUT(X+8,Y)-(X+16,Y+12),L,PSE
T
999 'GOTO20
1000 GOTO1000
```

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget this is* BASIC. *All programs resulting from your wishes are for your use, but remain the property of the author.*

Attention compact disc users

More Time Applications

By Fred B. Scerbo
Rainbow Contributing Editor

It is always a pleasure to get letters from readers who are using a specific program that I have listed. This month's offering is the result of a reply and a request I received several weeks ago. It will also be a big bonus to the many CD (Compact Disc) owners around the country who are lucky enough to use a CoCo.

The Mail

Mr. Donald Villiard of Starkville, Mississippi, recently wrote: "Your article in the April '89 issue ('How Much Time?', Page 89) aroused my interest. I saw where you added and subtracted time intervals. Although I have limited use for the program as it appears in the article, I do have a problem with adding time."

"I am an office manager for the Mississippi State Department of Health and one of my duties includes the verification of individuals' Time Study forms, which must be verified each month. At present I have approximately 25 such Time Study forms to check and double check monthly. . . . Since your program is the first I've seen that deals with time, I was wondering if you could help me to write a program to add time. . . . Any help would be greatly appreciated."

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

While there have been programs written to deal with adding time, I have never written one. *Time Card* was designed to figure out the difference between time-clock entries.

What Mr Villiard needs, instead, is a program allowing him to add increments of time, which is not what *Time Card* does. Therefore, the program has been completely rewritten to allow the entry of different data, with different results. Best of all, there is another use.

Attention CD Users

One of my biggest vices is buying music recorded on digital compact discs (CDs). Once I heard the quality of digital sound, I realized I could never buy albums or pre-recorded tapes again.

However, I do like to make tapes of my CDs to play on my car stereo. The biggest problem I usually face in making these tapes is fitting the correct amount of music on the correct length tape.

Real Time, as it turns out, also helps add up the time each song runs, so I can make a tape of the right length. Since the time can be viewed as "minutes:seconds," as well as "hours:minutes," this little calculator program can add minutes or hours.

Therefore, all you home taping folks now have a program to make your task a little easier.

How the Program Works

Remember, time is added on a base 60 number system. A minute turns over after 59 seconds. The same goes for minutes and hours.

Real Time lets you add using a base 60 number system so you can accurately add individual time amounts from a list. You may consider the amounts as minutes with seconds, or as hours with minutes. The readout is the same.

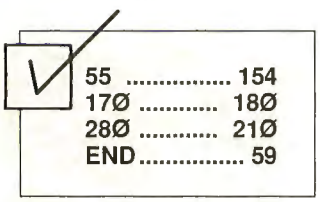
The program is also designed to add no more than 99 hours or 99 minutes. This should be suitable for both purposes, since no one should be working a 99 hour week, and few people use longer than a C-90 (90 minute) length cassette tape.

Running the Program

On running the program, you see our standard title card. Pressing ENTER starts the program. You are then asked to enter the first time amount. Twelve hours and fifteen minutes, for example, is entered as:

1 - 2 - 1 - 5

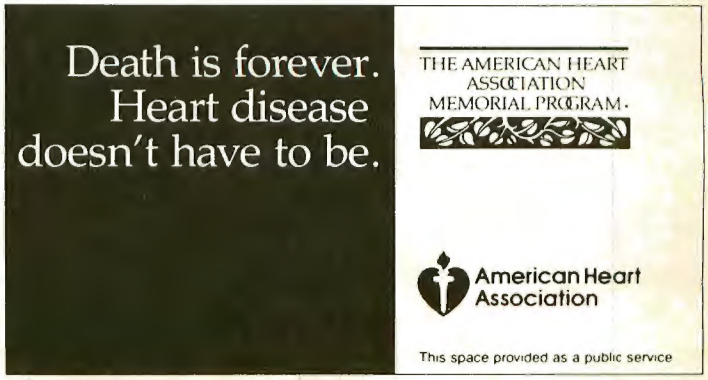
A four-digit number does not require pressing ENTER, while a shorter number like 2:15 or :15 does. After entering the next number to add, the total appears on the screen. You may continue adding by pressing the space bar. At this point, you need only add the next number to go on. Running totals are carried forward. If you wish to restart the program, simply press CLEAR and the totals are reset. Be sure to type slowly. You really cannot correct mistakes if you type too quickly. That's all there is to it. It is different from *Time Card*. I hope all of you can find some use for it besides Mr. Villiard. Until then, keep those ideas coming in. ❑



The listing: REALTIME

```
1 REM**************************
2 REM*   REALTIME CALCULATOR   *
3 REM*   COPYRIGHT (C) 1989    *
4 REM*    BY FRED B. SCERBO    *
5 REM*    6Ø HARDING AVENUE    *
6 REM*  NORTH ADAMS, MA Ø1247  *
7 REM**************************
8 CLEAR1ØØØ
9 CLSØ
1Ø PRINTSTRING$(32,188)STRING$(3
2,2Ø4);
15 FORI=1TO 16Ø :READ A:PRINTCHR
$(A+128);:NEXT
2Ø PRINTSTRING$(32,195)STRING$(3
2,179);
```

```
25 PRINT@358," REALTIME CALCULAT
OR ";
30 PRINT@390,"  BY FRED B. SCERB
O  ";
35 PRINT@422," COPYRIGHT (C) 198
9  ";
40 DATA94,92,94,92,90,93,88,93,9
2,93,92,93,88,93,92,92,90,21,28,
28,26,30,28,29,20,30,,,21,28,28,
29
45 DATA88,80,90,,88,85,,85,,85,,
85,,85,,80,82,21,,,,26,,21,,26,,
,21,,,
50 DATA,,90,,,85,,85,,85,,85,,85
,92,92,90,21,,,,30,28,29,,26,,,2
1,,,
55 DATA,,90,,,85,,85,,85,,85,,85
,,,80,21,,,,26,,21,,26,,,21,,,
60 DATA,81,91,,,87,82,87,82,,,87
,82,87,83,83,90,21,19,19,26,27,1
6,23,17,27,19,23,21,19,19,23
65 MM=1
70 IFINKEY$<>CHR$(13)THEN70
75 A$(4)="00:00"
80 A$(1)="00:00":A$(2)="00:00":A
$(3)="00:00"
85 CLS:GOSUB90:GOTO165
90 PRINT@0,"";:PRINT:PRINT
95 PRINTTAB(5)"TIME ADDING CALCU
LATOR"
100 PRINT
105 IF MM=2THENPRINTTAB(5)"LAST
ENTRY       "A$(1):GOTO115
110 PRINTTAB(5)"FIRST ENTRY:
 "A$(1)
115 PRINT
120 IFMM=2THENPRINTTAB(5)"NEXT E
NTRY:       "A$(2):GOTO130
125 PRINTTAB(5)"SECOND ENTRY:
 "A$(2)
130 PRINT
135 PRINTTAB(5)"TIME ELAPSED:
 "A$(3)
140 PRINT
145 PRINT
150 PRINTTAB(5)"PRESS SPACEBAR F
OR MORE"
155 PRINTTAB(5)"PRESS CLEAR FOR
RESTART"
160 RETURN
165 REM START CALCULATIONS
170 FORQ= MM TO2
175 FORI=1TO4
180 X$=INKEY$:IFX$=""THEN180
185 IFX$=CHR$(13)THEN240
190 IFX$=" "THEN80
195 IFX$=CHR$(12)THENZ$="":MM=1:
GOTO75
200 X=ASC(X$)-48:IFX<0THEN180
205 IFX>9THEN180
210 Z$=Z$+X$
215 IFI=1THENA$(Q)="00:0"+Z$
220 IFI=2THENA$(Q)="00:"+Z$
225 IFI=3THENA$(Q)="0"+LEFT$(Z$,
1)+":"+RIGHT$(Z$,2)
230 IFI=4THENA$(Q)=LEFT$(Z$,2)+"
:"+RIGHT$(Z$,2)
235 GOSUB90:NEXTI
240 Z$=""
245 CH=VAL(MID$(A$(Q),4,1)):IF C
H=>6THEN Z$="":A$(Q)="00:00":GOS
UB90:GOTO175
250 NEXTQ
255 A(2,2)=VAL(LEFT$(A$(2),2)):A
(2,1)=VAL(RIGHT$(A$(2),2))
260 A(1,2)=VAL(LEFT$(A$(1),2)):A
(1,1)=VAL(RIGHT$(A$(1),2))
265 A(3,1)=A(1,1)+A(2,1):IF A(3,
1)=>60 THEN A(1,2)=A(1,2)+1:A(3,
1)=A(3,1)-60
270 A(3,2)=A(1,2)+A(2,2)
275 C$=STR$(A(3,2)):IF LEN(C$)=2
 THEN C$="0"+RIGHT$(C$,1) ELSE C
$=RIGHT$(C$,2)
280 D$=STR$(A(3,1)):IF LEN(D$)=2
 THEN D$="0"+RIGHT$(D$,1) ELSE D
$=RIGHT$(D$,2)
285 A$(3)=C$+":"+D$
290 GOSUB90
295 C(1)=VAL(C$):D(1)=VAL(D$)
300 C(2)=VAL(LEFT$(A$(4),2)):D(2
)=VAL(RIGHT$(A$(4),2))
305 D(3)=D(1)+D(2):IF D(3)=>60 T
HEN D(3)=D(3)-60:C(1)=C(1)+1
310 C(3)=C(1)+C(2)
315 C$=STR$(C(3)):IFLEN(C$)=2 TH
EN C$="0"+RIGHT$(C$,1) ELSE C$=R
IGHT$(C$,2)
320 D$=STR$(D(3)):IFLEN(D$)=2 TH
EN D$="0"+RIGHT$(D$,1) ELSE D$=R
IGHT$(D$,2)
325 A$(4)=C$+":"+D$
330 GOSUB90
335 X$=INKEY$:IFX$=""THEN335
340 IFX$=" "THEN355
345 IFX$=CHR$(12)THEN MM=1:GOTO7
5
350 GOTO335
355 A$(1)=A$(3):MM=2:A$(2)="00:0
0":A$(3)="00:00":GOTO85
```

Novices Niche

THE RAINBOW is a teaching environment and we realize that the majority of our readers will always be beginners. In our continuing effort to always keep the new user in mind, and in addition to the many beginner feature articles and programs published in every issue, "Novices Niche" contains shorter BASIC program listings that entertain as well as help the new user gain expertise in all aspects of the Color Computer: graphics, music, games, utilities, education, programming, etc.

Graphics

As The World Turns

By Michael P. Kraft

16K ECB

Although sine and cosine may not seem particularly exciting in themselves (or as part of a math assignment), they can be very useful in graphics programs that draw circles or ellipses. This program draws eight graphics screens in PMODE 0, then uses the time-honored "page-flipping" method to produce animation. The result is a two-dimensional simulation of a three-dimensional rotating sphere.

The program begins by drawing a circle that will become the outer boundary of the sphere. Next, the program calculates and draws vertical cross sections, which, on a real sphere, take the form of circular arcs when viewed head on. After completing one graphics screen, the program begins another, moving the location of the arcs to simulate rotation of the sphere. When all eight screens are drawn, the program enters a loop, which displays each screen in rapid succession.

This method of animation can be used with any symmetrical object. Note that the speed of rotation can be increased or decreased by changing the length of the delay loop in Line 270. Also, before running the program, be sure to type PCLEAR8 to reserve enough memory for the graphics screens.

The Listing: WORLD1

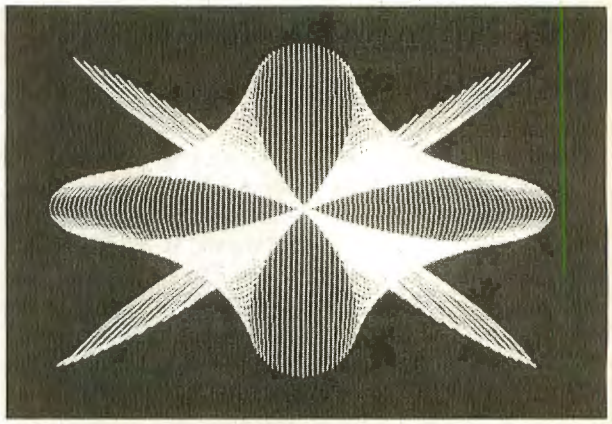
```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 '    AS THE WORLD TURNS
20 ' (C) 1989 MICHAEL P. KRAFT
30 '
40 POKE65495,0
50 R=90
60 FORS=1TO8
70 PMODE0,S:COLOR0,1:PCLS:SCREEN
1,0
80 F=0
90 '**CALCULATE OUTER CIRCLE**
100 A=1.5708:FORP=1.5708TO7.8540
STEP20/R:F=F+1:GOSUB290
110 NEXTP
120 '**CALC. ELIPSES ON LEFT**
130 M=(S-1)*.03927
140 FORA=1.5708-M TO1.5708/10-M
STEP-1.5708/5
150 FORP=1.5708TO4.7124STEP20/R
160 F=F+1
170 GOSUB290
180 NEXTP:F=0:NEXTA
190 '**CALC. ELIPSES ON RIGHT**
200 FORA=0+M TO1.5708STEP1.5708/
5
210 FORP=1.5708TO-1.5708STEP-20/
R
220 F=F+1
230 GOSUB290
240 NEXTP:F=0:NEXTA
250 NEXTS
260 '**"FLIP" GRAPHICS PAGES**
270 FORS=1TO8:PMODE0,S:SCREEN1,0
```

```
:FORD=1TO40:NEXTD,S:GOTO270
280 '**DRAW ELIPSES ON SCREEN**
290 IFF=1THENXX=128:YY=186ELSEXX
=X:YY=Y
300 X=SIN(A)*COS(P)*R+128
310 Y=SIN(P)*R+96
320 LINE(XX,YY)-(X,Y),PSET
330 RETURN
```

3-D Grapher

By John Mosley

CoCo3



You can create some exotic graphics using 3-variable equations and a little trigonometry. To see some 3-D graphics just type in the listing and run the program. To stop the program press BREAK. To use your own equations, edit Line 120 and change it to `Z =` (your own equation using `X` and `Y`). Some interesting ones are `Z = SIN (COS (X/Y))` and `Z = SIN ( X* Y*.0001 )`.

The Listing: GRAPH

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 POKE65497,0:X=-300:Y=-90
20 HSCREEN4:PALETTE0,0:HCLS0:PAL
ETTE1,63:HCOLOR1
30 GOSUB 150
40 FORX=-300 TO 300 STEP S
50 GOSUB 120
60 HLINE(320+X*Z,96-(90*Z))-(320
+X*Z,96-(90*Z)),PSET
70 FORY=-90 TO 90 STEP T
80 GOSUB 120
90 HLINE-(320+(X*Z),96+(Y*Z)),PS
ET
100 NEXTY,X
110 GOTO 130
120 Z=COS(X*Y*.0001):RETURN
130 ON BRK GOTO 140:GOTO 130
140 END
150 S=6:T=6:RETURN
```

But It's Not Winter Yet!

By Andre Needham

16K ECB

Yes, I know no one wants to think of winter yet, but this snowflake is just a computer generated image. Its formal name is "von Koch Snowflake Curve," and it is generated recursively from a triangle in the following manner: Take each side of the triangle and remove the middle third. Now, add two-thirds of a smaller triangle to each side to reconnect the lines. Do this over and over (recursively) and you get a snowflake.

Using this program couldn't be simpler — just type it in and run it. Each successive generation is displayed on the screen while the next one is being computed. Once it appears that the snowflake has stopped growing, press any key to watch it again, or press BREAK to stop the program.

The Listing: SNOFLAKE

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 DIMX(1026),Y(1026),A(1026)
20 IX=0
30 X(1)=128:Y(1)=10:X(2)=188:Y(2
)=114:X(3)=68:Y(3)=114:X(4)=128:
Y(4)=10:IT=4:PT=4:A(1)=2:A(2)=3:
A(3)=4:A(4)=0:MT=7
40 PMODE4,1:SCREEN1,1:PCLS0:COLO
R1,0:LP=1:CC=0
50 X=X(LP):Y=Y(LP)
60 IFCC=0 THENDRAW"BM=X;,=Y;":CC
=1
70 LINE-(X,Y),PSET
80 LP=A(LP):IFLP=0 THEN 90 ELSE
50
90 IFIX=IT THEN 200
100 GOSUB110:GOTO40
110 LP=1
120 LQ=A(LP)
130 XK=(X(LQ)-X(LP))/3:YK=(Y(LQ)
-Y(LP))/3
140 X(MT)=X(LP)+XK:X(MT+2)=X(LP)
+XK+XK:Y(MT)=Y(LP)+YK:Y(MT+2)=Y(
LP)+YK+YK
150 X(MT+1)=(X(LP)+X(LQ))/2+(Y(L
Q)-Y(LP))/3.4641
160 Y(MT+1)=(Y(LP)+Y(LQ))/2-(X(L
Q)-X(LP))/3.4641
170 A(LP)=MT:A(MT)=MT+1:A(MT+1)=
MT+2:A(MT+2)=LQ:MT=MT+3
180 LP=LQ:LQ=A(LQ):IFLQ>0 THEN 1
20
190 IX=IX+1:RETURN
200 IFINKEY$=""THEN200ELSE20
```

Want A Personalized Phone Number?

By David Driessen

16K ECB

"Act Now! Call 555-FAST. For more information dial 567-HELP." Ever wish that you had a personalized phone number? If you have ever checked the cost of having your number changed, let alone the problem of finding an unused number that spelled something, you might find it impractical. But not any more. In fact you may already have a theme phone number and not even know it. This program takes your number and spells out all the combinations of letters that would dial your number. In addition to words the letters can stand for a phrase or acronym, like NASA.

The program starts out by prompting you for the number of digits. It then gives you an estimate of the number of possible combinations. In numbers with a 0 or a 1, the actual number is less. If you want all of the combinations of your entire phone number, including the area code, you are looking at a lot of words. I usually run only the last four or five digits. The program then gets your number and starts to work. You can print to screen or printer. Use SHIFT @ to stop the screen.

The heart of the program is in lines 110 to 130. N(X) ranges from 0 to 2 and tracks which of the three possible letters that each digit could represent. X moves across the number and increments the N(X) for each number as needed. D(X) is the digit itself. If your number contains a 0 or a 1, the program won't print duplicate combinations. Line 130 prints out the current combination of letters. Line 150 sets up an array showing which letters are on which button. Maybe your number spells out my favorite combination: COCO!

The Listing: FONEFIND

```
0 ' COPYRIGHT 1989  FALSOFT,INC
10 'FONE FINDER
20 'BY D DRIESSEN 4/89
30 GOSUB150
40 INPUT"HOW MANY DIGITS";D:D=D-
1
50 PRINT"TOTAL NUMBER OF COMBINA
TIONS COULD BE";FIX(3^(D+1))
60 FOR X=D TO 0 STEP-1:PRINT"ENT
ER DIGIT";D-X+1;:INPUT D(X):NEXT
 X
70 INPUT"SHOW COMBINATIONS ON <S
>CREEN OR <P>RINTER";Q$
80 IF Q$="P"THEN P=-2:P1=79-D EL
SE P=0:P1=31-D
90 PRINT#P,"EVER WANTED A 'PERSO
NALIZED' PHONE NUMBER? BELOW ARE
 PRINTED ALL THE COMBINATIONS OF
 LETTERS WHICH YOUR PHONE NUMBER
 CAN SPELL OUT. GOOD LUCK!!":PRI
NT#P,"HIDDEN WORDS IN";:FORQ=D T
O 0 STEP-1:PRINT#P,STR$(D(Q));:N
EXTQ:PRINT#P,"":PRINT#P,""
100 X=0
110 IF X>D THEN PRINT#P,"":END
120 IF N(X)>2 OR (D(X)<2 AND N(X
)>0)THEN N(X)=0:X=X+1:N(X)=N(X)+
1:GOTO110 ELSE X=0:GOSUB130:N(X)
=N(X)+1:GOTO120
130 FOR Y=D TO 0 STEP-1:PRINT#P,
N$(D(Y),N(Y));:NEXTY:PRINT#P,"
";:IF POS(P)>P1 THENPRINT#P,""
140 RETURN
150 FOR X1=0TO9:FORY1=0TO2:READN
$(X1,Y1):NEXT Y1,X1:RETURN
160 DATA0,0,0,1,1,1,A,B,C,D,E,F,
G,H,I,J,K,L,M,N,O,P,R,S,T,U,V,W,
X,Y
```

Now, Where Was I?

By Ernie Thompson

16K ECB

Apart from a rare few, I suspect most RAINBOW readers are only able to pursue their favorite magazine in short sessions. Then it's, "Now where was I? What was the name of that program or ad, and what page was it on?"

Taking impromptu notes on the back of an old envelope will hardly suffice. You lose the envelope. Also, of the fortunate few who can sit down and read the columns at one sitting, cover to cover, at the end he or she must take notes.

This program prints a format used to keep track of programs, articles and any comments needed to help you with future references. Then when RAINBOW is being read, the appropriate prompts can be filled in.

The Listing: RBOWLIST

```
0 ' COPYRIGHT 1989  FALSOFT,INC
5 CLEAR 400
10 PRINT#-2,CHR$(27);CHR$(56)
20 A$(1)="RAINBOW ITEM NOTES YEA
R 19.. MTH....."
30 A$=STRING$(33,241)
40 A$(3)=STRING$(79,42)
50 A$(2)=STRING$(37,241)
60 B$="NAME"
70 B$(1)="ADRS"
80 B$(2)="CITY"
90 B$(3)="TITL"
100 B$(4)="PAGE"
110 B$(5)="CMTS
120 C$=STRING$(6,224)
```

RASCAN
VIDEO DIGITIZER

The Rascan Video Digitizer is a state-of-the-art image processing system designed to take advantage of your Color Computer 3's graphic capabilities.

The Rascan Video Digitizer connects easily to any color or black & white video camera, video recorder or video disc player and captures images with precision accuracy.

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Life is not simply black & white, that's why we added living color to our Digitizer. Now, through the use of advanced programming techniques, 512K Color Computer 3 owners can capture images from their video camera and display them in *4096 Super Hi-Resolution graphics!*

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Rascan also features a *professional pop-up menu system* which will allow for easy palette manipulation and color painting of captured images.

The Rascan Video Digitizer *comes complete with Rascan driver software, an easy to read manual, sample graphic images disk and print driver disk* (supporting most printers). Although no further graphic editors are necessary to produce quality images, Rascan images can be easily loaded into ColorMax and CoCo Max graphic editors.

Whether your interests are in desk-top publishing, report generation or simply for fun, the Rascan Video Digitizer will provide you with images of near photographic quality!

FEATURES	RASCAN YES	RASCAN NO	DS-69b YES	DS-69b NO
Support of 640 x 200 16 Level Grey Images	X			X
Support of 640 x 200 4 Level Grey Images	X			X
Support of 320 x 200 16 Color Images	X			X
Support of 4096 Hi-Res Color Graphics in 512K mode	X			X
Support of Multiple Image Buffers in 512K mode	X			X
Control of Contrast & Brightness via Control Knobs found on Digitizer	X			X
Professional, Easy to Use Pop-Up Menu System	X			X
Designed Exclusively to Take Advantage of the power of the Color Computer III	X			X
Built in Histograph Utility to Aid in Image Quality	X			X
Easy to use Paint and Palette editing, no need for additional Graphic editors	X			X
15 Day Full Money Back Guarantee	X			X
Interface through Joystick Ports	X			X
Requires additional cost of Y-Cable or Multi-Pak interface		X	X	

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ATTENTION PROGRAMMERS: Game Point Software is looking for talented writers. Top royalties guaranteed.

```
130 CLS:INPUT"HOW MANY SHOULD I
PRINT";L
140 FORT=1 TO L
150 PRINT#-2,CHR$(27);CHR$(14):P
RINT#-2,A$(1):PRINT#-2,CHR$(27);
CHR$(15)
160 PRINT#-2,A$(3):PRINT#-2,""
170 FORX=1TO6
180 PRINT#-2,B$;A$;C$;B$(5);A$:P
RINT#-2,""
190 PRINT#-2,B$(1);A$;C$;A$(2):P
RINT#-2,""
200 PRINT#-2,B$(2);A$;C$;A$(2):P
RINT#-2,""
210 PRINT#-2,B$(3);A$;C$;A$(2):P
RINT#-2,""
220 PRINT#-2,B$(4);A$;C$;A$(2):P
RINT#-2,""
230 PRINT#-2,STRING$(80,229):PRI
NT#-2,""
240 NEXTX
260 PRINT#-2,STRING$(9,10)
265 NEXTT
280 CLS:PRINT"<SPACE> FOR RESET"
:EXEC44539:GOTO130
```

Music

Sound-To-Play Conversions

By Bill Bernico

16K ECB

Sometimes when I write a program with sounds, I'd like to use the PLAY command. But since I'm more familiar with the SOUND command, I usually fall back on it, only because I'm not sure which PLAY note is the same as which SOUND value. This program matches them up for you.

Not every SOUND value has an equivalent in PLAY and vice versa. PLAY can go lower than SOUND, but SOUND can go higher than PLAY. That's why the DATA statements start first with the second octave (02) and end with SOUND value 238, when there is actually another whole octave (01) and SOUND values up to 255.

When the program is run, you are asked to input a SOUND value from 1 to 255. If there is not an equivalent PLAY value, the program states so and moves on. If there is, the value appears. You can also list all the equivalents by pressing L, when given the choice.

The Listing: PLAYCONV

```
0 ' COPYRIGHT 1989  FALSOFT,INC
1 'SOUND-TO-PLAY CONVERSIONS
   (C) 1989 FROM
   BILL BERNICO SOFTWARE

2 CLEAR100:DIMP$(63),S$(63):FORC
=1TO63:READP$(C),S$(C)
3 IF P$(C)="*" THEN 5
4 NEXT C
5 CT=0:CLS:GOSUB 30
6 PRINT@489,"lIST OR qUIT";
7 PRINT@97,"ENTER THE SOUND VALU
E (1-255)":INPUT SV$
8 IF SV$="Q"THEN CLS:LIST1:END
9 IF SV$="L" THEN 18
10 IF SV$=""THEN 7
11 PRINT:FOR C=1 TO 63
12 IF S$(C)=SV$ THEN PRINT"SOUND
 ";S$(C);",1 = PLAY";CHR$(34);"L
30";P$(C);CHR$(34):PLAY"L30"+ P$
(C):CT=CT+1
13 NEXT C
14 IF CT=0 THEN PRINT TAB(3)"NO
EQUIVALENT IN ";CHR$(34);"PLAY";
CHR$(34)
15 IF CT=0 THEN FOR X=1 TO 60:EX
EC 43345:NEXT X
16 GOSUB 31
17 GOTO 518 CLS:GOSUB 30
19 PRINT@66,"PRESS ANY KEY FOR N
EXT VALUE":PRINT
20 FOR C=1 TO 63
21 PRINT"SOUND ";S$(C)",1 = PLAY
";CHR$(34);"L30";P$(C);CHR$(34)
22 PLAY"L30"+ P$(C)
23 EXEC 44539
24 IF P$(C)="05B" THEN 16
25 NEXT C
26 DATA02F,5,02F#,19,02G-,19,02G
,32,02G#,45,02A-,45,02A,58,02A#,
69,02B-,69,02B,78
27 DATA03C,89,03C#,99,03D-,99,03
D,108,03D#,117,03E-,117,03E,125,
03F,133,03F#,140,03G-,140,03G,14
7,03G#,153,03A-,153,03A,159,03A#
,165,03B-,165,03B,170
28 DATA04C,176,04C#,180,04D-,180
,04D,185,04D#,189,04E-,189,04E,1
93,04F,197,04F#,200,04G-,200,04G
,204,04G#,207,04A-,207,04A,210,0
4A#,213,04B-,213,04B,216
29 DATA05C,218,05C#,221,05D-,221
,05D,223,05D#,225,05E-,225,05E,2
27,05F,229,05F#,231,05G-,231,05G
,232,05G#,234,05A-,234,05A,236,0
5A#,237,05B-,237,05B,238,*,*
30 PRINT@4,"SOUND-TO-PLAY CONVER
SION":FOR X=1028 TO 1051:POKE X,
PEEK(X)-64:NEXT X:RETURN
31 PRINT@484,"HIT ANY KEY TO CON
TINUE";:FOR X=1508 TO 1530:POKE
X,PEEK(X)-64:NEXT X:EXEC 44539:R
ETURN
```

Dr. Preble's Programs Since 1983

Pyramix

This fascinating CoCo 3 game continues to be one of our best sellers. ***Pyramix*** is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordan Tsvetkoff and a product of ColorVenture.

The Freedom Series

Vocal Freedom

I've got to admit, this is one nifty computer program. ***Vocal Freedom*** turns your computer into a digital voice recorder. The **optional Hacker's Pac** lets you incorporate voices or sounds that you record into your own BASIC or ML programs. This is not a synthesizer. Sounds are digitized directly into computer memory so that voices or sound effects sound very natural. One "off-the-shelf" application for Vocal Freedom is an **automatic message minder.** Record a message for your family into memory. Set Vocal Freedom on automatic. When Vocal Freedom "hears" any noise in the room, it plays the pre-recorded message! Disk operations are supported. VF also tests memory to take advantage of from 64K up to a full 512K. Requires low cost amplifier (RS cat. #277-1008) and any microphone.

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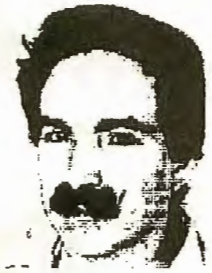

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Barden's Buffer

Computer Knowledge in Any Language

By William Barden, Jr.
Rainbow Contributing Editor

I love the scene in *Star Trek IV*, in which Scotty tries to program the ancient (late 1980s) computer to design a new material. He first talks to it by commanding "Computer!...", but is met with no response and is forced to rely on the archaic keyboard!

The day of the natural language computer is coming — maybe by the late 1990s. For the time being, however, we must communicate with computers through "unnatural" languages — BASIC, COBOL, Pascal, C, Forth and assembly language.

How does communication with these languages work? Why are there so many? Which one is best for the CoCo? In this article I'll try to answers these questions. By the end of it, you will have a better idea of what's involved in communicating with your CoCo using these languages.

The Benchmark Programs

The best way to illustrate languages is with concrete programs. For this reason, let's propose a few problems. I'll show you how the problems are solved in different languages and then compare the code. (A few of the Pascal and C examples may use special functions requiring additional programming.)

- Problem One: A grey-suited Tandy salesman wants to calculate interest on a $3000 charge card account used to buy a CoCo 3, Tandy 1000TL, and a Nintendo. The interest is 18.4 percent per year and the salesman wants to make $150 per month payments.
- Problem Two: A CoCo hacker wants to sort a list of numbers on a CoCo 1, 2 or 3. The list can be any size up to 100 entries. The result should show the characters arranged in ascending sequence (1, 5, 100, 312, 988, etc).
- Problem Three: The Tandy bell ringer must ring five bells at the Tandy Center at noon every day. The bell ropes are labeled A, B, C, D and E. To create an interesting song, he decides to play all the arrangements of the five bells. First he rings ABCDE, then ABCED, then ABDEC, then ABDCE, and so forth. How can he write a program to list all of the arrangements?

Good Ol' BASIC

Let's try these problems in BASIC, but first, it's important to know a little about the language.

BASIC was designed by Kemeny and Kurtz at Dartmouth in the early 1970s. Before BASIC there were FORTRAN (one of the first), a FORmula TRANslator; COBOL, a business-oriented language; assembly language for each different computer; and others. BASIC, though, was...well...basic. The language was easy to use and its commands made sense — PRINT printed results, GOTO caused the program to start at another point. Not only that, but BASIC was very interactive — if you had the short program:

```
100 INPUT A
110 INPUT B
120 C = A + B
130 GOTO 1000
```

This added two user input numbers, A and B, and if you wanted to see the result, you could add the new line:

```
125 PRINT The result is"; C
```

It printed the results immediately, instead of making the program change on a punched card, requiring you to take the cards representing the program to a computer center, having them compile the program, and then executing the compiled program to get the correct result — all of which took about a half-hour at least.

Interpreters Versus Compilers

This ability to rapidly change the program and immediately execute the changed version is characteristic of "interpreted" languages, such as BASIC. Interpreted languages are very friendly and easy to modify, but are not all that fast in execution.

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years' experience in the industry covers a wide background: programming, systems analysis and managing projects for computers ranging from mainframes to micros.

Listing 1: ECB Interest Program

```
100 ' CALCULATE INTEREST IN ECB
110 IN=(18.4/12)/100
120 INPUT "LOAN AMOUNT:"; PR
130 PRINT "MO INTR TO PRIN BALAN
CE"
140 PRINT "-- ---- ------- -----
--"
150 FOR I=1 TO 24
160 CI=PR*IN
PR=PR+IN-150
180 PRINT USING "## ##.# ####.##
 ####.##"; I,CI,150-CI,PR
190 NEXT
```

Listing 2: Bubble Sort in ECB

```
100 ' BUBBLE SORT IN ECB
110 DIM A(100)
120 FOR I=0 TO 100
130 INPUT A(I)
140 IF A(I)=0 THEN GOTO 160
150 NEXT I
160 I=I-1
170 LS=I-1
180 SW=0
190 FOR J=0 TO LS
200 IF A(J) <= A(J+1) THEN GOTO
260
210 SW=1
220 B=A(J)
230 C=A(J+1)
240 A(J)=C
250 A(J+1)=B
260 NEXT
270 LS=LS-1
280 IF SW=1 THEN GOTO 170
290 FOR J=0 TO I
300 PRINT A(J);
310 NEXT
```

Listing 3: Permutations in ECB

```
100 ' BELL-RINGING PROBLEM IN EC
B
110 A$="ABCDE"
120 GOSUB 300
130 END
300 ' ROTATE 1,2,3,4,5
310 FOR L=1 TO 5
320 GOSUB 400
330 A$=RIGHT$(A$,4)+LEFT$(A$,1)
340 NEXT L
350 RETURN
400 ' ROTATE 2,3,4,5
410 FOR K=1 TO 4
420 GOSUB 500
430 A$=LEFT$(A$,1)+MID$(A$,3,3)+
MID$(A$,2,1)
440 NEXT K
500 ' ROTATE 3,4,5
510 FOR J=1 TO 3
520 GOSUB 600
530 A$=LEFT$(A$,2)+MID$(A$,4,2)+
MID$(A$,3,1)
540 NEXT J
550 RETURN
600 ' ROTATE 4 AND 5
610 FOR I=1 TO 2
620 PRINT A$
630 A$=LEFT$(A$,3)+MID$(A$,5,1)+
MID$(A$,4,1)
640 NEXT I
650 RETURN
```

"Compiled" languages require more time-consuming editing by an editor, recompilation by a software program, and loading by a loader program to see the results. However, compiled languages are much faster than interpretive languages.

Some compilers, such as Borland's *Turbo Pascal* and *Turbo C* (not available on the CoCo) make it easy to go from one step to another, almost like an interpretive language. However, just about nothing beats the friendliness of interpretive BASIC, as, for example, CoCo Extended Color BASIC.

Color BASIC and Ext. Color BASIC

CoCo Color BASIC and Extended Color BASIC are similar to the original Kemeny and Kurtz BASIC. You don't need OS-9 to run them. They're interpreter languages and friendly (as friendly as a computer language gets).

One bit of advice: If you want to try programming in BASIC and haven't upgraded to Extended Color BASIC, do so. The original CoCo BASIC is not powerful enough to do interesting things, as is Extended Color BASIC.

Disk BASIC simply builds on Extended Color BASIC by adding a few more operating system commands. CoCo 3 Super Extended BASIC is essentially Extended Color BASIC with high-resolution capability. For simplicity, I'll use the term Extended Color BASIC to mean the original Extended Color BASIC, Disk BASIC or Super Extended BASIC in the following discussions.

Running the Benchmarks

Listings 1 through 3 show how the three benchmark problems are coded in CoCo Extended Color BASIC. To try these yourself, carefully type in the programs, line by line. If you make a mistake, retype the line in its entirety. After entering the last line, save it and type RUN after the "OK" prompt to execute the program.

Listing 1 shows the Extended Color BASIC solution to the interest problem. Each BASIC line is numbered. I used increments of ten, but could have used any sequence of line numbers — 1, 5, 9, 11, 100, 1000, 1111, and so forth, as long as they increase. Any higher line number is put in order, so it's easy to insert lines using an intermediate number.

The INPUT statement allows you to input a number. The PRINT statement prints results, text or numbers. Addition, subtraction, multiplication and division are handled by the +, -, *, and / characters, just as you'd write them. The IN, PR, I and CI symbols are variables that hold initial, intermediate and final results. About the only thing not too obvious here is the loop from the FOR statement to the NEXT statement. The *control variable* I goes from one to 24 in steps of one. The loop is executed 24 times to compute the current interest (CI) and new principal (PR). The PRINT USING statement helps in formatting the results — the ##.## characters define the format.

Listing 2 is a little more difficult. It first allows the user to input the list of numbers, which is stored in an array of 101 entries (zero through 100). The program then sorts the array entries, which at this point are in the order received, by a sort method known as the "bubble sort".

In the bubble sort, each pass through the loop results in the next largest value being added to the end of the array. For each pass, adjacent pairs of values are compared and a swap of two characters are made if the first item is greater than the second. This program is about the same complexity as the first and uses about the same BASIC statements, except for a DIM statement to allocate memory space to Array A. After the program sorts the values, the sorted array is listed on the screen.

Listing 3 is more difficult yet. It involves a building block called a "subroutine." A *subroutine* in BASIC is a set of statements, one to many, that can be executed at several places within a BASIC program. The subroutine saves repeating the statements each time they are executed; instead the statements are present at just one point. More complicated BASIC programs use many subroutines, some small and some large.

In Listing 3, there are three subroutines, each called by a GOSUB. In fact, one subroutine calls another — they are actually three nested subroutines. Listing 3 also uses the string statements LEFT$, RIGHT$ and MID$ to manipulate a string Variable A$. The string variable in this case holds the five text characters A,B,C,D and E. These characters are shuffled around to form all of the arrangements of A,B,C,D and E.

First the left-most character is moved to the end, then the second character is moved to the end, then the third character, and then the fourth. The sequence for the first time, ABCDE, becomes ABCED, then ABDEC, then ABDCE, and so forth. The new arrangement is printed each time the last two text characters are swapped.

BASIC09

If Color Extended BASIC is so wonderful, why have BASIC09? And what is BASIC09? To answer those questions, we need to look at a current trend in computing called "structured programming".

In the years from the first commercial computers in 1952 to the late 1960s, programmers spewed out, to paraphrase Carl

Listing 4: BASICØ9 Interest

```
PROCEDURE intrst
REM Calculate interest in BASIC09
DIM i:INTEGER; principal,monthly,current:REAL
INPUT "Loan amount: ", principal
monthly=18.4/12/100
PRINT " Mo  Intr To Prin Balance"
PRINT " --  ---- ------- -------"
FOR i=1 to 24
  current=principal*monthly
  principal=principal+monthly-150
PRINT USING"i3>,r6.2>,r8.2>,r8.2>",i,current,150-
  current,principal
```

Sagan, "billions and billions" of lines of code, much of it a jumbled mess that only the original programmer could decipher, and often not even the original programmer. Companies began spending 90 percent of their programming budget on program maintenance — correcting errors and adding embellishments to these convoluted programs. Obviously, something had to be done.

The result was new programming languages that were structured into small modules like subroutines. The modules performed a well-defined task and had one entry and exit point (one RETURN, for example). The use of GOTO statements was discouraged or forbidden.

Pascal, C and Modula 2 are examples of structured languages. Examples of unstructured languages are assembly language, COBOL, FORTRAN and BASIC. BASIC, especially, incurred the wrath of the academic community. It was deemed a hopeless mess of "spaghetti code" and dropped from the computer science curriculum at many schools. Structured languages were found to be easier to decipher and understand.

BASIC09 is a structured version of BASIC. But it only runs under OS-9 on the CoCo. Why? There's no reason why BASIC09 couldn't be made to run without OS-9. It's just that when Microware sold Tandy on the idea of the OS-9 operating system, they also included compiled languages, and BASIC09 was one of those. Because BASIC09 is compiled, it isn't quite as interactive as Color Extended BASIC. although it is nicely integrated into a package with editor and execution capability (unlike the nightmarish steps one must perform to edit and execute OS-9 Pascal or C).

Another detriment to BASIC09 is that you must be a bit of an OS-9 expert to use it. OS-9 is not the most user-friendly operating system. Neither is its close relative Xenix and more distant relative UNIX,Yet, UNIX, Xenix and OS-9 remain extremely powerful operating systems and have many supporters.

Aside from the fact that BASIC09 follows structured programming principles, it has one other advantage — it's faster than interpretive Color Extended BASIC — anywhere from two to 10 times as fast. Given a choice of running a debugged, operational program in BASIC09 or Extended Color BASIC, I would pick BASIC09 every time. However, there is usually a lot more time and grief in achieving a debugged BASIC09 program than an Extended Color BASIC version.

There are other advantages, which we'll look at in a moment.

Looking at the Benchmarks

Listings 4 through 6 show the BASIC09 versions of the three Benchmark programs. There are some obvious differences between the Extended Color BASIC and BASIC09 versions. First, you'll notice there are no line numbers. Line numbers are permitted in BASIC09, but often are not used. Remember, line numbers are tied in with GOTOs, and GOTOs are discouraged in structured languages.

Next, you may notice loops indented several spaces. This helps define the structure of the program. The program generally flows from beginning to end with short loops in the middle.

Also, both upper- and lower-case characters can be used, providing your CoCo can support them. Another advantage to BASIC09 is that variable names, such as principal and monthly, can be more than two characters. More than two character names are allowed in Extended Color BASIC, but only the first two characters are meaningful (INTEREST and INTR would be considered the same name).

Listing 5: BASICØ9 Bubble Sort

```
PROCEDURE bubble
REM Bubble Sort in BASIC09
BASE 0
DIM values(100):INTEGER
DIM a,b,i,j,last1:INTEGER
i=0
REPEAT
  INPUT values(i)
  i=i+1
UNTIL values(i-1)=0
i=i-1
swap=1
last1=i-1
WHILE swap<>0 DO
  swap=0
  FOR j=0 TO last1
  swap=1
  IF values(j)>values(j+1) THEN
    swap=1
    b=values(j)
    c=values(j+1)
    values(j)=c
    values(j+1)=b
  ENDIF
  NEXT j
  last1=last1-1
ENDWHILE
FOR j=0 TO i
  PRINT values(j);" ";
NEXT j
```

Y o u would expect the BASIC commands to be the same, and this is true to a certain extent. However, look at the different format between the PRINT USING in Listing 1 and Listing 4. The fact is, Extended Color BASIC and BASIC09 are not very compatible. BASIC09 looks for a comma instead of a semicolon in certain commands, and requires a different format, completely, in others. It would be nice to be able to use the interactive power of Extended Color BASIC to rapidly debug programs and then to compile the debugged programs with BASIC09 for highest speed, as you can do on PC systems with GW-BASIC and Quick BASIC or Turbo BASIC. Forget it with standard Ex-

Listing 6: BASICØ9 Permutations

```
PROCEDURE driver
REM Permutations in BASIC09
DIM letters:STRING[10]
INPUT letters
RUN Permutation(1,letters)

PROCEDURE Permutation
PARAM n:INTEGER; a$:STRING[10]
DIM i:INTEGER
FOR i=1 to len(a$)-n+1
  a$=LEFT$(a$,n-1)+RIGHT$(a$,LEN(a$)-n)+MID$(a$,n,1)
  RUN Permutation(n+1,a$)
NEXT i
IF n=LEN(a$) THEN PRINT a$
ENDIF
END
```

Listing 7: Pascal Interest

```
(* Pascal Interest Program *)
program Interest;
var
  Principal,Monthly,Current: Real;
  I: Integer;

begin
  Write ('Principal: ');
  Read (Principal);
  WriteLn;
  Monthly:=18.4/12/100;
  Write(' Mo  Intr To Prin Balance');
  WriteLn;
  Write(' --  ---- ------- -------');
  WriteLn;
  for I:=1 to 24 do
    begin
      Current:=Principal*Monthly;
      Principal:=Principal+Monthly-150;
      Write (I:3,Current:6:2,150-Current:8:2,Principal:8:2);
      WriteLn;
    end;
end
```

tended Color BASIC and BASIC09 (but see the "Other BASICs" subhead).

Another obvious difference in the BASIC09 code is the DIM statement. In Extended Color BASIC, this "sizes" arrays. In BASIC09, it also determines the variable type. In most structured languages, variables must be declared before they are used. This is called "strongly typing" variables. Although this isn't mandatory in BASIC09 for simple variables, I've done it here for discussion purposes. Variable I is an "integer" variable (-32768 to +32767) and variables principal, monthly and current are "real" variables — mixed numbers such as 34.45, -65.77 and 2901.66. The purpose of such variable typing is to catch variable errors before the program is compiled. Another ground rule in structured languages is that variable names often exist only within the module — "locally." This eliminates problems in a 3000-line BASIC program in which I and J are erroneously used at the beginning of the program and then again at the end, as the programmer searches for variable names. In a program made up of modules with local variables, I and J might be found in several modules, but each module would not be aware of the use of I and J in different modules, and, in fact, would be stored as physically different variables.

In Listing 5, WHILE and REPEAT loop structures are used. These are not found in Extended Color BASIC (WHILE is found in GW-BASIC used on MS-DOS systems.). They are different ways to define a loop structure without using GOTOs. The IF statement is different as well — an entire sequence of actions can be defined, everything between the IF and ENDIF statements.

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Listing 8: Pascal Bubble Sort

```
(* Pascal Bubble Sort Program *)
program Bubble;
var
  Swap:Boolean;
  Last1,A,B,C,I,J:Integer;
  Values:array[0.:100] of Integer;

begin
  I:=0;
  repeat
     Write ('? ');
     Read (Values[i]);
     WriteLn;
     I:=I+1;
  until Values[i-1]=0;
  I:=I-1;
  Swap:=True;
  Last1:=I-1;
  while (swap<>False) do
    begin
      Swap:=False;
      for J:=0 to Last1 do
        begin
          Swap:=True;
          if (Values[J]>Values[J+1]) then
          begin
            B:=Values[J];
            C:=Values[J+1];
            Values[J]:=C;
            Values[J+1]:=B;
          end;
        end;
      LastL:=Last1-1;
    end;
  for j:=0 to I do
    write (Values[j],' ');
end.
```

Listing 9: Pascal Permutations

```
Program Driver;
(* Pascal Permutation Program *)
Type
  AString=string[10];

Var
  Letters:AString;

procedure Permut( N:Integer; var S:AString );

Var
  J:Integer;

begin
  for J:=1 to Length(S)-N+1 do
    begin
      S:=Copy(S,1,N-1)+Copy(S,N+1,Length(S)-N)+Copy(S,N,1);
      Permut(N+1,S);
    end;
  if N=Length(S) then
    begin
      write(S);
      writeln;
    end;
end;

begin
  Read( Letters );
  Write( Letters );
  Permut(1, Letters);
end.
```

between Extended Color BASIC and BASIC09: The sort of 30 values runs in 36 seconds for the ECB version and five seconds for the BASIC09 version.

Listing 6 is interesting. It shows the modularity of a structured language like BASIC09. There are two procedures here, a main driver and a subroutine. The main procedure `driver` calls subroutine `permutation` by a `RUN` statement to do the shifting of letters. However, `permutation` also calls `permutation`. How can this be? What you're seeing here is "recursion," the ability of a program to call itself. When `permutation` is called, two parameters are passed with it, the starting position of the letter and the string involved. `Driver` calls `permutation` to start from the left of the string (for example, the "a" in abcde). `Permutation` calls itself to start from smaller and smaller pieces of the string ("bcde", "cde", "de" and "e"). Recursion generally makes programs smaller and more elegant. It can't be used for every problem, but can be used for problems that perform repetitive functions.

Pascal

Pascal is a fairly new language, having been around only since the early 1970s. It is one of the first structured languages, and has achieved wide acceptance in university computer science courses. In the real programming world, however, Pascal was hardly used, until Borland International brought out its *Turbo Pascal* for MS-DOS systems. Prior to *Turbo Pascal*, compiling a Pascal program took laborious editing, compiling, testing and then a repeat of the whole process. *Turbo Pascal* made the process a lot easier by making the editor, compiler and loader part of the same package and enabling the user to move between one and the other by a few keystrokes.

Unfortunately, Pascal under OS-9 is more akin to one of those laborious Pascal compilers than *Turbo Pascal* or BASIC09. It's a real chore to edit, compile, load and execute a program. (I just know I'll have OS-9 buffs putting plastique under my car seat after saying this. . . .) However, the more proficient you become with OS-9 and Pascal itself, the less of a chore it is. Since Pascal is now so popular, it is certainly one of the languages you might want to try. However, be forewarned, Niklas Wirth, the father of Pascal, has created a new language, Modula-2, which threatens to replace Pascal in computer science courses. There is a great deal of similarity between the two languages, just as there is between BASIC09 and Pascal. If you can program in structured BASIC09, you're almost there in Pascal. The structures, commands and concepts are very close.

Looking at the Benchmarks

Compare the Pascal *Interest* program, Listing 7, with the BASIC09 version. Like BASIC09 and other structured languages, Pascal relies heavily on indentions to define the loops and other structures. You won't see a `GOTO` in Pascal either — flow is from beginning to end of the program. The `var` section of the program defines variables. A `const` section (not shown) defines constants. Pascal is even more strongly "typed" than BASIC09. You must declare every variable you are going to use in the `var` section. Pascal and Modula-2 are a little retarded in print formatting. The `Write` statements allow you to format lines, but only by defining "fields". The `:8:2` characters, for example, define a field width of eight characters, with a decimal field of two characters.

Listing 10: C Interest Program

```
/* C Interest Program */

  float principal,monthly,current;
  int i;

main()
{
  printf("Principal: ");
  scanf("%f",&principal);
  printf("\n" );
  monthly=18.4/12/100;
  printf(" Mo  Intr To Prin Balance\n");
  printf(" --  ---- ------- -------\n");
  for (i=1; i<24; i++) {
    current=principal*monthly;
    principal=principal+monthly-150;
    printf("%3d%6.2f%8.2f%8.2f\n",i,current,150-
current,principal);
  }
}
```

The Pascal *Bubble Sort* program, Listing 8, follows the BASIC09 version closely. About the only differences are the more extensive use of "begin" and "end" to denote loops. The Boolean Variable Swap can have either one of two values, True or False. Boolean variable types are found in many structured languages.

The Pascal *Permutation* program, Listing 9, also follows the BASIC09 version closely. Like the BASIC09 version, it performs the computation by recursive calls. Pascal seems to be more verbose than BASIC09 because of all the begins and ends. This program shows, further, the way parameters are passed between subroutines (procedures). Variables are local in many cases — Variable J, for example, is not recognized outside of procedure permutation. Variables can be passed between procedures by Value or Variable. Value is just a copy, but Variable allows a variable to be changed. The whole idea here is to keep modules as separate units without affecting other modules unless required.

The C Language

The interesting thing about C is that it is very much tied in with UNIX/Xenix/OS-9. As a matter of fact, most of UNIX was written in the C language, illustrating how it can be used for systems programming purposes. It has a lot of "bit twiddling" operations that permit a systems programmer to examine bits and fields within bytes, something that Pascal does not have.

Lest you think that C is just for systems programmers, it has many other capabilities. The structure is very similar to BASIC09 or Pascal with functions (subroutines), indented code, loops, deemphasis on GOTOs, and about the same types of operations.

C has had a large user base for some time. Many programmers using the UNIX operating system on larger computer systems use C. The language became very popular on MS-DOS systems after introduction of Borland's *Turbo C* and Microsoft's *QuickC*. (Like it or not, many CoCo software products follow the trends in the MS-DOS world.)

C in OS-9 shares the same implementation problems as Pascal — it's harder to edit, compile, load and execute than BASIC09, but it may be worth the trouble to invest the time in learning how to use it efficiently.

Looking at the Benchmarks

Listings 10 through 12 show the three benchmark programs in C. I think you'll agree that the listings look a lot cleaner than the Pascal versions — C eliminates a lot of extraneous formatting such as begin and end. The left and right braces perform the same functions. Like Pascal, C is more strongly typed than a BASIC interpreter or BASIC09. Variables must be declared before they are used and may be mixed numbers (real), integers, characters, strings or other types. There are no Boolean types in C. The cumbersome := of Pascal is replaced by a simple = for assignment. The FOR loop looks mysterious, but is fairly powerful — the first field is the initial value (I=1), the next, the conditions under which the FOR loop operates (I<24), and the last, actions to take on each pass (normally this involves incrementing a control variable by a ++ operation).

The print formatting is also a little esoteric — decimal (integer) or floating-point numbers may be formatted for field width and number of decimal places, and may be right or left justified. The scanf command reads in an input value. The & character is used to denote the address of the variable (& principal). When variables are "global" in memory, or are to be passed as parameters, they must be changed via their address

Listing 11: Bubble Sort in C

```
/* C Bubble Sort Program */

  int swap,last1,a,b,c,i,j;
  int values[100];

main()
{
  i=0;
  do
    {
      printf("\n? ");
      scanf ("%d",&values[i]);
      i++;
    }
  while (values[i-1]!=0);
  i--;
  swap=1;
  last1=i-1;
  while (swap==1)
    {
      swap=0;
      for (j=0; j<=last1; j++ ) {
     swap=1;
     if (values[j]>values[j+1]) {
      b=values[j];
      c=values[j+1];
      values[j]=c;
      values[j+1]=b;
    }
     }
     last1=last1-1;
  }
  for (j=0; j<=i; j++ )
    printf("%d ",values[j]," ");
```

Listing 12: Permutations in C

```
/* C Permutation Program */

  typedef char AString[10];

  AString Letters;

  void Permut( int n, AString s);

main()
{
  scanf("%s", &Letters);
  Permut(0, Letters);
}

void Permut( int n, AString s)
{
  int j,k;
  char temp;
  for (j=n; j<=strlen(s)-1; j++){
    temp=s[n];
    for (k=n; k<strlen(s)-1; k++)
      s[k]=s[k+1];
    s[strlen(s)-1]=temp;
    Permut(n+1,s);
  }
    if (n==strlen(s)-1)
    printf("%s\n", s);
}
```

pointer, a somewhat complicated procedure compared to the pass-by-value and pass-by-variable method in Pascal.

The C *Permutation* program has been changed slightly from the Pascal version. C does not allow very much in the way of string processing functions. Here the strings are treated as character arrays, and the shuffling of characters is done by moving the characters between array elements. Like the Pascal version, however, the processing is done by recursive calls to function `permut`.

Assembly Language

Nothing inspires more awe and loathing than assembly language. The 6809 microprocessor has a built-in set of instructions to do relatively simple things, such as adding two numbers held in special memory locations called "registers", subtracting two numbers, comparing two numbers, or changing the sequence of instructions. About the most complicated these instructions get is the Multiply instruction, which . . . you guessed it . . . multiplies two numbers. There are about 60 basic instructions in the 6809.

The 60 basic instructions can be put together in long sequences to do just about anything. All applications programs ultimately reduce down to a sequence of these instructions, executed at rates of hundreds of thousands per second. Jump and Branch instructions are similar to `GOTO`s and `IF. . .THEN` statements and cause different sequences of these instructions to be executed. Loops are used, just as in BASIC and other higher-level languages.

The 6809 contains logic to decode the binary data representing these instructions into the proper machine language instruction. The two bytes 10001011 01100100 decode into "Add 100 to the contents of the A register and put the results into the A register". Constructing a machine language program consists of writing the proper codes in binary and then entering them into a block of memory. The 6809 then starts at a given memory location and decodes and executes the instructions one at a time to perform the program.

Since writing hundreds of thousands of zeroes and ones would be excruciating agony for any programmer, an automatic program called an *assembler* converts a more English-like form of the instruction sequence into the proper binary codes. Listing 13 shows such an assembly language listing.

Assembly language is an intermediate step between a high-level language and machine code. Most compilers produce an assembly language program, then assemble the program to produce the machine language code. Rather than writing in the higher-level language, though, some programmers choose to program directly in assembly language.

Assembly languages offer some great advantages. The biggest advantage is it's extreme speed, as much as hundreds of times faster than interpretive BASIC. Another advantage is extremely compact code can be custom-tailored for an application.

However, assembly language is a very tedious and exacting language in which to code. It's also difficult to learn. The difficulty lies not so much in what the instructions do as in how to put the instructions together to perform useful and efficient functions.

The assembly language listing above is a version of Benchmark Program 2. I'll describe what it does in a moment, but first look at the general layout: The four fields at the right of the listing (from `P130` over) are what the programmer actually enters into the editor portion of the assembler program. Each line represents a single machine language instruction. The four fields at the left (from Line 00100 to the left) are what the assembler program generates on the printed listing.

The fourth column consists of line numbers, starting from Line 00100.

The left-most column is the actual memory location in which the machine language code of the instruction is stored. Since a machine language instruction may consist of from one to five bytes, these locations may change by these amounts. Memory locations are in hexadecimal, a shorthand form of binary.

The next two columns are the actual ma-

Listing 13: Assembly Language Bubble Sort

```
                00100 * ASSEMBLY LANGUAGE BUBBLE SORT
0000 BD A92B    00110         JSR     $A92B       CLEAR SCREEN
0003 0F 6F      00120         CLR     $6F         INITIALIZE DISPLAY
0005 8E 005E    00130         LDX     #AA         POINT TO AA
0008 C6 64      00140         LDB     #100        (FOR I=0 TO 100)
000A BD A0000   00150 P130    JSR     ($A000)     (INPUT...
000D A7 80      00160         STA     ,X+           ...A(I))
000F BD A002    00170         JSR     ($A002)     DISPLAY
0012 B1 00      00180         CMPA    #0D         (IF A(J)=CR...
0014 27 03      00190         BEQ     P160          ...THEN GOTO 160
0016 5A         00200         DECB                (NEXT I)
0017 26 F1      00210         BNE     P130
0019 30 1F      00220 P160    LEAX    -1,X        (I=I-1)
001B BF 00C3    00230         STX     II          STORE I
001E 30 1F      00240         LEAX    -1,X        (LS=...
0020 BF 00C5    00250         STX     LS            ...I-1)
0023 7F 00C2    00260 P170 CLR   SW          (SW=0)
0026 8E 005E    00270 P200    LDX     #AA         (FOR J=0 TO LS)
0029 A6 84      00280         LDA     ,X
002B A1 01      00290         CMPA    1,X         (IF A(J)<=A(J+1)...
002D 2F 0D      00300         BLE     P260          ...THEN GOTO 260)
002F C6 00      00310         LDB     #0
0031 F7 00C2    00320         STB     SW          SW=1
0034 A6 84      00330         LDA     ,X          (B=A(J))
0036 E6 01      00340         LDB     1,X         (C=A(J+1))
0038 E7 84      00350         STB     ,X          (A(J)=C)
003A A7 01      00370         STA     1,X         (A(J+1)=B)
003C 30 01      00380 P260    LEAX    1,X         BUMP J
003E BC 00C5    00390         CMPX    LS          (NEXT...
0041 2F E3      00400         BLE     P200          ...)
0043 7A 00C5    00410         DEC     LS          (LS=LS-1)
0046 7D 00C2    00420         TST     SW          (IF SW=1...
0049 26 D8      00430         BNE     P170          ...THEN GOTO 170)
004B BD A92B    00440         JSR     $A92B       CLEAR SCREEN
004E 8E 005E    00450         LDX     #AA         (FOR J=0...
0051 BC 00C3    00460 P290    CMPX    II            ...TO I)
0054 2E 07      00470         BGT     P320        (PRINT...
0056 BD A002    00480         JSR     ($A002)       ...A(J);
0059 30 01      00490         LEAX    1,X
005B 20 F4      00500         BRA     P290
005D 39         00510 P320    RTS
005E            00520 AA      RMB     100         (DIM A)
00C2 00         00530 SW      FCB     0           SW VARIABLE
00C3 0000       00540 II      FDB     0           I VARIABLE
00C5 0000       00550 LS      FDB     0           LS VARIABLE

                                                  00560       END
```

chine code in hexadecimal for each instruction. Each two hexadecimal digits represents a byte of data (7F is binary 01111111, for example).

Color Computer Assemblers

Assemblers for the Color Computer come in one of two flavors, non-OS-9 and OS-9. Unfortunately for fledgling CoCo hackers, the non-OS-9 assemblers, *EDTASM+* (for tape users) and Disk *EDTASM+* were discontinued after OS-9 was introduced. However, copies are still available from your local CoCo club. There are a number of patches that enable them to work with the CoCo 3. These two assemblers are excellent — I can't say enough about them for the beginner or intermediate user.

The OS-9 assembler is also good, but not for the novice. By the nature of OS-9 programs (modules that can be moved around in memory) the assembler programs for OS-9 are more complicated and require advanced programming techniques, such as position independent (relocatable) code (allowing the resulting assembly language modules to be loaded anywhere in memory instead of at specific locations). Cut your teeth on *EDTASM+*, cassette or disk version, and then move up to the OS-9 assembler.

Looking at the Benchmarks

Unfortunately, I can't provide a nice, succinct listing of equivalent assembly language code for all of the Benchmarks. Assembly language operates by performing very rudimentary operations. Just about anything can be built from these rudimentary operations, but it may require a great deal of code to do so. In the Benchmark Program One, for example, floating-point operations are performed to do addition, subtraction and multiplication of mixed numbers such as 296.67 and 83.88. The actual assembly language code to perform floating-point operations takes about 600 instructions in Extended Color BASIC. Either you must code these operations yourself, steal an existing assembly language routine to do the operation, or call an existing routine in Extended Color BASIC. For this reason, assembly language programs are best for programs that do not require a great deal of floating-point computations or print or display formatting. Integer computations can be performed with relative ease, however.

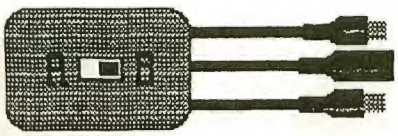
The program shown in Listing 13 is a version of Benchmark Program Two. The right-most column is a comments column in which any explanatory text can be written. I've matched the assembly language code with code for Listing 2 by indicating the corresponding Listing 2 operations in parentheses in the comments. Actually, this program is somewhat simplified from the BASIC version. It accepts only single characters as data to be sorted, rather than complete decimal values, as in the BASIC version. The sorted results are displayed on the screen as a sorted string of characters. The program uses two subroutines from ROM, an `INPUT CHARACTER` subroutine (`JSR ($A000)`) and a `DISPLAY CHARACTER` subroutine (`JSR ($A0002)`). Again, such input and output operations must be built from the ground up, or existing subroutines used. In this case, BASIC ROM contained appropriate subroutines.

Other CoCo High-Level Languages

Although Extended Color BASIC/Disk BASIC, BASIC09, Pascal, and C are probably the most popular high-level languages available for the CoCo, there are several other high-level languages available — versions of BASIC, Logo and FORTH.

Other BASICs

In addition to Radio Shack versions of BASIC, there are several developers who have enhanced Extended Color BASIC to add new hardware capability (especially



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disk drivers), better memory access, or new commands. *MyDOS* adds new hardware features and six commands to Disk BASIC. *ADOS*, from SpectroSystems, adds new commands and utilities. *512K BASIC*, from Microcom, allows full memory to be accessed on CoCo 3s. *MJK* from CoCo Connection adds hardware support and about 40 new commands.

The silver lining to this weather fax picture of storm clouds is that the CoCo really has a wealth of languages available for it.

There are also several developers who have implemented BASIC compilers. CerComp's *CBASIC III Editor/Compiler* is an integrated package that edits and compiles Extended Color BASIC statements. Burke and Burke's *R.S.B.* runs Extended Color BASIC programs under OS-9 and also enhances the language. *MLBASIC* from WasatchWare is an enhanced BASIC/Extended Color BASIC compiler that adds enhanced machine language capability.

For a more extensive description of these products, look for their reviews in back issues of THE RAINBOW.

Logo

Another CoCo high-level language is Logo. Logo was originally developed for grade schoolers to draw pictures on the screen by moving a graphics device called a "turtle." Radio Shack's version, *D.L. Logo* (*Dale Lear Logo*), is roughly equivalent in capability to the original Color BASIC, but has some good graphics and sound features. Logo has never become really popular language in the computer market.

FORTH

FORTH has been around since the early days of microcomputers. D. P. Johnson offers FORTH for the CoCo under OS-9. The language is radically different from any discussed up to this point. It was developed for use in small computers with limited memory for control applications. FORTH is a "stack-oriented" language, meaning it has a last-in, first-out memory, similar to the Reverse Polish Notation used on Hewlett-Packard calculators.

FORTH starts with a kernel of basic operations — adding two bytes, subtracting two bytes, comparing two bytes, and so forth. All operations are done with the stack. Adding two numbers adds the first two numbers on the stack and puts the result back on the stack. You define and add new functions at will by combining these basic operations.

What About Other Languages?

The languages described above, Extended Color BASIC, BASIC09, Pascal, C, assembly language, Logo, and FORTH, are about the only languages available for the CoCo. Languages such as COBOL, FORTRAN, PL/I, APL, Modula-2 and Smalltalk, although they are very popular in other segments of the computer world, are simply not available for the CoCo. The reason they are not available is that it takes an enormous amount of effort — roughly two or three man years — to write a compiler for any computer. That's about 5000 hours at $50 per hour, making the typical compiler cost about $250,000! The CoCo has BASIC because some supplied language was necessary, and Microsoft was supplying BASIC for virtually every new computer that came out in the 1970s. BASIC09, Pascal and C are a fallout from Radio Shack's decision to use OS-9. These compilers were bundled with the deal for the operating system and existed in other versions. Logo and FORTH are relatively easy to implement and were, therefore, cost efficient. What I'm driving at is this: Don't expect to see COBOL, FORTRAN, or Ada on the CoCo.

The silver lining to this weather fax picture of storm clouds is that the CoCo really has a wealth of languages available for it. Extended Color BASIC and enhanced products, BASIC09 and other BASIC compilers, Pascal, and C are excellent languages. Logo is a good training language for kids, And FORTH works nicely for short to intermediate size programs.

Availability

Unfortunately, Radio Shack language products for the CoCo do not do well in sales. Part of the problem is probably the Shack's pricing — all of the OS-9 languages are offered at about $100, a hefty price for the average CoCo user. As a consequence, Radio Shack has dropped some of the CoCo language products from the catalogs. You'll see the OS-9 operating system and development software in the catalog pages, but will not see BASIC09, Pascal, C or Logo. At this time of writing, most of these products are available by special order if you can't find existing stocks in stores.

Non-Radio Shack products, however, are doing better. Most developers know the CoCo market and have priced the products competitively. All of the products mentioned by name were advertised in recent RAINBOW ads.

Which Language is Best?

Obviously, the best language is the one used by the Enterprise's on-board computer. None of the languages discussed here is a quantum leap forward from the others, even though you'll hear aficionados of BASIC09 or C tell you differently. On the CoCo, it really comes down to whether you're an OS-9 freak or not. If you've invested the time in learning how to use OS-9, then BASIC09 is a very powerful, structured language that is fairly interactive. I'd heartily recommend it.

If you haven't taken the steps to learn OS-9, then Extended Color BASIC is an excellent implementation of BASIC, although somewhat slower than BASIC09, and not along structured lines. When I sit down at a keyboard to whip off a quick program, I always tend toward interpretive BASIC — it's just so interactive and easy to use. On the other hand, if you are using a large, complex program that has to run at a high rate of speed, BASIC09 or C under OS-9 is probably the way to go.

I'll admit to being prejudiced in favor of C over Pascal. It does things a lot cleaner, with less clutter. C appears to be the most popular high-level language for micros at this time.

Assembly language may be worth the trouble if you want the absolute fastest version of an application. However, be prepared for a lot of tedious coding and agonizing debugging. Also be prepared to write a lot of your own special input, output and number crunching subroutines.

Although FORTH is appealing, once you've undertaken a large programming project in it, you're locked into its strange structure. At least with other languages, especially the structured ones, you can easily translate code from one to another — not so with FORTH.

I wouldn't consider Logo as a serious language for intermediate CoCo users, although it is a good learning language for CoCo kids.

This gives you some insight into the language options available with the CoCo. You can't go too far wrong with any of them, especially BASIC or the structured languages. You'll have control of your own destiny and applications by writing your own programs, and you'll be building up a base of computer knowledge to benefit you in any language. If you avoided programming up to this point, try one of the languages mentioned. If you're programming only in Extended Color BASIC right now, try BASIC09, Pascal, or C — you have nothing to lose but your GOTOs!

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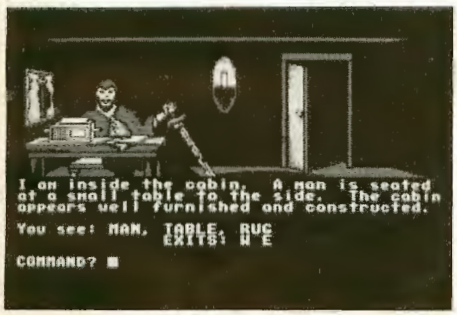

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OS-9 Makes Big Showing at Chicago

By Dale L. Puckett
Rainbow Contributing Editor

High visibility — If I had to describe OS-9 at RAINBOWfest Chicago, those two words would do the job. This month presents a look at a few of the rising stars of the OS-9 world who were there, a discussion of the new products that were demonstrated, and *Maxic*, a mouse- and menu-driven icon editor in the *MultiVue* Shell.

Questions and Answers

Kevin Darling and friends presented the "Overview of OS-9" session at noon Saturday. Along with Gary Robinson of Tandy, James Jones of Microware, Kent Meyers, Kevin Pease and Paul Ward, Darling moderated a question and answer session bar none.

The session started with a request for audience feedback regarding the design of a possible OS-9 Users Group 68K computer. Kevin Pease had been working on the project for several months and needed to get a feel for the needs of OS-9 users.

Questions included: What do you want? What applications do you need? Should this computer run 6809 software? Do you want it to use dual 6809/68000 processors? What about a 68K computer with a GIME socket and a DAT that would let you use two megabytes of memory — and still be CoCo compatible? The audience met the challenge of his questions.

Most of the audience wanted cheaper and easier word processors, spreadsheets, business software and educational software — all running under OS-9. They also were clearly addicted to the CoCo OS-9 CLEAR key.

Why can't I pluck down $300 and buy an application program that will do something? Inquiring minds wanted to know. *Word Perfect* and *WordStar* are being ported to UNIX. How do we get these programs on OS-9?

James Jones explained that 80 percent of Microware's business is in the controller market and they don't have the resources to support any more business. That's why they haven't been actively interested in the personal computer market. Yet, as he reminded us, OS-9 is the only operating system NASA trusts to run real-time software aboard the space shuttle.

Gary Robinson explained that Tandy buyers don't have time to pursue developers and encouraged OS-9 users to convince RS-DOS developers to get on the OS-9 bandwagon — and then take their products to Tandy.

Paul Ward said he thought we must attract the developers first, especially the ones who are young and hungry — people at companies who already use UNIX. He thought they would be the easiest to lure into the OS-9 world and issued a call for all C programmers to port any and all UNIX programs into the OS-9 environment. The seminar audience responded in kind.

"Give us the tools!" "Fix up the C compiler!" At this point Gary Robinson noted that even though the C compiler is not in stock at Radio Shack stores any longer, it is available by mail order.

But, that brought up another question popping up at RAINBOWfest. Will there be an upgrade for the OS-9 C programming package? The answer, "Probably not." Yet, with all the interest expressed in Chicago, maybe someone was listening.

James Jones explained the difference between the Level I and Level II compilers, noting that the Level I compiler works under Level II. He also noted many patches available on the electronic forums that let you set up your machine in a number of different ways.

This mention of OS-9 SIGS on CIS, DELPHI and GEnie prompted Darling to repeat a survey. Last year, during our seminar, Kevin asked the audience how many people were active on an electronic forum. Six hands went up. This year more than half the audience held up their hands.

Ward then jumped in to point out that 68K C programmers are in big demand — earning $60K per year in some cases. He gave, as an example, a new fiber optic experiment for NASA and the University of Maryland.

Taking a positive note, James Jones announced a magic number — 515-224-1929. Jones told the audience they would be amazed at the programs available for OS-9 68K.

"You just don't see the ads," Jones said. "The problem is that people just haven't heard much about recently developed OS-9 software." Jones encouraged the audience to get a hold of *The OS-9 Catalog* and *The OS-9 Sourcebook*. Both publications are free, from Microware.

Jones told the group he thought CDI (Compact Disc Interactive), means a lot to CoCo OS-9 users because it lets them get ahead of the learning curve before these new machines hit the market this Christmas. He said many opportunities would be available for people with OS-9 experience.

When the questions turned to problems, the group discussed the myth of programs only being 64K long with OS-9. Not true!

Dale L. Puckett, a freelance writer and programmer, serves as director-at-large of the OS-9 Users Group and is a member of the Computer Press Association. His username on Delphi is DALEP: on packet-radio, KOHYD @ N4QQ; on GEnie, D.PUCKETT2; and on CIS, 71446,736.

Wizpro and several other professional products on the market today are more than 128K long.

The group also discussed Level II's image problem. "Because *Color Computer Artist* and *Home Publisher* are slow, everyone assumes OS-9 Level II is slow," Darling said, noting how Art Flexer had been teasing him about how he was able to play *Scramble* faster on DELPHI using RS-DOS.

"That's alright," Darling replied online, "I'm also playing *Flight Simulator* in another window."

Darling then asked the group how many people had demonstrated their CoCo OS-9 Level II system to MS-DOS users. Many had. But first he presented his own scenario.

"Show him text, he says fine. Show him graphics, he says fine," Darling said. "Then after you show him two or more programs running at the same time, he'll say, 'this is a demo, right?'"

One person in the audience told how a local OS-9 Users Group made about 200 enemies at a computer fair. After watching OS-9 perform, all the MS-DOS Users Group members turned their back on the OS-9 booth.

Speaking of MS-DOS, Darling attributed the Quote of the Day to Bill Gates at Microsoft. "It is virtually impossible to do any serious multitasking with less than four megabytes of memory.

"Turn on your CoCo, fire up your favorite OS-9 Level II word processor, type those words and smile!

Alpha Software Hits OS-9 Market Hard

Meeting Keith Alphonso and seeing the many OS-9 products he has put on the market was a highlight of RAINBOWfest Chicago. It's great to see young people take a fresh approach to new markets. While Alphonso has only been in the CoCo OS-9 market since June last year, he's accomplished much.

"I had been programming the Color Computer for years — using RS-DOS," Alphonso said. "I owned OS-9 Level I, but never used it much. When Level II came out, I fell in love with the windows and really wanted to get into it. I discovered I could do a lot of things I just couldn't accomplish with RS-DOS.

"When I first started, I discovered a lot of things that were hard to do with plain vanilla OS-9. That's when it started," he said. "Since I was a programmer, I wrote tools for myself — things to make life easier."

Alphonso built quite a collection, thought they were pretty good, and so decided to sell them. Alpha Software was born.

"I had eagerly anticipated OS-9 Level II. Since I bought it, I've never gone back to RS-DOS — I haven't seen an "OK" prompt in months," he said.

Alphonso said there were problems to overcome, but bit-by-bit, with help from friends like Kevin Darling, he became a star OS-9 programmer in his own right.

"I have a good friend who helped me and even wrote one of the packages I sell today."

To get Alpha Software started, Alphonso looked through some of the best software he had written and grouped a number of the smaller programs together to form a handy package of OS-9 tools. Alphonso also believes in the future of telecommunications — to the extent that he has written a bulletin board program for OS-9 Level II.

"A friend asked me to write it for him," Alphonso said. "He had been running an RS-DOS board and didn't really like it. He brought me some ideas for an OS-9 bulletin board and we put them all together. We use multiple processes, with one process calling another to set up a board that can be completely configured by any user."

"The reaction to Alpha Software's first appearance at RAINBOWfest Chicago was very good," Alphonso said. "A lot of people didn't know what to expect from our ad."

Alphonso's thoughts for newcomers to OS-9? "The road hasn't been too hard and long," he said. "It was slow at first — I needed more software. But after I wrote the software, and used OS-9, I found I could really fly. Our *Tools* can help everyone trying to bootstrap into OS-9." Alphonso said, "If you have the right tools, any job is easy."

Alphonso tells beginners that the first step is to put together a working system. "You need to have drives `/d0` and `/d1` configured to operate with a step rate of six milliseconds. You need to have your boot file right and you need to get a RAM disk set up, etc.

Alphonso takes the most pride in Alpha Software's latest product, *Presto-Partner*. "Both programmers and users will find it useful," he said. "Its calculator and notepad can help anyone stay organized. The program runs itself in its own device window in the background. Various overlay windows are used to display several utilities that pop up when you type special key strokes. *Presto-Partner* is very much like *Sidekick*.

"Most of Alpha Software's programs use a text interface. In fact, Alphonso's only mouse-based interface is found in *Multi-Menu*, a program that lets you run non-*Multi-Vue* compatible software in a *Multi-Vue* environment. It also lets you create your programs so they will run in *Multi-Vue*, even if you don't know how to write them for *Multi-Vue*."

For example, you can write a straight old-fashioned BASIC09 program and call it from *Multi-Menu*. Each *Multi-Menu* can run up to 10 OS-9 commands. Why 10?

"You can have 10 menu items in up to 10 menu entries," Alphonso said. "It's sort of like owning an automatic visual shell. I didn't want to make *Multi-Menu* too big however, because it would require too much

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memory."

What's the next step in the evolution of *Multi-Menu*? "*Multi Tools*, which lets you create buttons and scroll bars," Alphonso said. "I'll probably add this capability to *Multi-Menu*, but I may release it as a separate package you can integrate with *Multi-Menu*.

"If I make it a separate package, I'll include all the things needed to build a completely mouse-driven interface," he said, "including automatic dialog boxes and an automatic method to open and read or write to a file selected from a list of files presented in a dialog box similar to the Macintosh standard file dialog."

Alphonso believes there's a speed problem with *Multi-Vue*, noting that the time required to update the mouse pointer drags down the system a bit. But he hadn't seen the new *GShell+* module, which was enhanced by the OS-9 Users Group.

What else does Alpha Software sell?

"*Level II Tools* is a group of programs that does a number of things I've always needed to do," Alphonso said. "It gives you wild card commands to efficiently move files around. There's a set of tree display commands that give you a visual assist when you are trying to find a file. You can list an entire directory and actually break out any file."

The *OS-9 Level II BBS Release 3.0* is Alphonso's most popular program. "We have more than 100 people using it," he said. Our users are spread throughout the country and Canada. We're busy now setting up a support group for the board. Mike Camera will take charge of the new service.

Not all of his customers are using it to run a public bulletin board. A few are using it as a private E-Mail system. Some even use it as a menu to run their own OS-9 applications.

"Most people really like it," Alphonso said. "Especially the people who prefer OS-9. I've had a few people who don't know a lot about OS-9 and have had trouble running it. Others said it forced them to run OS-9."

Did he have to overcome any technical problems while writing it?

"Well, there was the carrier-detect problem," he said. "The ACIAPAK driver has this capability built in, but it doesn't always work quite right."

Alphonso wrote a routine that kills any process started by the parent if carrier detect is lost. It also took him a while to solve the baud-rate detection problem. The program now sets itself up for 1200-baud operation and waits for a user to press the ENTER key. Depending on what OS-9 returns, it switches the speed up or down.

Alphonso was able to tell which direction to switch the speed to because one speed returns an arrow, the other returns a junk character. He checks this character, then resets and goes. If nothing happens in four seconds, he resets and goes back to 1200 baud.

A public domain version of *Galatic Conflict*, a game first published in THE RAINBOW in November, 1986, is now bundled with *BBS Release 3.0*. It was translated to BASIC09 by John Sebella and Melvin Gaskins of Hobart, Indiana.

Hyper-Tech — Another Rising Star

Keith Alphonso wasn't the only young man at RAINBOWfest, Chicago determined to capture a piece of the pie created by OS-9's increased popularity.

We were also pleased to meet and interview Eric Crichlow (HYPERTE on DELPHI) and his friend Chester Simpson. Eric, 17 and Chester, 19, teamed up with Mike Haaland to form Hyper-Tech in June of 1988. Together, the trio plans to introduce several exciting new OS-9 products in the near future.

Crichlow's labor of love is *Shellmate*, a $25 program that emulates the popular hands-free file management techniques of the Macintosh and Amiga on an OS-9 stage. It's used to copy, delete, move and rename files. It can also list files, print them or display pictures from them — even arc and de-arc them.

"*Shellmate* lets you perform essentially every operation you could ever want," Crichlow said. "It's especially handy when you need to move a large number of files and want to do it with very few keystrokes or mouse moves. When I'm through I hope *Shellmate* will have everything *Multi-Vue* has built into it — and much more. Besides, it's my first C program . . . everything I learn will go into constant updates of the program."

So how did Hyper-Tech get started?

"We felt the Color Computer 3 offered an amazing amount of potential no one was exploring under RS-DOS or OS-9," Crichlow said. "We felt the only way to do anything to help the CoCo reach its potential was to write some programs ourselves."

By this time, Chester was already proficient with assembly language programming under RS-DOS. Mike and Eric were starting to learn C. Chester was already working on graphics and animation programs under RS-DOS.

Chester began to design a graphics and animation development system. Mike started talking to distributors and learned there was a big demand for easy animation programs. Chester's passion became a major project.

Chester's OS-9 product is so young it doesn't even have a name. An RS-DOS version already on the market is called *Imagemaster*. *Imagemaster* runs on a 128K system and edits 64-by-64 pixel graphics images that can be used to create graphics images for automation sequences.

Eric and Mike want to do many things. "Tandy and Microware gave us much power and opportunity in the OS-9 Level II windowing system. Hardly anyone has done anything with it," Crichlow said. "We want to do things with *Multi-Vue* windows that most people think are impossible."

For example?

"Graphics! Menus! A clipboard standard," Crichlow said. I'm also attempting to set up windows you can move and resize. I figure it can do it the same way *Multi-Vue* does. If you click on the menu bar, but not on a selection, it will know you are asking to move the window."

How will he do it?

"I'll `deiniz` the window and give you a box the same size as your original window. Then, after you move the box and resize it, I'll read the parameters of the box again and open a window the size you want at the location you request. In the meantime, I will have saved a buffer with all the data that was in your window originally. After I create the new window, I'll write it back out again.

MVCanvas Promises Speed and Ease

MVCanvas is another Hyper-Tech product that lurks on the immediate horizon. In fact, it may be available by the time you read this column.

"We plan for *MVCanvas* to be just as functional as any RS-DOS paint program — bar none," Simpson said. "It will also be just as quick. You'll be able to access a pop-up menu that holds all of the drawing tools from the menu bar at the top of your screen. This means you'll have the entire screen free for your artistic masterpiece," he said. "*MVCanvas* is an intelligent program."

Mike grabs a piece of the screen and holds it in a buffer, then uses a *Multi-Vue* call to make the buffer his pointer. This lets *Multi-Vue* handle moving the image around the screen.

MVCanvas also supports large fonts. While Mike works on the program, Chester is creating the new fonts — ranging from 8-by-8 to 24-by-32 pixels using *Imagemaker*.

It was the impressive speed of *MVCanvas* that prodded Chester to make the move to OS-9. To him, speed is everything. Simpson is presently working on a graphics program that can transport images back and forth between RS-DOS and OS-9 programs. He hopes to be able to save an image to the OS-9 clipboard, transfer it to an RS-DOS disk and then load it into *Imagemaker*

— or vice versa.

The beta version of *MVCanvas* I received May 5th had the font capabilities installed. You could also load and save clips and manipulate them. It also has an Undo feature command at the top of its edit menu. Just think, they told Mike it couldn't be done.

Hyper-Tech had not yet announced the price of *MVCanvas* during RAINBOWfest. The first people to hear about the new program will most likely be people who check into DELPHI or CIS. Hyper-Tech plans to post a demo there as soon as the program is ready for release.

After they release *Shellmate* and *MVCanvas*, Eric, Chester and Mike hope to do a lot with integrated *Multi-Vue* windows and graphics packages.

Disto 4-in-1 Board with RGB Hard Disk

Chris Rochon's wife, Johanne, gave birth to a beautiful baby daughter earlier this year. At RAINBOWfest the couple's company, CRC Computers, gave birth to another great OS-9 product.

The new 4-in-1 card, designed by RAINBOW's Tony DiStefano is an answer to the Multi-Pak hater's dream. When you add this plug-in card to your Disto Super Controller II, you can throw away your Multi-Pak Interface. With this combination you have a floppy disk controller that does not halt the processor when it's reading to or writing from the disks; a real-time clock; a Centronics parallel port; an RS-232 port able to work with Tandy's ACIAPAK drivers; and a hard disk interface able to communicate with either an SASI or SCSI disk controller. You're in business!

I kept my Multi-Pak because I use the 512K RAM disk card, also designed by DiStefano and sold by CRC. This outboard RAM disk is indispensable to me when I am experimenting with a C program or running the fantastic mouse-/menu-based word processor, *Window Writer*, from Owl-Ware.

The new 4-in-1 from CRC is fantastic. It comes with cables designed to plug directly into your hard disk, as well as your parallel and serial devices. All its components are rated at two megahertz, so you no longer need to slow down your CPU when you perform I/O. Yet, the cables aren't all you receive with CRC's 4-in-1 card. You also receive OS-9 drivers for the real-time clock, parallel port, RS-232 port and the hard disk interface. And not only do the drivers come in the package, they are easy to install and work well. All you need to do to get up and running with this new card is to OS-9 a new OS9BOOT file, using the OS9Gen utility.

But, I expected the best. The drivers were written by Kevin Darling. Despite the enthusiasm, that's only half the good news. Next month, I'll tell you how we're using the new Disto/CRC 4-in-1 card with a new SCSI controller, and drivers from Roger Krupski at RGB Computer Systems. This combination was made in heaven — especially for people who want to be able to reserve a portion of their hard disk drive for RS-DOS use. But the best thing about this combination is that it lets you boot automatically into OS-9 when you turn on the power. Again, we'll have more about this combination next month.

Robert Moody's *Maxic*

Maxic, Robert Moody's deluxe BASIC09 icon editor described in the July column, is not included this month because of magazine space limitations. However, because we want you to share our enthusiasm, the 28 listings that make up *Maxic* are included on this month's RAINBOW ON DISK. The executable I-code modules, as well as the source code are also available for downloading from the RAINBOW ON DISK section of the DELPHI Color Computer/OS-9 Online Forums.

Because Robert Moody wants to share his bag of tricks with the rest of the Color Computer Community, we will print the BASIC09 source code for *Maxic* over the next three issues so that you can study one short module at a time. After we've mastered the pieces, we'll dig into the main program and see how Moody brings the total product together by excercising the smaller and shorter tools. It's amazing what people can do once you get them started.

Maxic was born after Moody studied the listing of our *MVShell* last August. It's an amazing program. In it you'll find many secrets to fully exercising the *Multi-Vue* menus system, getting the most out of your CoCo's mouse, and performing magic using OS-9's GET/PUT buffers.

TCP-IP for OS-9

We ran into James Jones from Microware at RAINBOWfest Chicago and he had good news for amateur radio operators. He had just received a public domain version of Phil Karn's TCP-IP implementation from Peter Dibble. It had been written in C using the OSK (OS-9 68K) compiler. Peter received it from a German group, and promised to send me a copy. I'll try to get it in the OS-9 Users Group library. When I receive it, I'll try to put out a note on the packet radio network also.

That's it for August. I hope you're enjoying your summer and will join us again in September for more exciting OS-9 news. Until then . . . Keep On Hacking!

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- Louisville — Hawley-Cooke Booksellers (2 Locations)
- Newport — Simon's Castle News

LOUISIANA
- Baton Rouge — City News Stand
- Lockport — TV Doctor/Radio Shack
- New Orleans — Sidney's News Stand Uptown
- Monroe — The Book Rack

MAINE
- Bangor — Magazines, Inc.
- Brockton — Voyager Bookstore
- Caribou — Radio Shack
- Oxford — Books-N-Things
- Sanford — Radio Shack

MARYLAND
- College Park — University Bookstore

MASSACHUSETTS
- Boston — Eastern Newsstand
- Cambridge — Out Of Town News
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- Littleton — Computer Plus
- Lynn — North Shore News Co.
- Swansea — Newsbreak, Inc.

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- Birmingham — Border's Book Shop
- Durand — Robbins Electronics
- E. Detroit — Merit Book Center
- Hillsdale — Electronics Express/Radio Shack
- Holland — Fris News Company
- Kalamazoo — The Book Raft
- Lowell — Lowell Electronics
- Muskegon — The Eight Bit Corner
- Niles — Michiana News Service
- Perry — Perry Computers
- Riverview — Riverview Book Store
- Roseville — New Horizons Book Shop

MINNESOTA
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- Edina — Shinder's Leisure Lane
- Minneapolis — Shinder's (2 Locations)
- Minnetonka — Shinder's Ridge Square
- Roseville — Shinder's Roseville
- St. Paul — Shinder's Annex; Shinder's Maplewood; Shinder's St. Pauls

MISSOURI
- Farmington — Ray's TV & Radio Shack
- Flat River — Ray's TV & Radio Shack
- Florissant — Book Brokers Unlimited
- Jefferson City — Cowley Distributing
- Kirksville — T&R Electronics
- St. Louis — Book Emporium

NEBRASKA
- Lincoln — Nebraska Bookstore
- Omaha — Nelson News

NEVADA
- Carson City — Bookcellar
- Las Vegas — Hurley Electronics; Steve's Books & Magazines

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- West Lebanon — Verham News Corp.

NEW JERSEY
- Atlantic City — Atlantic City News Agency
- Cedar Knolls — Village Computer & Software

NEW MEXICO
- Albuquerque — Page One Newsstand
- Santa Fe — Downtown Subscription

NEW YORK
- Amherst — Village Green-Buffalo Books
- Brockport — Lift Bridge Book Shop, Inc.
- Brooklyn — Cromland, Inc.
- Elmira Heights — Southern Tier News Co., Inc.
- Fredonia — On Line: Computer Access Center
- Hudson Falls — G.A. West & Co.
- Huntington — Oscar's Bookshop

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	55 Water Street
	World Trade Center #2
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	Idle Hours Bookstore
	International Smoke Shop
	Jonil Smoke
	Penn Book
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Chapel Hill	University News & Sundry
Charlotte	Newsstand Int'l
Hickory	C^2 Books & Comics
Jacksonville	Michele's, Inc.
Kernersville	K & S Newsstand
Lexington	Martin's News Stand
Marion	Boomers Rhythm Center
Winston-Salem	K & S Newsstand (3 Locations)
	Rainbow News Ltd.

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Lima	Edu-Caterers
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Tulsa	Steve's Book Store

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	Rich Cigar Store, Inc.
	Sixth & Washington News
Salem	Capitol News Center
	Checkmate Book

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Altoona	Newborn Enterprises
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Feasterville	Global Books
King of Prussia	Gene's Books
Malvern	Personal Software
Reading	Smith's News & Card Center
Temple	Software Corner
West Chester	Chester County Book Co.
York	The Computer Center of York
	Tollgate Bookstore

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Clemson	Clemson Newsstand
Florence	Ray's #1
Greenville	Palmetto News Co.
Spartanburg	Software City

TENNESSEE

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	Guild Books & Periodicals
Knoxville	Anderson News Co.
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Hampton	Benders
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Norfolk	I-O Computers
	Turn The Page
Richmond	Volume I Bookstore

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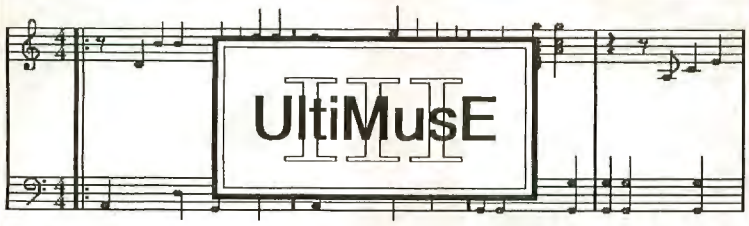

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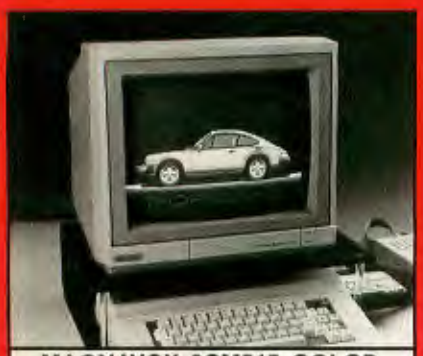

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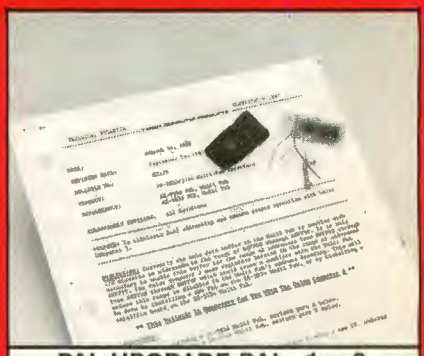

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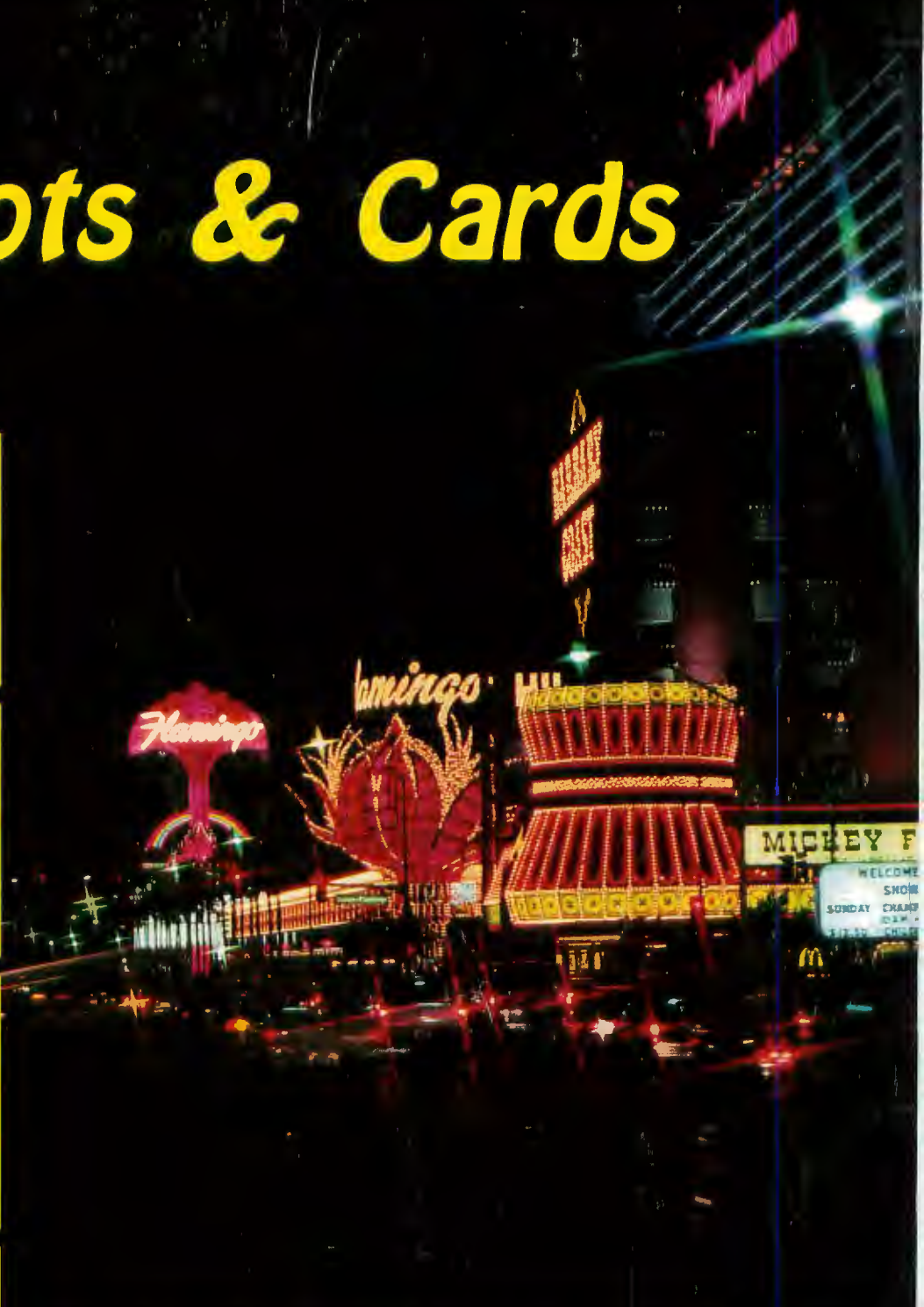

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