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The

RAINBOW

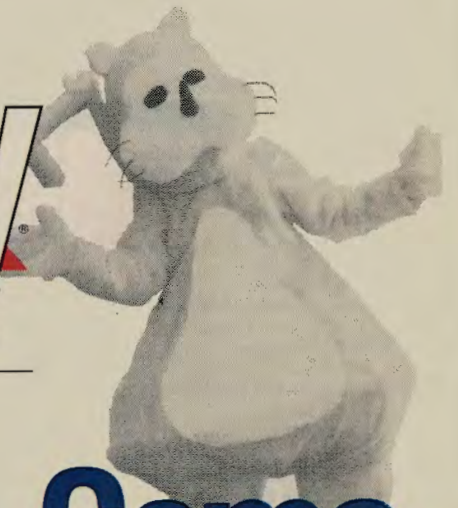
12
YEARS

THE COLOR COMPUTER MONTHLY MAGAZINE

May 1993

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The Time Has Come

*Old Dog Tray's ever faithful;
Grief cannot drive him away;
He is gentle, he is kind.
I'll never, never find
A better friend than Old Dog Tray.*

Stephen Foster was writing about his beloved dog, Tray, who died while trying to rescue someone from a burning house. I'm writing about THE RAINBOW. THE RAINBOW is the second-oldest continuously published computer magazine in the world. It is the longest-lived computer-specific magazine in existence. But more important than that, it is the best-loved computer magazine the world has ever known.

For 154 consecutive months, from July of 1981 until now, THE RAINBOW created a community of computer users absolutely unmatched in the brief history of computers. In all, three-quarters of a million people welcomed it into their homes every month. It engendered program-writing contests, its own computer show, more than a dozen books, and a nickname for its subject that even the manufacturer adopted. It was probably the only magazine in existence that even had a mascot.

As THE RAINBOW grew from four dot-matrix-printed pages to nearly 400 typeset pages with full-color covers, illustrations and advertisements, it came to personify not just the spirit and vigor of the Tandy Color Computer but the vitality of a new age of technology — an age that brought the ultimate technology, a computer, into the hands of normal, everyday people. It started hundreds of businesses, most of them of the kitchen-table variety, and made it possible for us “just folks” to make a buck doing something that was fun and exciting.

THE RAINBOW brought some 350,000 people to its 20 RAINBOWfests; it attracted more than 1000 entries for its “CoCo Gallery” monthly contest column; it gave publicity to some 300 Color Computer clubs; and it crashed the entire Delphi Information Service numerous times with floods of CoCo users all trying to log on at the same time.

I know of at least two marriages that were the direct result of people's meeting through THE RAINBOW — the ceremony for one of which was almost held at a RAINBOWfest until the bride's parents objected strongly. Subscribers came from every continent on the planet, even Antarctica, and it was once rumored (though I was never able to get NASA to confirm this) that one issue even went into Earth orbit with an astronaut.

We mailed THE RAINBOW to people who lived on boats, to servicemen and women in the Army, Navy, Marines and Air Force (and those of several other countries), and to at least one CIA spy who used a mail drop for receiving his copy. We blasted through the Iron Curtain when it still existed and crossed the Berlin Wall as well. THE RAINBOW penetrated the Bamboo Curtain too. At one point or another we sought out local residents who were fluent in Arabic and Hebrew, Russian and Japanese to translate letters for us. Of course we got our share of French (from France as well as Quebec), Spanish, German and Italian letters too. We had subscribers from the holy cities of Jerusalem, Rome and Mecca. We once had a grandfather who bought 10 subscriptions, one for each of his grandchildren. We even licensed a special edition of THE RAINBOW in Australia; it was printed there to save the Aussies postage and was very successful.

But most of all, the story of THE RAINBOW is the story of friendship. Never was it unusual to see a group of 20 or 30 people still huddled together at 3 a.m. during a RAINBOWfest. We always had more pen-pal requests than we could ever print. And there were the stories of people who drove 100 miles to attend a CoCo club meeting or just to help someone install a disk drive when he or she couldn't figure out how to do it alone.

When, nearly five years ago, Tandy told us it would no longer manufacture the Color Computer, I knew this time would someday arrive. We have strived mightily to keep THE RAINBOW alive. But for the past two years, it has lost money. Without a new computer on which to build our subscription base, we never had any real hope of turning THE RAINBOW around. Yet out of a sentimentality that probably has no part in the business world, we continued publishing, looking for economies where we could. THE RAINBOW has survived this long simply because we were willing to spend profits from our other Tandy magazine, PCM, to sustain it. Today, with its subscription base ever-shrinking, even our in-place economies are insufficient to keep THE RAINBOW going. Like Old Dog Tray, the ever-faithful RAINBOW ceases to exist with this issue.

I love this dear magazine that was born so small, grew so large, and has become so small again. I am sure many of you few thousand who are still with us do as well. I've found, in my many discussions with other editors and publishers, that none of them quite believes the devotion and affection the CoCo Community lavished on a mere magazine — by all of us here, and especially by all of you.

We will fulfill your subscriptions to THE RAINBOW with subscriptions to PCM. Those of you with RAINBOW ON TAPE and RAINBOW ON DISK subscriptions will receive PCM ON DISK subscriptions. Not incidentally, you will find many of your old friends from THE RAINBOW are subscribers to PCM. It was founded on and continues to follow the same philosophy that made THE RAINBOW so successful. Indeed I cannot count the number of people who, as they moved from the CoCo to the PC, have written to me saying that in PCM they were pleased to find for their new computers the same support and enthusiasm to which they had become accustomed in THE RAINBOW.

You will note that we have special advertisements in this final issue for THE RAINBOW Bookshelf, for back issues of THE RAINBOW itself, for RAINBOW binders, and for back issues of RAINBOW ON TAPE and RAINBOW ON DISK. Some are in short supply, and of course we won't be reprinting or duplicating any of them. If you would like to fill out your collection of any of these items, please write or call us as soon as possible.

There is little left to say, my friends. How to close the book? How to end these years? Life, I suppose, is merely one goodbye after another — and now it is time to for us to say goodbye to you.

*To everything there is a season, and a time to every purpose under the heaven:
A time to be born and a time to die; a time to plant, and a time to pluck up that which is planted;*

A time to weep . . .

Weep not for THE RAINBOW. It forged a community of spirit. A commonness of purpose. A wonderful adventure. It was the instigator of lasting friendships. It touched us all, and we were all a part of it.

It was the greatest.

— Lonnie Falk

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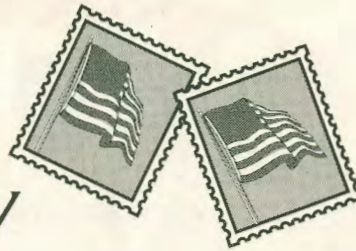
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Letters to THE RAINBOW



Are 512K Upgrades Reliable?

Editor:
I have a 128K CoCo 3, a Multi-Pak Interface (Catalog No. 26-3124) and two FD-500 disk drives. I also have Multi-Vue and DeskMate. I often hear about 512K upgrades breaking down. I need the extra memory to use these programs, but I don't want a dead CoCo. Do I need to upgrade the Multi-Pak Interface as well?

John Black
P.O. 2404
Whitehouse, OH 43571

While it is true that nothing lasts forever, the 512K upgrades aren't susceptible to damage any more or less than any other component in your CoCo; you'll probably experience years of trouble-free operation. If you are using OS-9 Level II, the 512K upgrade is practically required. The Multi-Pak Interface must be upgraded before you use it with a CoCo 3. See "CoCo Consultations" in this issue for Multi-Pak Interface upgrade information.

Wants to Learn About RMA

Editor:
Where can I get information on the RMA assembler that comes with the Level II Development System? I am interested in seeing examples of how this assembler works.

Also, I recently bought the Accounting Level 2 program from CoCoPRO! and have been unable to get it to work. Can you give me any information that will help me get this program up and running?

Samuel McGregor
4213 Trough Springs Road
Adams, TN 37010

The manual that comes with the Development System for OS-9 Level II supplies a couple of source code examples for the RMA assembler. For more comprehensive

information, though, we recommend you check the databases in the Delphi OS9 Online SIG.

Unfortunately we never received an evaluation copy of Accounting Level 2 from CoCoPRO!. Perhaps another reader who is familiar with the package will be able to offer some help.

Dueling Printers

Editor:
The people at Tandy Corporation gave me your address in reference to questions I have concerning my Color Computer. I have a CoCo 3 with a DMP-133 printer, an FD-502 disk drive and a VM-4 monochrome monitor.

I want to add a second printer to the system. Ideally I would like to be able to load one printer with paper and the other with labels, then use a switch to tell the system which printer I want to use. Tandy is no longer manufacturing this system and does not have any replacement printer stock.

Orval Bogart
710 S. Fitch Mountain Road, #102
Healdsburg, CA 95448

Just about any printer can be used with the CoCo, though no manufacturers currently produce a printer with a serial port for the CoCo 3. Given what you want to accomplish, purchase a parallel printer switch (check the Jameco and JDR Microdevices ads in current electronics magazines for availability). Then contact Owl-Ware (see the ad in this issue) to obtain a serial/parallel converter to go between the CoCo and this switch. Finally, use standard parallel cables to connect the two printers to the switch.

BASIC09 Typos Corrected

Editor:
I am having a problem getting the sample program on Page 9-40 in the BASIC09 section

of the OS-9 Level II manual to work properly. The new window appears, but nothing happens when I press a key; the program hangs at the GET #1 statement. To get out of the program, I have to press the BREAK key. And I lose the original window in the process. Can you help?

Burton Parke
2567 Elderberry Drive
Clearwater, FL 34621-2207

There are three errors in the program listing provided on Page 9-40 in the BASIC09 section of the Level II manual. First, change the word WRITE in the fourth line to UPDATE. Second, change the eighth line from

GET #1,RESPONSE

to

GET #PATH,RESPONSE

The last correction is to swap the ninth and tenth lines, making CLOSE #PATH the next-to-last line in the program.

Using DOS to Run BASIC Programs

Editor:
I have written a utility program in BASIC that combines many stand-alone machine-language utilities (by poking them into memory). I call this program SETUP.BAS, and I want to execute it using the DOS command when I first turn on the CoCo. Any information on how to use the DOS command in this fashion would be much appreciated.

Alan Doherty
169 White Moss Drive
Marstons Mills, MA 02648-1082

An explanation of the DOS command and how to use it to start user programs is included in "A Special Use for the DOS Command." This article by Roger Schrag appears on Page 140 of the November 1984 issue of THE RAINBOW.

Needs Help With BASIC09 Under Multi-Vue

Editor:
I need some help writing programs in BASIC09 for use with Multi-Vue. I have many ideas for programs I'd love to write, and it would help a great deal if I could interface them with Multi-Vue. I am most interested in being able to use the pull-down menus and such that Multi-Vue supports. Can anyone out there help?

Also, I want to purchase a DS-69B or Rascan video digitizer. Since no vendors currently carry these products, I'm willing to buy a used unit. Any offers?

Shawn Langley
901 Flakes Ford R.D., SW
Washington Court House, OH 43160

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Feature Program

Add a Text-Screen Mouse Pointer

By Nick Johnson

A useful addition that makes just about any program more user-friendly is the text-screen mouse pointer. A what? A text-screen pointer is just a block on the text screen. You move it using a mouse or joystick, and you select items by pressing the firebutton. This type of pointer is great for text-based programs where no graphics screens are involved.

The 32-column screen is an excellent place to use the pointer; it is small enough to allow for complete motion all over the screen area. It won't work with an 80-column screen since the joystick port only allows for 64 positions. It will work with 40-column screens, but I decided to write the routine here for 32 columns only, allowing it to be used on any CoCo. (But readers with CoCo 3's can modify the program for use with 40 columns.)

The pointer routine is a subroutine that is meant to be accessed via a GOSUB command from within a larger program. To use it, set Variable CL to a value of 0 through 8 (corresponding to the color number of your choice) and use GOSUB to call the routine. As listed, the program contains an example of how this works. The routine returns when the mouse or joystick button is pressed.

Then check the value of Variable G to determine the current screen location

The text-screen pointer can really make your programs shine; as a menu pointer in text-based programs, it can't be beat.

Nick Johnson is 17 years old and a senior at Crestview High School. He began programming using a CoCo 1 in 1982. After purchasing a CoCo 3, he advanced quickly and now programs almost constantly. He can be contacted at 5830 Reinke Dr., Crestview, FL 32536-8913. Please include an SASE when requesting a reply.

16K ECB

The Listing: TEXTPTR

```

1 *TEXT JOYSTICK POINTER
2 *BY NICK JOHNSON
3 *COPYRIGHT (C) 1993
4 *BY FALSOFT, INC.
5 *RAINBOW MAGAZINE
30 POKE &HA9E6.1 *FASTER JOYIN
40 CLS
50 GOTO 500
60 *ENTRY CONDITIONS:
    
```

```

70 *CL=THE COLOR OF THE CURSOR.
80 * THIS CAN BE ANY VALUE
90 * FROM 0 TO 8.
100 *EXIT CONDITIONS:
110 *G=THE SCREEN LOCATION OF
120 * THE CURSOR.
130 *ROUTINE EXITS WHEN FIRE
140 *BUTTON IS PRESSED.
150 CC=128+(CL*16-1):IF CC<128 T
HEN CC=128
160 A=JOYSTK(0):B=JOYSTK(1)
170 E=INT(A/2):F=INT(B/4)
180 G=F*32+E
190 H=PEEK(1024+G)
200 POKE 1024+G,CC
210 C=JOYSTK(0):D=JOYSTK(1)
220 I=INT(C/2):J=INT(D/4)
230 IF PEEK(65280)=126 OR PEEK(6
5280)=254 THEN 270
240 IF E=I AND F=J THEN 210
250 POKE 1024+G,H
260 GOTO 160
270 POKE 1024+G,H:RETURN
500 CL=RND(9)-1:GOSUB 150
510 GOTO 500
    
```

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DELPHI BUREAU

EDDIE KUNS

SIG Menus

Over the past several months, I've covered a number of features of the CoCo and OS9 Online SIGs. But how do you find out on your own what features are available in the SIGs? If your current prompt mode is set for menus (/PROMPT=MENU) or if you enter a question mark (?) at either SIG's main prompt, you'll see the SIG menu (see figures 1 and 2). The fact that press ? brings up the current menu at any prompt is important to remember if you often get lost online.

As you look over the menus shown in figures 1 and 2, you may notice similarities between many of the menus' options. Some of the common features between the CoCo SIG and OS9 Online are independent even though they operate identically. For example, each SIG has its own database areas and topics. This is also true for the Announcements and Forum areas. In fact, only a very few areas are shared between the CoCo SIG and OS9 Online. Conference is one such area. If you are in conference in one SIG, you will be able to see and talk to people who are in conference in the other SIG. Another shared feature is the "Who's Here" function (which has exactly the same effect as typing the slash-command /WHO. When you are in the CoCo or OS9 SIG, the WHO command lists all users who are cur-

rently in either SIG. There is no way to tell from the "who" command in which SIG a specific user is working.

Although the Conference area and the WHO commands do not distinguish between the CoCo SIG and OS9 Online, the entry log does. If you want to see the last time a specific person logged on to a specific SIG, you have to enter that SIG yourself and enter /ENT *username*. Keep in mind, this command does *not* report the last time the specified user was on Delphi. It tells you only the date and time that person entered the SIG in which you are working.

Electronic mail (Mail) and your Workspace area are global. You are taken to the same area regardless of the Delphi SIG you are in before you enter either of these areas.

Eddie Kuns is pursuing a doctorate in physics at Rutgers University. He lives in Aurora, Illinois, and works as a programmer and researcher at Fermilab. Eddie is the database manager of the OS-9 Online SIG on Delphi and can be reached online as EDDIEKUNS.

Announcements	Topic Descriptions
Conference	Who's Here
Databases (Files)	Workspace
Entry Log	Help
Forum (Messages)	Exit
MAIL (Electronic)	Classifieds
Member Directory	OS9 Online
Poll	Questions & Feedback
Set Preferences	Rainbow Magazine Services
Shopping Service	

Figure 1: The CoCo SIG Menu

Announcements	Topic Descriptions
Conference	Voting Booth
Databases (Files)	Who's Here
Entry Log	Workspace
Forum (Messages)	Help
MAIL (Electronic)	Exit
Member Directory	Classifieds
Questions & Feedback	Portal to Coco Sig
Set Preferences	Rainbow Services

Figure 2: The OS9 Online Menu

Delphi Support to Continue

While this issue of THE RAINBOW is the last to be published, we recently renewed a contract with Delphi for the continued operation of the CoCo and OS9 Online SIGs. Over the years, these SIGs have become an important meeting place for members of the CoCo Community. Now communication through

this medium is of even greater importance, and we intend to continue our support there. If you have not already availed yourself of this service, consider doing so now. You can reach Delphi by dialing (800) 695-4005 or (617) 491-3393.

DATABASE REPORT

OS9 Online:

General Information:

UNIX TERMCAP CODES	
DAVGEORGE	David George
BENCHMARK	
FHOOG	Frank Hogg
ENC9: SOFTWARE ANNOUNCEMENT	
DONVAIL	Don Vaillancourt
LOCATE: SOFTWARE ANNOUNCEMENT	
JSUTEMEIER	Jim Sutemeier
OS9CN DECEMBER NETNEWS	
OS9CN	Tom Birt

Applications (6809):

GSHELL V3.2: IPATCH UPGRADE	
EARTHER	Shawn Driscoll
CRON ED #12: TASK SCHEDUALER	
WOAY	Jim Martin
GSORT ED #12: DIR SORT UTIL	
WOAY	Jim Martin
UNLZH #7: EXTRACT .LZH ARCHIVES	
COGITATR	Norman Rheume
NEWDEL: REPLACEMENT FOR DEL[ETE]	
WOAY	Jim Martin
BRU 1.2: HARD DISK BACKUP	
WOAY	Jim Martin
FORMATS: BATCH DISK FORMATTER	
RICKGRAY	Rick Gray

Games & Graphics:

THREE SCREEN SAVERS	
SIGMUND	Tom Bauer
GRAPHICAL CHRISTMAS CARD	
JOELHEGGER	Joel Hegberg
SHOWGIFTC70: TC-70 GIF VIEWER	
THUNDERFNRS	Bruce Moore
OSK ROGUE V5.3	
KSCALES	Ken Scales
MM-1 FLICKER ANIMATION	
GRAPHICSPUB	Bob Montowski

ROTATING SPHERES-FLICKER	
GRAPHICSPUB	Bob Montowski

Music & Sound:

TV SOUND FILES	
RICKMAC	Richard McNabb

OSK Applications:

REPLACE: CHANGE CHARS IN FILES	
TIMKIENTZLE	Tim Kientzle
DU: DISK USAGE	
TIMKIENTZLE	Tim Kientzle
TREE: HEIRARCHICAL DIRECTORY	
TIMKIENTZLE	Tim Kientzle
UPTIME: SYSTEM "ON" TIME	
VILLARREAL	Joe M. Villarreal
HDBACKUP 1.5:HARD DRIVE BACKUP	
MARKGRIFFITH	Mark Griffith
GHOSTSCRIPT 2.4:POSTSCRIPT EMULA	
JOHNREED	John Wainwright

CoCo SIG:

Utilities & Applications:

ALPHA-DIR UTILITY	
JASONGROSS	Jason Gross
IBM TO/FROM RSDOS UTILITY	
JES68K	Jesse Newton
6309 EDITOR/ASSEMBLER PRE-VIEW	
CHETSIMPSON	Chet Simpson

Hardware Hacking:

PIN OUT OF 512K BOARD	
MARTYGOODMAN	Marty Goodman

Soapbox (chitchat):

MALCOLM X: A REVIEW	
MARTYGOODMAN	Marty Goodman

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Games | <input type="checkbox"/> DEC 86 | Holiday | <input type="checkbox"/> APR 90 | Business |
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| <input type="checkbox"/> OCT 83 | Graphics | <input type="checkbox"/> FEB 87 | Utilities | <input type="checkbox"/> JUN 90 | Summer Fun |
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OS-9 |
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| <input type="checkbox"/> NOV 84 | Data Comm. | | | <input type="checkbox"/> NOV 90 | Data Comm. |
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| <input type="checkbox"/> JAN 85 | Beginners | | | <input type="checkbox"/> JAN 91 | Beginners |
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Games | | | <input type="checkbox"/> AUG 91 | VOLUME 11
Graphics |
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Games | | | <input type="checkbox"/> AUG 92 | VOLUME 12
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CoCo Consultations



Q **Is This MPI Upgraded?**
How can I tell if an older Multi-Pak Interface (Cat. No. 26-3024) has been upgraded with the new PAL chip?
Francis Swygert (DSRTFOX)
Robins AFB, Georgia

A The PAL chip is a 20-pin socketted chip — the only socketted chip in the 26-3024 Multi-Pak (unless other chips had been replaced during an earlier repair). All 26-3024 Multi-Paks were originally supplied with a 14L4-type PAL chip, usually made by Monolithic Memories Inc. ("MMI") is usually visible as part of the logo on the chip). Thus, if your 26-3024 Multi-Pak has a 14L4 PAL chip with no special label, it almost certainly has *not* been upgraded for the CoCo 3.

The original upgrade PAL supplied by Tandy was a Signetics PLS153N chip. This chip usually was supplied with a small, brown paper dot stuck to it. If you find such a chip in the Multi-Pak, it is upgraded. Many third parties (including me) supplied upgrade PAL chips for the 26-3024 Multi-Pak. A few of those I supplied were 14L4 chips, but I put labels on them noting that they were upgrade chips. The label usually had the word "CC3" (for CoCo 3) on it. Most of the upgrade PAL chips I supplied were 16V8 or 16V8a GAL chips, often made by Lattice. I put labels on all of those I sold to individuals or dealers. Thus, if your Multi-Pak has a 16V8 or 16V8a GAL chip in the socket, or for that matter any type of PAL other than a 14L4, you can be virtually certain it has been upgraded. By the way, to my knowledge there is no current commercial source for upgrade PAL chips for 26-3024 Multi-Pak Interface. Those who have PAL and GAL programmers can download from the Hardware Hacking database area of the Delphi CoCo SIG fuse-maps I posted for burning upgrade PAL chips, then burn their own. If all else fails, contact me at 1633 Bayo Vista Ave, San Pablo, CA 94806).

Q **The CM-11 and the CoCo 3**
Can a Tandy CM-11 monitor be used with the Color Computer 3?
Anthony Lee Dawson (KEYBOARDMAN)
St. Petersburg, Florida

A The CM-11 is a relatively high-quality CGA (RGBI, or 4-bit digital RGB) monitor. You can make a cable to go between it and the CoCo 3 by wiring like-named pins together. Using this approach, the CM-11 will display text screens and show a total of six colors plus black and white.

The pinout for the CM-11 connector is as follows:

- | | |
|---|--------|
| 1 | ground |
| 2 | ground |

- | | |
|---|-----------|
| 3 | Red |
| 4 | Green |
| 5 | Blue |
| 6 | Intensity |
| 7 | not used |
| 8 | Hsync |
| 9 | Vsync |

The CoCo 3 video connector uses the following pinout:

- | | |
|---|--------|
| 1 | ground |
| 2 | ground |
| 3 | Red |
| 4 | Green |
| 5 | Blue |
| 8 | Hsync |
| 9 | Vsync |

When wiring the new cable, just ignore the CM-11's Intensity line. Note, however, the cable can't be wired straight through because the *numbering* on the CM-11's 9-pin connector is different than that used on the CoCo 3's 10-pin dual-row connector. The DB-9 has pins numbered 1 through 5 in one row and pins numbered 6 through 9 in the other. The 10-pin CoCo 3 connector has all *odd-numbered* pins in one row and all *even-numbered* pins in the other. Hence, you have to solder a new cable from scratch — you can't simply use two standard crimp-on connectors.

If you want to get true analog RGB (64 colors) out of the CM-11 when using it with the CoCo 3, you will need a schematic for the CM-11 and some knowledge of video electronics. It should then be fairly easy to rip out the CGA conversion circuitry and feed the R, G and B signals from the CoCo 3 directly into the bases of the lowest level analog R, G and B video-amplifier transistors in the CM-11. But this project is not for the average tinkerer.

Q **Mixed-Up Drives**
I am installing a disk drive from a Tandy FD-500 drive system into the second drive bay of an FD-502 drive system. I managed to change the power supply connector in the FD-502 case to the large power connector required by the FD-500 drive. However, I discovered that the 34-pin edge connector is in a different area of the FD-500 drive than it is on the FD-502, and the cable in the FD-502 case is so short that the spare connector won't reach over to mate with the FD-500 drive. Is there an extender cable I should use, or what?
Bob Williams (BAWILLIAMS)
Cedar Hill, Missouri

A Extenders for 34-conductor disk-drive cables exist, but they are hard to find and quite expensive. By far the better solution would be to make a completely new drive cable, with connector spacing

appropriate for your setup. Alternatively, you might be able to just crimp a third connector onto the existing FD-502 cable far enough from the end that it would allow you to connect both drives. Female 34-pin, crimp-on edge connectors are inexpensive and widely available at electronics stores (including Radio Shack).

When mixing an FD-502 drive with another drive, you may have to experiment with termination in the second drive. The FD-502 drive uses a soldered-in 1000-ohm terminator. Your best bet when adding a second drive that has a socket for a terminator resistor is to put a 470-ohm terminator pack into that socket. If all you have is the standard 150-ohm terminator pack for your added drive, experiment with the added terminator present and absent to see which setup offers the most-reliable operation. You will also have to move the drive-select jumper on the added drive so it acts as Drive 1.

Q **Open I/O Addresses in the CoCo 3**
Can you suggest some good I/O locations to use for a CoCo 3 hardware project?
Eddie Kuns (EDDIEKUNS)
Aurora, Illinois

A If I'm not mistaken, locations \$FF10 through \$FF1F and \$FF30 through \$FF3F in a CoCo 3 are available for general use. This is definitely *not* the case on a CoCo 1 or 2, for those locations are filled with ghost images of the PIAs at \$FF00 and \$FF20. But I believe the PIAs in the CoCo 3 are more completely decoded, freeing those locations for use. You should verify this through experimentation.

Apart from those locations, \$FF60 through \$FF67 are generally to be considered available. The Radio Shack X-Pad uses \$FF60 through \$FF63, but I doubt there are too many X-Pads currently in use. I don't know of any device ever made that uses locations \$FF64 through \$FF67. Stay away from \$FF68 through \$FF6F, for these are the standard locations for the primary and secondary serial ports for the CoCo. \$FF70 through \$FF7E are more or less to be considered available, although a lot of the products from Speech Systems (EARS, realtime clock, SC-01 voice) use those locations.

Naturally you must avoid \$FF7F, for that location controls slot selection on the Multi-Pak Interface. The GIME chip is not documented as using locations \$FF80 through \$FF8F, and you might be able to get away with using stuff in that area if your hardware card plugs directly into the CoCo 3 system bus. However, if you plan to use a Multi-Pak Interface, you may find that the upgraded Multi-Pak will not allow you to address ports above \$FF7F. The upgrade

PAL chip does this to protect the GIME chip, and this "protection" extends down to \$FF80 because locations \$FF80 through \$FF8F were reserved for future GIME enhancements (which never appeared). Therefore, it would be safer to stay away from using those tempting 16 bytes at \$FF80 through \$FF8F.

Q **Disk BASIC or ADOS 3?**
What location do I "peek" to determine if ADOS or Disk BASIC is present in a CoCo 3?
Terry Simmons (MRUPGRADE)
Des Moines, Iowa

A According to Art Flexser, you should check the contents of Memory Location SA282. If Disk BASIC is present, this location should contain \$BD. If ADOS 3 or Extended ADOS 3 is present, you should find \$17 there.

Q **Upgrading the CoCo 3**
I have a CoCo 2 with 64K and a CoCo 3 with 128K. Are there any parts inside the CoCo 2 that I can use to enhance my CoCo 3? I'd like to do a memory upgrade, taking the CoCo 3 to 512K.
Erin Wilkins (AERIN)
Salisbury, Maryland

A There is nothing in a CoCo 2 that can be used to enhance a CoCo 3, although a few of the chips in most CoCo 2 versions are potentially of some value as replacement parts for identical chips in the CoCo 3. This is especially true of the SALT chip (SC77527) that is part of the power supply circuit, and the Joystick/D-to-A chip (SC77526). Both of these are custom chips that are impossible to get through normal sources.

It is becoming increasingly difficult to find 512K upgrade boards for the CoCo 3. Indeed, at this time the only source I know for such upgrades is via classified ads (see those in the Delphi CoCo SIG). A determined hacker could in theory make his own upgrade by constructing four sets of four-high piggybacked 41256 chips, but such an undertaking would require extensive knowledge of and experience with electronics tinkering.

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 THE RAINBOW's CoCo SIG. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Get More Speed from BASIC

by Nick Johnson



While your Color Computer is running a BASIC program (interpreting commands), it repeatedly runs a built-in routine (KEY IN), checking to see if you have pressed the BREAK key or the SHIFT-@ combination. The KEY IN routine (found at Location \$A1CB) is 161 bytes in length and handles tasks such as reading the keyboard PIA, checking keyboard debounce and checking for the BREAK and SHIFT keys. Granted, since the routine is in machine language, it executes almost instantaneously.

But since it is executed constantly (sometimes taking up as much as 35 percent of processor time) it slows down execution of BASIC programs a lot!

What can be done to speed up this process? Well, we can force the system to make sure a key has been pressed before going to all the trouble to see which key it is. After all, there is no reason to check for BREAK or SHIFT if no key has been pressed. And the machine-language routine to accomplish this little task is only 16 bytes in length.

KeyCheck requires Disk BASIC, and it works on the CoCo 3 or a CoCo 1 or 2 in the all-RAM mode. Enter the program listing as shown, and save it to disk. Now run it, and the special machine-language routine is poked into an area of memory just past the end of Disk BASIC. Unless you use some form of Reset protection, if you press the Reset button, you'll have to run KeyCheck again.

After the program is executed, the display shows the percentage speed increase realized. This figure is an approximation only, and it will change if you press Reset and run the program again. It should be somewhere between 40 and 55 percent.

I hope you enjoy this program and the extra speed it gives you.

16K ECB

The Listing: KEYCHECK

```

1 'THE KEYCHECK PATCH
2 'BY NICK JOHNSON
3 'COPYRIGHT (C) 1993
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 CLS:PRINT"WORKING..."
20 POKE&HFF02,0:Z=PEEK(&HFF00)
30 IF Z<>127 AND Z<255 THEN PRINT"RELEASE KEYS!":GOTO 20
40 TIMER=0
50 FOR I=1 TO 500:NEXTI:K=TIMER
60 POKE &HADEB,57
70 READ A:IF A=999 THEN 90
80 POKE &HDF60+X,A:X=X+1:GOTO 70
90 POKE &HA1C2,223:POKE&HA1C3,96
100 POKE&HDF67,Z:POKE &HADEB,189
110 TIMER=0
120 FOR I=1 TO 500:NEXTI:J=TIMER
130 IF K-3<=J THEN PRINT"NO SIGNIFICANT SPEED INCREASE.":GOTO 150
140 PRINT"SPEED INCREASED BY"FIX(((K/J)*100)-100)"PERCENT."
150 END
160 DATA 127,255,2,182,255,0,129,255,38,1,57,126,161,203,999
    
```

Nick Johnson is 17 years old and a senior at Crestview High School. He began programming using a CoCo 1 in 1982. After purchasing a CoCo 3, he advanced quickly and now programs almost constantly. He can be contacted at 5830 Reinke Dr., Crestview, FL 32536-8913. Please include a SASE when requesting a reply.

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"The UPGRADE" National Diskmagazine

From "Mid Iowa & Country CoCo"
We bid a sad farewell to Lonnie Falk and Rainbow. Despite some criticism over the years; (you can't please everyone) Lonnie has done a great job! Providing central support for the CoCo outlasting all the others. Radio Shack sold the hardware, but Rainbow has put the heart in the CoCo for many of us. To Lonnie and the Rainbow staff: We salute you!

Who will we go from here? No one will replace Rainbow. Neither we nor others will try. Yet, there will be "CoCo support for the years to come"! I can say that firmly by the response from our members in over 40 states plus Canada.

For those who are unaware, there is a good support base already in place outside of Rainbow. These will grow still larger. Look around the pages of this issue, choose what seems to meet your taste and subscribe.

The "UPGRADE" Disk Magazine:
Does not support OSK, or Computers not compatible to CoCo. That we leave to those more qualified.

Is not hard copy though it can dump to your printer. Displays first rate 16 color H2 graphics, with articles. Does keep you informed with news from around the country. Including ads and recommendations of better dealers.

Does have OS-9 articles concerning the CoCo. We've just started an excellent level II tutorial series. Does have Basic program technique Article & tutorials. Does carry a full variety of indepth articles and reviews. We carry tips on where to buy printers, drives & hardware.

This is a newsdisk, not a software disk. That we leave to the MI&CC library, where you can select from a variety of the Best available, for a filing & backup fee \$3.00 per disk. And we've done "All of this for eight consecutive years"! (three on disk)

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Include your Phone & System information

A FOND FAREWELL . . .



(Lonnie, as I've come to know him) over the years.

I am not a writer, but I have, in some small way, "touched" every Color Computer owner's life.

I have written purchase orders for more CoCos than anyone else in the world. I stopped counting them when it passed a million . . . Coordinated the development of at least five different versions of the CPU. Let's see, the CoCo 1, 2, direct video out 2, TDP 100, CoCo 3; yep, that's five . . . Walked miles around CES, Comdex, NCC and RAINBOWfest — shopping. I had to be aware of what "the competition" was doing, what was new in the industry, and generally give everyone a hard time.

I spent 10 years attempting to positively motivate Radio Shack store personnel to get excited about the CoCo. Every year, Radio Shack used to gather the store managers in regional areas to roll out the new catalog. The buyers would then try to "sell" their product lines to the store personnel. Two and a half days of intense "training," six one-hour fifteen-minute sessions each day for half the month of August. It was fun. I was even accused of reminding people of George Carlin, but I deny it to this day . . . Bought the MC-10. It was originally going to be a "kit computer," but we could finish building it cheaper than just making it a kit . . . Helped turn a three-year product cycle into a decade product cycle. The original ideas were planned to last for a maximum of three years. But it [the CoCo] sold well and the "installed base" (you, the customer) became very dedicated, and the rest is history.

As for some of the people I've known, I remember Lawrence C. Falk from when he printed THE RAINBOW on an LP VII. The professional relationship has always been at arms' length, meaning Lonnie would always ask for information, inside stuff, probably a holdover from his earlier UPI training. I would talk in circles, around others, insinuate, reply, but never lay it out on the table. It worked well for THE RAINBOW's credibility . . . Jon S. Shirley, VP who let me do the necessary things. He got the ball rolling, then moved to a small young company in the northwest called Microsoft, as their president . . . Van Chandler, a free thinker about software, like negotiations with Steve Spielberg about Poltergeist, the movie and the game . . . Mark Siegel, an OS-9 guru; someone you'd always want in your corner. Mark first came to Radio Shack with his boss, Pat Ketchum from DataSoft. We bought some of their products, Mark applied, we hired him. He's been an invaluable resource ever since . . . programmers like Steve Bjork and Dale Lear . . . Ken Kaplan, head man of OS-9. The definitive answer on the digitized picture — three of Ken's employees. Why is another story, and I'm not a writer . . . Dale Chatham, designer of circuits and custom chips. I won't say much here 'cause he keeps a lower profile than I do . . . Kenji Nishihawa, built them as fast as they were selling. As a matter of fact, his factory became so proficient at building CoCos with such a low defect rate that when it came time to start building Tandy 1000s, guess where . . . Steve Barry, helped smooth the way between manufacturing, engineering and quality control. Steve, along with Steve Osborn, Bill Valentine and the rest of the technicians, engineers, designers and advertising personnel all helped get the product from us to you . . . Gary Pack, contracts were always such fun. Lawyers, you don't know whether to like them or shoot them.

As for the things I have not done, I have not seen the

development of a CoCo 4, (although I did see a mockup once with a floppy 3½ built-in that looked remarkably similar to a Tandy 1000 EX) . . . Haven't seen the development of a bridge CoCo ?? which runs both MS-DOS and OS-9 and is compatible with ROM software. (Don't expect to either.)

I have not sold either of my personal CoCos. (But I did inherit a Tandy 1000.)

. . . Managed to escape involvement with software for the Color Computer. My current position at Tandy Consumer Mail Center oversees the sale of virtually all the original titles offered by Radio Shack, either through the store or direct to customers — customers can call (800) 321-3133. (Small commercial advertisement, sorry.)

I have never been the Saturday morning breakfast speaker at a RAINBOWfest. Several times over the years, as the staff at the RAINBOW was planning the next "fest," Lonnie would call and offer. Keeping the professional attitude, I would decline.

I have never written an article for *Hot CoCo*, *Color Computer Magazine* or *THE RAINBOW* (this piece doesn't qualify as an article, does it?).

I have never attended the Kentucky Derby.

Barry Thompson
Tandy Corporation



"**B**uilding the Rainbow" was my column in THE RAINBOW. The name came from a fanciful poster I first spotted in a small shop in San Francisco. The series of monthly essays was my managing editor's report on our building process — the creation of each new issue.

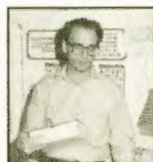
As in the poster, our joy was in the building. We were too immersed in production of the next issue to think much about how high or how wide THE RAINBOW would be. The "magic" in magic lies in not knowing the whole story. We just kept kept climbing, adding more building blocks, confident that something magic was happening, and taking elfin pride that those of us on the magazine staff were part of it all.

We helped build the CoCo Community. It's as real as Walton's Mountain, as illusory as Mayberry, RFD. In one way or another, we've all been there. For longer than any of us had a right to expect, it was a bustling boom town.

But even elves have sad times, just as Bambi had her forest fire. And, in real life, there is an end of THE RAINBOW. The machinery grows silent. The building stops. The builders disperse. What is and what was becomes "Once upon a time."

Those of you who've stuck by THE RAINBOW all the way understand it's OK. It's part of the natural order of things. And, if somewhere in the CoCo Community a solitary reader wipes an eye with a shirtsleeve while reflecting on what's gone by, it's as it should be. The beauty of a mountain is seen from its base, not the top. No one can better appreciate the peaks we had than those of us now on the valley floor.

— Jim Reed



Thanks to all the many wonderful customers who purchased our products and wrote so many kind letters of encouragement to us. And thanks to Lonnie Falk, Kim Lewis, Ira Barsky and all the other people at THE RAINBOW for doing such a good job for all these years, especially for keeping the advertising costs in THE RAINBOW as reasonable as possible — and for being so nice to do business with.

Stewart Newfeld
Zebra Systems



Progress continues, the results are now known. The will of the clock has finally been shown.

The waiting is over, it happens this year. The end of our RAINBOW is painfully near.

To Lonnie and Cray and all of the crew, This isn't goodbye, but thank you.

You all pulled together, and through your good deeds, THE RAINBOW gave CoCo the support it needs.

With BASIC, Assembly and OS-9 too, There's hardly a thing that CoCo can't do.

Word processing, games, graphics and such, We even did MIDI without spending much!

If your mailbox seems empty this upcoming June, I'm sure you'll agree, it happened too soon.

Cecil Houk
Rulaford Research



THE RAINBOW has meant to me the sharing of knowledge about computing. But most of all THE RAINBOW has stood for friendliness and friendships among those with a common interest. Nearly a dozen years ago, I knew that THE RAINBOW and friendliness went hand in hand: Lonnie Falk himself telephoned to tell me of the acceptance of my first article, and we had a pleasant and friendly conversation. Ever since, THE RAINBOW staff has been most friendly and helpful. Readers, through letters and telephone conversations, have been more than kind and have epitomized the spirit of friendship.

H. Allen Curtis
CoCo Friends Disk Magazine



As we approach the last issue of THE RAINBOW, I have feelings of both sorrow and joy. Sorrow that we have come to the end of this wonderful magazine. Joy that we can celebrate the wonderful life that this magazine has had.

THE RAINBOW has brought a special focus to the Color Computer Community that has been truly unique. All of us have gained so much in technical knowledge. We have made so many friends. These have been friends which I have made from customers all over the world, which I have made at RAINBOWfests, which I have made through the forum on Delphi, and so on.

You had a vision, Lonnie, for a very special magazine and community which is unique. Other magazines for the Color Computer have come and gone. Some of them, true, made their own contribution; but THE RAINBOW has always been very special and unmatched.

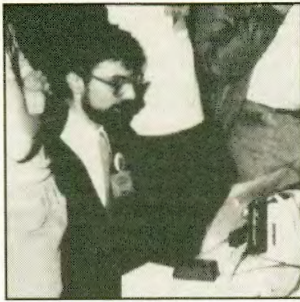
You took your vision and ran with it. And you have always had very special people working with you. In recent time, you have continued the magazine when it was obvious that the easy way would have been to cut your losses and end it.

I also want to recognize the special relationship that I have had with Kim Lewis. She has been a delight to work with and I will always consider her a dear friend. A true professional, so typical of the many people in your organization.

I commend you for all that you have done for all of us in the CoCo Community. The best to you and all the wonderful people at THE RAINBOW and Falsoft!

Gilman Shattuck
Granite Computer Systems

At first, I bought THE RAINBOW when I happened to see it on the newsstand at the B. Dalton Bookstore in Schaumburg, Illinois. It wasn't too long before I was making a special trip to buy it as soon as it hit the stores; soon, I was a full subscriber.



I looked forward to the feature articles and regular columns by Tony DiStefano, Marty Goodman and Dr. ASCII, but a lot of THE RAINBOW's appeal was in the mail-order ads. I think the first thing I ever bought from a RAINBOW ad was *Basic Unraveled* by Spectral Associates. Here was something you'd never find in a Radio Shack store: a complete disassembly of the Color Computer's BASIC ROM.

In addition to THE RAINBOW itself, there were the RAINBOWfests. For many years, the Chicago RAINBOWfest was held about two miles from my house. It was really exciting to see all of the advertisers and their products in person at the 'fests. I'm not sure how much money I spent on my CoCo at RAINBOWfests, but it was a lot.

It was THE RAINBOW that got Burke & Burke started. I started seeing ads for mail-order hard drives for about \$1200, and that was a lot more than I could afford. At the time, IBM PC hard drives were about \$450. I bought one and used electronics data books to figure out how to hook the IBM controller to my Color Computer. Then my wife, Trisha, and I saw a column by Marty Goodman in THE RAINBOW. Marty wrote that somebody should be able to figure out how to hook an IBM PC hard drive to the Color Computer, that there was probably a market for such a thing. With encouragement from RAINBOW editor Jim Reed, Trisha and I had circuit boards made up. We sold the first CoCo XT hard-disk interfaces that year at a RAINBOWfest in Princeton, New Jersey.

So many people at THE RAINBOW — Lonnie Falk, Jim Reed, Ira Barsky, Kim Lewis, Marty Goodman, Cray Augsburg, Greg Law, and others — have helped us and given us good advice over the years. We've also had the opportunity to meet a lot of really nice people associated with THE RAINBOW, a kind of "community" which wouldn't have been possible without THE RAINBOW.

A few years ago I had the privilege of speaking at the RAINBOWfest CoCo Community Breakfast. In that talk, I described the Color Computer as the "focal point" of an extended family of people with different interests — the CoCo Community. I described how a family can splinter when it loses its focal point. In recent months, I've come to realize that THE RAINBOW is another such focal point; that the time of its loss is near; that we have reached the end of an era. Even so, I can't help but wonder: could the CoCo Community itself be the "gold" at the end of THE RAINBOW?

Chris Burke
Burke & Burke

When Lonnie first announced to us that the May issue would be the last issue of THE RAINBOW, I didn't really think much about it. The first thing I did was think of my current advertisers and what their reactions would be. Then my thoughts seemed to wander back over the last seven years I have worked with advertisers from the East Coast. What a book I could write! I have had the great pleasure of working with many people who wrote programs for the CoCo, or who sold hardware and peripherals for the CoCo. I have had many heart-to-heart conversations with these people, not only about their businesses but their personal lives as well. Many people worked out of their homes, so I got to know their children and spouses, and I saw those kids grow up, as I grew up, too. The closing of this magazine has surprisingly tugged at a special place in my heart.

I laughed a lot with my advertisers. I heard many jokes over the telephone. In fact, John Monin at Colorware, used to fax them to me. I had one advertiser, Khan Nyguen at Selected Software who couldn't speak English well. He used to have me look up words in THE RAINBOW and those were the words he would want to

use in his ad. Chris and Joann at CRC didn't speak English well either, but we managed to muddle through. I guess we are all good communicators! I saw them get married, and they now have two children.

RAINBOWfests were always busy for our staff and for my advertisers, but we all had some great times. I know I'll never forget them. I'll also never forget Jordan Tsvetkoff from JWT. I worked with him while he was still in high school, now he's in college. Glen Dahlgren, owner of Sundog Systems, now graduated from college and a full-time programmer for an entertainment software company. Tom DiMarco from Gimmesoft, what a pleasure it was to work with him. Logan Ward from The Computer Center, he was the heart and spirit of the CoCo. I got to work with him on advertising after the owner of The Computer Center, Greg Hall, tragically died in an accident. Greg's death clearly had an impact on me, as I usually spoke to him twice a week. I recently had the pleasure of speaking to Ben Burnette. He and Wayne Smith own Cy-Burnet-ics, an educational software company. Ben and Wayne, you see, are elementary school principals in Knoxville. He said he just used their software and a speech synthesizer from Rich Parry's Speech Systems the other day to help a troubled little boy. They always traveled to RAINBOWfest to purchase items for their schools. We had some great times and laughs together. Dennis Derringer from Derringer Software, as I recall, was the very first advertiser I ever spoke to on the telephone. I ran into Dennis two years ago in Atlanta at COMDEX, a computer trade show we were both attending.

My relationship with THE RAINBOW has always been with the people more than the computer. As many of you know, I'm not that knowledgeable about the CoCo, but you've all been so patient when explaining your new products to me. I've met so many people through this job that it's hard to name every single one. Thank you to all the folks who stayed with us to this point. I will miss you all and will always cherish our friendships. My sincere wish for you is continued success and happiness throughout your lives.

Kim Lewis



four issues. I tried advertising in "hot" magazines (at the time) such as *80-Micro*, *Hot Coco* and *Color Computer News*; but it wasn't until I connected with THE RAINBOW that T&D Software start to grow.

It was very exciting, but it also took a lot of time to write 10 good, quality programs each month. I soon hired a local high-school student and a programming genius, Roland Degraaf, to help me out. With the help of some great authors — Andrew Pakerski, Terry Steen and Tom Mix authors, just to mention a few — we published over 2000 programs in 11 years for the CoCo. It is hard to believe that at one time I was duplicating and labeling thousands of cassette tapes at a shot. In 1983 cassette tape was the main media.

In 1984 I went to my first of 12 CoCo shows. I got to meet most of the vendors as well as the pleasant staff of THE RAINBOW. The show became the highlight of the year. I also got a chance to meet a lot of valuable CoCo customers at the show. I thank all of you for coming to visit our booth and for your patronage. I'll never forget the friendships I made at these conventions.

In 1988 I realized that the CoCo market was shrinking almost daily. I constantly worried that I wouldn't be able to support my family with the CoCo much longer. In 1989 I opened an 1800-square foot computer store: 20 percent was filled with CoCo paraphernalia, the rest with IBM-compatible hardware and software. T&D Software helped support me while Computers and More started to grow. It allowed me to build up the inventory in the store and support my family at the same time.

I now have six employees. Even though the market is very competitive, the store has expanded to 2900 square feet and is doing well. Not only do we sell computers, but we service, rent, train and sell everything related to the

IBM market. The CoCo products will be available through the store for at least one more year.

I still have a fondness for the CoCo I cannot describe. It's kind of like your first love in life. Even though the simple sounds and graphics that used to entertain me from the CoCo were replaced with Super VGA graphics and stereo sound from a 486 PC, the CoCo was ahead of its time. The experiences I encountered with the CoCo were pleasant ones. I want to thank you all for your support.

Tom Dykema
T&D Subscription Software



I couldn't let the final issue of THE RAINBOW go to press without a trip back to RAINBOWfest. I remember as if it were yesterday, getting to the hotel after a long day's travel and checking in, only to hear the person on the other side of the counter say, "I'm sorry, but your rooms are not ready." That was the last thing we wanted to hear. However, we were so excited just to be at RAINBOWfest, it didn't matter.



Then came the exhibitors. They began setting up in the exhibit hall and the CoCo Community would start to come alive. First one attendee, then another would stop by the RAINBOWfest registration counter to get an advance look at the program and, if lucky, sneak a glimpse in the exhibit hall. In hindsight, it is now obvious what was brewing in their minds. They were planning the quickest route to THE RAINBOW booth or to be the first to purchase the latest piece of hardware or software on display at the Radio Shack booth!

The long lines to get into the show would form hours before the official opening. The crowd couldn't wait to get through the doors. There would be confusion over which line to stand in (our signs at the registration counter were adequate at best). Lonnie Falk (you know, the person on the microphone, as he was called so many times) would signal Cecil Houk (Rulaford Research) for the National Anthem (there was a Canadian one played as well for the many thousand who made the pilgrimage from up north), and the show doors would open.

I remember talking to people and answering their questions. Some of them we were able to help, others had to help us. I'm still convinced we were asked trick questions which had no answers. I still remember some of the questions even we wanted answers to. They usually began with: "Is it true that Radio Shack will be . . ." or, "I heard a rumor that . . ." To this day I think about some of those questions.

How about the temperature of the exhibit hall? First it was too cold, then too hot, then it was cold again. What gives? Couldn't someone have set the thermostat to fix this? And the aisles? I overheard hotel managers worrying about the fire marshal because we drew such large crowds. There were times we had so many attendees walking the aisles, people would stand shoulder to shoulder and still not be able to see the newest games Sundog Systems and others were debuting.

And the seminars; they were packed to standing-room-only capacity. I remember the diehard people who would listen to the speakers from the hall because they couldn't get in to see them. I spoke to many people who left seminars early so they would be able to see part of the next one, only to do it again.

I remember the very late nights in the hotel coffee shop. I'll bet I only got four hours of sleep a night (if that much). We would sit around and talk and talk and talk. People we didn't even know would walk by and join the conversation and then stay for hours.

And the CoCo Community Breakfast. That was always fun. There were times when you would be on the edge of your seat, laughing till you hurt. Other times you were listening closely for what was soon to be announced or maybe you were part of the annual sing-along-with-Lonnie.

Oh, and CoCo Cat and the time when . . .
Ira Barsky

I am sad to hear about THE RAINBOW. It brings back memories of when computers were mainly for hobbyists and of when there was a mystique about them [computers]. Thanks to the CoCo, I was able to get my break into the computer technical field. I have moved on to other platforms; however, I will never forget what the CoCo and THE RAINBOW have done for me and how my life has been forever changed because of them.

I can't help but feel sad today because the last issue of THE RAINBOW has hit the presses. Unfortunately, technology changes, supposedly for the better; but in my book, the CoCo and THE RAINBOW will always be the best. Good-bye, RAINBOW. Long may you live in the hearts of all us hackers.

Logan Ward
Systems Management Group



It happened in September 1981. I was the proud owner of a Radio Shack Color Computer with a chicklet keyboard, 4K of memory and a Chess cartridge. A friend loaned me a copy of THE RAINBOW. It was printed on a Line Printer VII, no descenders, and mimeographed. It actually had programs in it that were written for my CoCo. The first thing I typed in was the big feature article on Page four, a genuine word processor:

```
10 PRINT@416,;LINEINPUT"(16 spaces);A$
20 PRINT#-2,A$
30 CLS:GOTO10
```

When I ran my very first CoCo program, I promptly received an SN ERROR in Line 10. After consulting the manual to find out what the heck an SN ERROR was, then spending another hour or so to correct the error — a missing quotation mark in Line 10 — my very own "word processor" was up and running. I typed many a letter with this new program and my newly acquired Line Printer VII.

To make a long story short, I sent in the order for my subscription to THE RAINBOW, and I have been learning ever since. It has been 12 years since I bought my first RAINBOW and not an issue goes by that does not teach me something new about this machine of ours. Without THE RAINBOW, my CoCo would have found its way into a closet as soon as I'd grown tired of playing Chess. But thanks to Lonnie Falk and THE RAINBOW, I learned to use and program this machine. One of the highlights in my life was the day that I actually saw one of my own programs published.

It is very sad indeed to see THE RAINBOW end up in the land of the GOSUB without a RETURN. But my bookcase is adorned with about a gross of back issues, all containing valuable reference materials that I will use for years and years to come. Although I understand the reasons that led to the decision to end the publication of our magazine, I am saddened to see it go. It is like losing a very good friend.

In closing, my heartfelt thanks to Lonnie Falk, THE RAINBOW staff, and all the contributors for bringing me this great magazine that not only taught me how to use my Color Computer but also was directly responsible for the acquisition of many new friends. THANKS, THANKS and THANKS again.

George Quellhorst

I bought a Radio Shack modem shortly after acquiring my new 16K Extended BASIC CoCo in the early 80s and soon became an online addict, which I have remained to this day. The CoCo experience and the online experience will forever be tied together for me. I remember being very impressed, my first time on CompuServe's CoCo SIG, by the colorful personality and apparently exhaustive knowl-

edge of one Marty Goodman, who seemed to be the ruler of the roost even though he had no official position there. By the time we finally met face to face at a RAINBOWfest, Marty and I had been friends for several years. One of the first exchanges we had was about the "cassette modem," a now-obscure home-made device whose central component was a Radio Shack speaker phone, which enabled files to be exchanged over the phone at 1800 baud using the CoCo's cassette port. It served me well until the prices of 1200-baud modems dropped enough to bring them within reach. The online services were later of invaluable help to me in the development of ADOS products. CompuServe and, later, Delphi participants gave me all sorts of useful ideas for features, as well as feedback concerning compatibility and other problems that enabled me to continue improving ADOS and its successors. ADOS products will continue to be available and supported by me into the indefinite future.

Thank you, Tandy, for leaving 2K of free space in the Disk ROM, which practically cried out to me for insertion of additional goodies and so led to the development of ADOS. Since ADOS supported lowercase, I sent an early copy to Dennis Kitsz of Green Mountain Micro, from whom I had recently bought a Lowerkit to allow my CoCo 1 to display lowercase. I was somewhat in awe of Dennis, having known him up to that point only from his regular columns in *80 Micro*, and was elated when, after months of hearing nothing, I got a call from him out of the blue. We wound up sharing a booth at several RAINBOWfests.

RAINBOWfests were always a treat for me because I got to meet so many people that I had come to know on Delphi or CompuServe. (Thanks, Lonnie, for those great Saturday night buffet parties for the vendors!) Fests, too, were great sources of feedback about my software, in addition to being places where I could immerse myself in the camaraderie that has always been an outstanding feature of the CoCo Community.

Art Flexser
SpectroSystems

I first heard that the Color Computer was coming 13 years ago, when I was studying electrical engineering at the University of Louisville and was already involved with Tandy computers (namely the TRS-80 Model I, which I still have somewhere). A fellow student had picked up the rumor, from someone he knew at Motorola, that Tandy was working on a 6809-based system that would use the 6847 video generator for color graphics. I still remember trying out the first 4K CoCo that went on display that fall; there wasn't that much action in the store the day I stopped in, so I got to sit down at the keyboard, glance through the Color BASIC manual (the partial one they shipped in the first few months of production) and was able to write a short BASIC program to display a color bar test pattern.

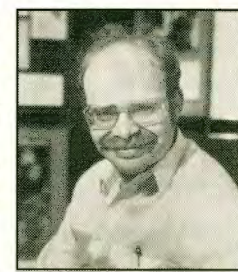
I stuck with the Model I for the next few years; but after I helped a coworker (in a previous job) set up a Commodore VIC-20 as a telephone dialer, I started talking to Jim Reed at THE RAINBOW about doing a similar CoCo program. I think Lonnie still remembers the time I knocked on his back door, shortly after Falsoft moved out of his basement, because the phone book still showed his home address! I never finished the dialer program, but after I helped THE RAINBOW staff out of a few minor jams (such as fixing a 32K CoCo that didn't work reliably because the guy who upgraded it forgot to solder the jumper wires in place!) and wrote a few reviews, I joined Falsoft in late 1983. I've been here ever since, over two years on THE RAINBOW itself and the rest with other Falsoft activities — but I've been involved with THE RAINBOW all along.

The interesting thing to me is how long the CoCo has been able to keep its hard core of devotees. Nearly all the other small systems that came out starting in 1977 — the TRS-80 Model I/III/4, the Commodore PET, VIC-20, 64 and 128, the 8-bit Atari machines, the TI 99/4 and the like — are long gone from the consciousness of most computer hobbyists. (Even the Apple II has faded into obscurity, except in the educational market.) The CoCo may never have

had the best graphics in its class, the greatest expansion capability or the widest range of big-name software publishers behind it, but it did have a manufacturer that believed in it long after the competition had gone on to other things, a group of after market suppliers that made it their bread and butter (not just the icing on their cake), and perhaps the most loyal user base a "home computer" could ever boast of. All these things combined to keep the CoCo viable so long that when most of its fans finally felt the need to upgrade, they could get reasonably priced systems with power undreamed of when they first took the CoCo plunge — computers that made the switch truly worthwhile.

I'm still amazed that the CoCo and THE RAINBOW made it as far as they did, but I'm glad it happened that way.

Ed Ellers

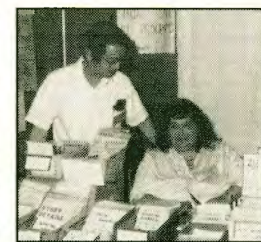


For over a decade, I've enjoyed using and supporting the Color Computer. Even more, I've enjoyed the special fellowship of the "CoCo Community," a phenomenon unique in the world of computing. The fellowship and honesty among CoCo developers, retailers and end users is legendary. The years have some very happy memories for me of exciting moments at RAINBOWfests, technical triumphs, and many friends I have made through my involvement with this machine.

"Nothing lasts forever" is a very ancient bit of wisdom common to quite a number of religions and philosophies. We have reached the end of the publication of THE RAINBOW, and I will no longer be able to share my technical musings and opinionated observations with you. I want to thank you all for having enriched my life, by being there and providing me with a kind and understanding audience. I hope that I've been able to be of service to you during these years.

I'm not going to vanish, however. CoCo users with technical questions can still find me on the Delphi CoCo SIG, where I'll continue to do my best to help you. We can meet there and reminisce about old times, with Art Flexser and others from the "good old days." Be well, my friends. Au revoir.

Marty Goodman



Farewell to old friends. Cheryl and I wish to say good-bye to the many friends and acquaintances we made over the years through THE RAINBOW and Computer Island. What began as a new hobby for me mushroomed into a most

pleasurable business for my entire family.

Our children grew up during the years we were associated with the CoCo and THE RAINBOW. Each one of us has many happy remembrances of the people we met and the places we traveled to as a result of our business.

We wish to thank Lonnie Falk for the many encouragements he gave us to always enlarge our business, to travel to RAINBOWfests throughout the country, and to write the column "Education Notes." He maintained our business for over a decade, and we will always be grateful for the experiences.

Steve Blyn
Computer Island

At its high point, somewhere in the early to mid 80s, the Color Computer had three slick, glossy, monthly magazines (and several non-glossies) devoted exclusively to it. Hundreds of software companies, mine included, were doing a booming business selling products in this market.

We all take personal pride in that success, but it's clear to me that without Lonnie Falk and THE RAINBOW none of it might have ever happened.

When THE RAINBOW first appeared as a newsletter, there were already several other established Color Computer magazines on the market. Unfortunately, they were generally filled with misspellings and grammatical errors and techie-oriented articles that only served to further the image of the Color Computer as a powerful toy for hobbyists and hackers, certainly not something an average person should even consider.

Lonnie Falk's genius was in realizing, in those early days, that the Color Computer was a powerful tool that all kinds of people could use in all kinds of ways — if somebody would just come along and let them know about it.

THE RAINBOW was the vehicle for spreading that awareness. Thanks in part to a journalism background, Lonnie was able to produce a magazine that was clean, grammatically correct and readable; in other words, THE RAINBOW was the first truly "user-friendly" Color Computer magazine.

It brought relevant articles to average, non technical users (as well as technical information for those so inclined), but it also did something else that was extremely important: it brought respectability to the Color Computer by giving it its first glossy, perfect-bound, professionally edited magazine. Suddenly more and more people were forced to take notice.

THE RAINBOW, in both appearance and content, and more than any other publication or forum or company, was responsible for establishing the Color Computer as a powerful, sophisticated machine with

capabilities that were available for anybody and everybody.

Other slick magazines, produced by large conglomerate publishers, tried to follow on THE RAINBOW's success, but they all eventually faded while THE RAINBOW flourished and grew. What the others didn't understand was that Lonnie Falk had brought more than just slickness and professionalism to the Color Computer market. He also brought enthusiasm and heart. Through THE RAINBOW he consciously created a unique and loyal community of people (hundreds of thousands strong, spread throughout the United States and Canada as well as overseas). And it was these people who became the customers that made possible Cognitec's success and the success of many other Color Computer-based companies.

As THE RAINBOW publishes its last issue, we've just elected a new president who campaigned on the promise of "putting people first." Though it only occurred to me in the course of writing this, I doubt that there's any better phrase to explain THE RAINBOW's longevity and success. Because, in the end, THE RAINBOW wasn't about hardware and software. It wasn't about ROM upgrades and disk drives and serial-to-parallel converters and word processors and paint programs. It was about the people who used all that stuff and looked to THE RAINBOW as the hub of a supportive community that encouraged and assisted and nurtured them.

Lonnie Falk not only brought respectability and accessibility to the Color Computer world, he also brought humanity. And in 1993 we can only hope that Bill Clinton will carry it off as well as Lonnie Falk did 12 years ago.

Howard Cohen
Cognitec



When Cray called to let us know the May 1993 edition of THE RAINBOW would be the last, Esther and I were saddened. For more than eight years, THE RAINBOW and the Color Computer Community played an important part in our lives. We attended every RAINBOWfest between mid-1983 and 1990. We met thousands of fantastic people. We traded messages with hundreds more in THE RAINBOW's OS9 Online SIG on Delphi. We worked hard to make the complex and powerful world of OS-9 easier to understand.

The creativity of Color Computer Users everywhere and the relentless drive of the entrepreneurs that supported them continue to amaze us to this day. It was a fantastic voyage we'll never forget. THE RAINBOW made it possible. To everyone at Falsoft, we say thank you. To all our readers and friends, we bid a fond farewell.

I leave you with the traditional Coast Guard goodbye. May you be blessed with Fair Winds and Following Seas!

Dale Puckett



The C Compiler for the CoCo has finally arrived...

CoCo-C

CoCo-C is a complete RSDOS based C development package for the Color Computer not requiring the OS-9 Operating System. CoCo-C consists of five main programs: a Text Editor, a C Compiler, an Assembler, and a Library Linker which are all controlled by the CoCo-C Command Coordinator.

Text Editor

A full featured screen oriented line editor for the CoCo 3 developed by Bob van der Poel. Powerful editing and cursor commands with auto-indent and user defined macros make this a great editor for writing C or assembly language programs. A less sophisticated version for the CoCo 2 is also available.

C Compiler

The CoCo-C Compiler is a full featured K&R style integer compiler specifically designed for RSDOS based systems. It has assembly language output, position independent code and can output ROM-able code if desired. Added features allow you to mix C, assembly language and BASIC commands within your program!

Assembler

This symbolic assembler is capable of assembling files as large as available disk space. It supports a Motorola style syntax and outputs standard binary files ready for LOADM and EXEC. Options include list file output and generation of symbol table file.

Library/Linker

The Library Linker is a utility which links the CoCo-C's 90+ function library with your compiled binary file, creating a stand alone executable ML file.

Command Coordinator

The Command Coordinator is CoCo-C's main program. Its user friendly menu driven screen smoothly switches back and forth between the Editor, Compiler, Assembler and Linker.

The CoCo-C Compiler package includes BOTH CoCo 2 and CoCo 3 versions of ALL the programs listed above plus MORE! *Compatible w/B&B RGBDOS*

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Contact: George Schneeweiss, (Treasurer) Glenside Color Computer Club
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We also accept National & International Club Memberships

Of late, there were but two fears for the die-hard CoCo enthusiast: 1) that something might happen to Hillary, thus forcing the powers of the presidency upon Bill Clinton; and 2) that THE RAINBOW, the last bastion of support for our beloved CoCo, would cease to exist. So when I heard that the May issue of THE RAINBOW would be its last, I felt kind of personally responsible. Please let me explain.

It was back in October of 1992; the economy looked so bleak that businesses were adding anti-freeze to their cold cash flow when I happened to come upon an odd-shaped bottle while walking along the beach. I was rubbing the dirt off the bottle when . . . *poof* . . . out came a genie who offered me one wish (even genies have been asked to tighten their belts). For a number of reasons, none of which seem even vaguely reasonable now, I wished that Clinton could win the election. After a long pause, the genie faced me with a sad face and said, "Oh please, master, even with the powers bestowed upon me, I can't grant such a wish. It is just too difficult; it's down right impossible. Please make any wish but that."

Not having seen much new software for the CoCo, I wished that Falsoft would continue its publication of THE RAINBOW. Upon hearing that, the genie turned more colors than a CoCo III in HI-RES PMODE 4 and said, "Let me give that election another shot."

And the rest, as they say, is history.

George Aftamonow

To put into words what Tandy's Color Computer and THE RAINBOW have meant to me and thousands of others is simply an impossible task! The hours which have been spent contributing to THE RAINBOW, producing THE RAINBOW, and using THE RAINBOW is a unique phenomena which will

never be fathomable to anyone who never experienced it.

THE RAINBOW has been the primary reason for the longevity of the Color Computer! It's provided many with the opportunity to be "Real Published Authors" and/or "Real Computer Entrepreneurs!" THE RAINBOW has and continues to be a source of information necessary for us to fully enjoy our CoCos.

I realize that it is no longer viable for THE RAINBOW to continue, and I wish to thank all who helped make it GREAT! I also want to add that the passing of THE RAINBOW in no way marks the passing of the CoCo! There are a number of organizations now prepared to carry on the work, on a somewhat smaller scale than THE RAINBOW did. Many of them will probably have ads in this final issue. I encourage all who plan to continue to enjoy the CoCo to join some of these groups and continue to support "the machine that loved THE RAINBOW."

Rick Cooper

Rick's Computer Enterprise

Well, I'm writing this using a TW-80 on my CoCo 3 some 11 years after I purchased my first CoCo. Throughout those years the boys from Tennessee (Ben Burnette & Wayne Smith) have made many friends all because of this little machine. We've sold educational software through CY-BURNET-ICS in all 50 states. Although we never made much profit, our hope is that we helped some children.

Our favorite times were the RAINBOWfest trips to Chicago and Princeton, whether we were exhibitors or just participants. Although we may forget the names, we'll never forget the faces and the sense of camaraderie all CoCo nuts seemed to have. The RAINBOWfest breakfasts and Lonnie's pizza parties

and receptions will long be remembered, along with Lonnie forgiving my debt (my favorite sudee hat) after I lost a bet on the Tennessee/Alabama football game.

I don't know how many more years I will continue to use the CoCo. One thing for sure, the CoCo would not have made it through the 1980s without THE RAINBOW and Lonnie Falk. I mourn the passing of a good computer and THE RAINBOW. Lonnie, my hat's off to you, buddy. YOU DONE GOOD.

*Ben Burnette
CY-BURNET-ICS*



I wish to thank all the staff at THE RAINBOW for a fun and rewarding 11 years of association with a publication for the Color Computer. As many advertisers dropped out, you kept up THE RAINBOW for a long time. You had to stop sometime because the CoCo does not have the support from as many users or suppliers as it did at the peak of its popularity. Again, thanks for the support.

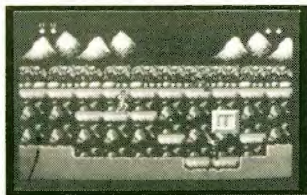
At OWL-WARE (now usually called OWL Computer Services), we started as a part-time operation and have been a full-time computer company for more than eight years. Because we have advertised in THE RAINBOW for a continuous 11 years, I guess we have become the longest-term supporter of the CoCo. We still are and will be here as long as there are users out there.

*Tom Roginski
OWL Computer Services*

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The Contras

This 512K paramilitary combat arcade game features a 2-player cooperative mode, incredible graphics, super-smooth animation and scrolling, sizzling sound effects, and an outstanding background music score. The Contras proves that the CoCo can match — or surpass — any home game system. Blow away the enemy through multiple levels and power up with ever more destructive weapons. The most ambitious game ever created for the CoCo 3! \$34.95

Photon

Photon is a proven winner. The critics agree that it is one of the most challenging, original, and addictive games ever made for the CoCo. This arcade game combines action and strategy with 16-color, ultra-smooth animation and loads of real-time music and sound effects. Over 60 devious levels of excitement. Requires 128K CoCo 3. \$34.95

"It is the most addicting game I've played on the CoCo since Tetris. . . Photon has the mark of a classic game. . . My recommendation: Addict yourself!!"
— Lauren Willoughby, Rainbow magazine.

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Feature Program

Zap: Arcade Action on the CoCo 3

by Nick Bradbury

Zap is a fast-paced arcade-style game for the CoCo 3. The object is to protect your centralized space bases from destruction by enemy fighters. You do this by atomizing them with your joystick-based zapper.

When you run *Zap*, the game screen appears after a short pause, during which the CoCo 3 is creating the graphics invisibly. After this point, press the right joystick firebutton to begin play, or press L to change the level of difficulty. A difficulty level of one provides the same action as normal game play at Level 1, while difficulty levels of two and three start the game at Level 5 and Level 10, respectively.

The right joystick controls the direction of the zapper turret on your base. Pushing the joystick to the left causes the turret to rotate counter-clockwise; pushing it to the right causes the turret to rotate in a clockwise fashion. Press the joystick firebutton

to fire the zapper.

During game play, enemy fighters appear and attempt to destroy your base by hurling bombs toward the turret. These bombs must be zapped before they reach your base.

To progress from one playing level to the next, you must destroy 10 enemy fighters. After Level 5, you are further challenged by rotating space spikes. Like the bombs, you must zap these spikes before they reach your base.

The few levels of *Zap* are relatively easy to complete. But the game becomes harder after each level you finish; fighters appear and disappear more rapidly, and their bombs travel faster. In later levels, spikes begin to appear much more often. You have only four space bases, and the game ends once all four bases have been destroyed.

To give you a "breather" of sorts, you enter a target-shoot bonus round after every third level you complete. To earn bonus

points, you must shoot all triangle-shaped craft that appear on the screen. After each one is zapped, the time for which the next one remains on the screen is reduced. Missing one of these craft ends the bonus round and returns you to normal play.

Scoring for *Zap* is as follows:

enemy fighter 10 pts
 enemy bomb 2 pts
 space spike 5 pts
 bonus craft 20 pts

In addition, points are awarded for each level you complete. The number of such points is determined by multiplying the level of play by 10. All points are awarded at the end of each level.

Program Notes

Because *Zap* uses the high-speed poke (POKE 65497,0 in Line 0), make sure the computer is returned to normal speed before attempting any tape or disk I/O. To do this, simply enter POKE 65496,0. The listing is somewhat long, so I recommend that you save it often while entering it. Also, don't run the program until you have finished entering the entire listing.

Most of the special effects in *Zap* were created by manipulating the PALETTE command. The stars that twinkle in the background were created by using HSET at random pixel locations in HCOLORS 6 and 7. During game play, two random numbers between 0 and 63 are stored in palette registers 6 and 7. This simple technique is very effective for creating a starry background. For a simple demonstration of this

effect, enter the short listing below:

```
0 CMP: ON BRK GOTO 80
10 HSCREEN 2: HCLS 8
20 FOR I=1 TO 40
30 HSET (RND(320),RND(192),6)
40 HSET (RND(320),RND(192),7): N
NEXT I
50 FOR X=1 TO 10: NEXT X
60 PALETTE 6,RND(63): PALETTE 7,
RND(63)
70 GOTO 50
80 HSCREEN 0: CMP: WIDTH 32: END
```

The fade that occurs when your base is destroyed is handled in much the same manner. The palettes used to color the base are decreased until they reach zero, at which point the base is completely black. By setting the palettes back to normal, the base quickly reappears.

The listing for *Zap* shown here is designed for use with televisions and composite monitors. If you use an RGB monitor with your CoCo 3, change lines 910 and 1000 as follows to select appropriate RGB colors:


```
910 DATA 0,56,2,19,5,40,63,12,15
,63,4,46,54,0,38,7
```

```
1000 DATA 15,50,6,18,63
```

Nick Bradbury is a freelance cartoonist and a recent graduate of the University of Tennessee. He is currently employed by the American Red Cross.

COCO FRIENDS DISK MAGAZINE

"The most exciting new product for the CoCo Since....?"



COCO FRIENDS DISK MAGAZINE (CFDM) is devoted exclusively to those who still enjoy running under RS Dos. The standard system needed to use CFDM is CoCo 3, RGB monitor, at least one disk drive, and the RS Dos which came with your CoCo 3.

CFDM is a monthly disk based publication which is produced on a "flippie" disk. When you "Run" the "magazine" side of CFDM, you'll be greeted with a beautiful cover picture by CoCo Friend James Gibbons. Pressing any key takes you to the magazine's colorful Main Menu. There you'll find 14 sections which are filled with entries. Sections included are: About CFDM; About this Issue; Active CoCo; Advertisements; CoCo Friends Art Gallery; Articles of the Month; Family Tree; Forum; From the Editor; Letters to the Editor; Potpourri; Programs of the Month; Reviews; and Question & Answers.

Next you will enter a Section and find a number of entries written by our CoCo Friends from all over the world. Each issue of CFDM contains from 60 to 80 entries. Some sections contain documentation about the many programs and graphics found on the "flip-side" of CFDM.

The "flip-side" or "program" side of CFDM is filled with contributions of wonderful programs and graphics from our many CoCo Friends! Each issue has from 2 to 4 hi-res pics and from 8 to 15 never-before-seen programs.

**8 to 15
never-before-seen
programs**

The cost of CFDM is \$6 per issue or \$30 for a 6 issue subscription. Join us now for a lot of fun! If you're like me, there's never too many Friends around to enjoy a great time on the CoCo.

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WHAT NOW???

What direction will the CoCo take with the close of the Rainbow, the cornerstone of the community? What is going on with the new OSK machines coming out on the market? Where can I find continued support for the CoCo and its products? If you would like answers to these questions and more, consider subscribing to **UpTime**, the monthly newsletter for the CoCo and the newer OSK machines. Along with current news and other articles, look for product reviews, CoCo event information, upcoming product announcements, and many dealer ads from such distributors as *Cer-Comp*, *FARNA Systems*, *Hawkssoft*, *Color Systems*, *Kala*, *Sundog*, and more. Subscriptions for **UpTime** can be ordered in two installments of \$7.50 (\$9.00 Canadian, \$11.00 Foreign). For just \$7.50, you can start your subscription today and be billed for the remainder at a later time. **NINE TIMES**, the bi-monthly magazine on disk for OS-9 Level 2 is still being offered for \$34.95 per year. If you want more information about OS-9, this is a great resource. Please write for additional information about our other products and back issue information for **UpTime** and **Nine-Times**.

**JWT Enterprises, 5755 Lockwood Blvd.,
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CoCo 3

The Listing: ZAPPER

```

1 'ZAP
2 'BY NICK BRADBURY
3 'COPYRIGHT (C) 1993
4 'BY FALSOFT, INC.
5 'RAINBOW MAGAZINE
10 POKE65497,0:DIMC(15):HBUFF1,8
80:HBUFF2,880:HBUFF3,88:HBUFF4,8
8:HBUFF5,318:HBUFF6,318:HBUFF7,3
18:HBUFF8,318:HBUFF9,318:HBUFF10
,3358
20 HBUFF11,180:HBUFF12,180:HBUFF
13,180:HBUFF14,206:HBUFF15,231:P
OKE&HE6C6,33
30 GOSUB910:DF=1
40 B0=0:L=0:NH=0:SC=0:LV=0:W1=60
:SH=0:BM=0:PLAY"V31L255T255":B0=
1:GU=1:T1=0:T2=15:T3=11:T4=17:NS
=3:GOSUB1370:GOSUB1360
50 R=1:GOSUB500:GU=1:SH=0:GOSUB2
20:HLIN(39,126)-(278,143),PRESE
T,BF:HLIN(112,55)-(208,63),PRES
E,T,BF
60 J0=JOYSTK(0):J1=JOYSTK(1):IFT
1/5=INT(T1/5) THENPALETTE7,RND(6
3)
70 IFJ0<20THENGU=GU-1:IFGU<1THEN
GU=4
80 IFJ0>43THENGU=GU+1:IFGU>4THEN
GU=1
90 HPUT(150,88)-(168,103),4+GU,P
SET:IFB0=1THEN10ELSEIFBUT(0)
=1THENHE=1:GOSUB10ELSEHE=0:OH=0
H=1:IFOH<0THENOH=0
100 IFT1/2=INT(T1/2) THENPALETTE
6,RND(63)
110 PALETTE4,C(4):IFB0=1THEN720E
LSETI=T1+1:IFT1>T2 THENI=0:GOSU
B330 ELSEIFT1>T3 ANDSH0 THENHPU
T(SX,SY)-(SX+28,SY+28),2,PSET:SH
    
```

```

=0
120 IFHE>0THENOH=OH+1:IFOH>25THE
NPALETTE4,6:IFOH>32THENGOSUB450
130 IFSH>0ANDRND(T4)=1THENGOSUB3
70
140 IFBM>0THENGOSUB380
150 IFLV>4THENGOSUB620
160 I$=INKEY$:IFI$="R"THEN1380
170 GOTO60
180 HCOLOR9:X1=X1(GU):X2=X2(GU):
Y1=Y1(GU):Y2=Y2(GU):IFGU=BM THEN
470ELSEIFGU=WZ THEN680ELSEHLIN(
X1,Y1)-(X2,Y2),PSET:PLAY"04V17G0
28":HLIN(X1,Y1)-(X2,Y2),PRESET
190 IFGU=SH THENSHPUT(SX,SY)-(SX+28
,SY+28),2,PSET
200 PALETTE1,C(1):PALETTE15,C(15)
:NH=NH+1:IFNH/10=INT(NH/10) THE
N220
210 RETURN
220 HCOLOR9:PALETTE8,0:C(8)=PC(P
I):IFB0=1THENB0=0:SC=SC+(10*LV)
ELSEIF(LV+1)/4=INT((LV+1)/4) THE
NB0=1:TX=X2(1)-16:TY=Y2(1)-4:R=1
:A2=15
230 HLIN(264,15)-(300,24),PRESE
T,BF:PALETTE4,0:PALETTE5,0:PALET
TE10,0:PALETTE11,0:PALETTE6,0:PA
LETTE7,0:HPRINT(32,2),SC:IFB0=1
HENHPRINT(14,12),"BONUS LEVEL" E
LSELV=LV+1:HPRINT(16,12),"LEVEL"
:HPRINT(21,12),LV
240 FORI=1TO5:PLAY"01V8CE02V14CE
03V19CE04V26CE05V30CE":NEXTI:T2=
T2-1:T3=T3-1:T4=T4-3:FORI=1TO100
0:NEXTI:HLIN(112,96)-(204,104),
PRESET,BF:HPUT(131,69)-(189,124)
    
```

```

,10,PSET:IFBM>0THENBM=0:HPUT(BX,
BY)-(BX+8,BY+8),4,PSET
250 IFLV>9THENB0=3ELSEIFLV>4THEN
B0=2
260 IFT2<5THENT2=5
270 IFT3<4THENT3=4
280 IFT4<4THENT4=4
290 HE=0:OH=0:IFBD>3THENB0=3
300 IFLV>6THENT2=T2+.4:T3=T3+.4
310 GOSUB1370:GOSUB1360:W1=W1-6:
IFW1<2THENW1=2
320 IFWZ>0THENWZ=0:HPUT(WX,WY)-(
WX+13,WY+12),13,PSET:RETURN ELSE
RETURN
330 IFSH>0THENHPUT(SX,SY)-(SX+28
,SY+28),2,PSET
340 R=RND(4):IFR=WZ THEN340ELSEI
FR=1THENSX=146:SY=5 ELSEIFR=2THE
NSX=288:SY=83 ELSEIFR=3THENSX=14
4:SY=172 ELSESX=20:SY=83
350 SH=R:HPUT(SX,SY)-(SX+28,SY+2
8),1,PSET
360 RETURN
370 IFBM>0THENRETURNELSEBM=SH:BX
=BX(SH):BY=BY(SH):RETURN
380 ONB GOTO410,420,430,440
390 HPUT(BX,BY)-(BX+8,BY+8),4,PS
ET:IFBM=1THENBY=BY+3*BD ELSEIFBM
=2THENBX=BX-6*BD ELSEIFBM=3THENB
Y=BY-4*BD ELSEBX=BX+6*BD
400 HPUT(BX,BY)-(BX+8,BY+8),3:RE
TURN
410 IFBY>62THEN450ELSE390
420 IFBX<188THEN450ELSE390
430 IFBY<125THEN450ELSE390
440 IFBX<118THEN450ELSE390
450 HE=0:OH=0:HPUT(BX,BY)-(BX+8,
BY+8),4,PSET:NS=NS-1:HB=1:GOSUB1
270:BM=0:IFNS<1THEN1380
460 RETURN
470 SC=SC+2:IFBM=10RBM=3THENX=X1
:Y=BY ELSEX=BX:Y=Y1
480 HLIN(X1,Y1)-(X,Y),PSET:BM=0
:PLAY"05V31FE01A"
490 HPUT(BX,BY)-(BX+8,BY+8),4:HL
IN(X1,Y1)-(X,Y),PRESET:RETURN
500 PALETTE13,58:HCOLOR13:R=1:HP
RINT(14,7),"DIFFICULTY":HPRINT(2
4,7),DF:HPRINT(9,17),"PRESS 'FIR
E' TO START":HPRINT(5,16),"PRESS
'0' TO CHANGE DIFFICULTY":XZ=1:
ONDF GOTO580,600,610
510 PALETTE3,RND(63):HPUT(150,88
)-(168,103),4+R,PSET:RR=1-RR:IFR
R=1THENRR=R+1:IFR>4THENR=1
520 TT=TT+1:IFTT>20THENTT=0
530 IFTT/8=INT(TT/8) THENPALETTE
7,RND(63)
540 IFTT/3=INT(TT/3) THENPALETTE
6,RND(63)
550 I$=INKEY$:IFI$="D"ORBUT(1)
=1THEN560ELSEIFBUT(0)=1THENP
ALETTE3,C(3):PALETTE13,0:RETURN
LSE510
560 DF=DF+1:IFDF>3THENDF=1
570 ONDF GOTO580,600,610
580 PI=0:SC=0:LV=0:W1=60:BD=1:T2
=15:T3=11:T4=17
590 PALETTE8,PC(PI):IFXZ=1THENXZ
=0:GOTO510ELSEHLIN(200,55)-(208
,63),PRESET,BF:GOTO500
600 PI=1:SC=0:W1=36:LV=4:T2=11:T
3=7:T4=5:BD=2:GOTO590
610 PI=2:SC=0:W1=6:LV=9:T2=7.2:T
3=4.4:T4=4:BD=3:GOTO590
620 IFWZ>0THEN650ELSEIFRND(W1)>1
THENRETURN
630 W3=0:WZ=RND(4):IFWZ=SH ORWZ=
BM THEN630ELSEWZ=WX(WZ):WY=WY(WZ
)
640 HPUT(WX,WY)-(WX+13,WY+12),11
,PSET
650 HPUT(WX,WY)-(WX+13,WY+12),13
:IFWZ=1THENWY=WY+3ELSEIFWZ=2THEN
WX=WX-6ELSEIFWZ=3THENWY=WY-3ELSE
WX=WX+6
660 W2=1-W2:HPUT(WX,WY)-(WX+13,W
Y+12),11+W2,PSET:W3=W3+1:IFW3>16
THENWZ=0:HPUT(WX,WY)-(WX+13,WY+1
2),13,PSET:GOSUB450:RETURN
670 RETURN
680 WZ=0:IFGU=10RGU=3THENY2=WY E
LSEX2=WX
690 HLIN(X1,Y1)-(X2,Y2),PSET:PL
AY"03V31E02V15E01V5E":HLIN(X1,Y
1)-(X2,Y2),PRESET
700 HPUT(WX,WY)-(WX+13,WY+12),13
,PSET:SC=SC+5
710 RETURN
    
```

```

720 T1=T1+1:IFT1>T2 THENT1=0
730 A=A+1:IFA>A2 THEN850
740 HPUT(TX,TY)-(TX+28,TY+11),15
,PSET
750 IFBUT(0)=1THEN780ELSEBU=0
760 '
770 GOTO60
780 IFBU=1THENGOTO760ELSEHCOLOR9
:X1=X1(GU):X2=X2(GU):Y1=Y1(GU):Y
2=Y2(GU):HLIN(X1,Y1)-(X2,Y2),PS
ET:PLAY"04V17G020":HLIN(X1,Y1)-
(X2,Y2),PRESET
790 BU=1:IFR=GU THENPLAY"05V31EF
A0V10EAA":GOSUB810
800 GOTO760
810 R=RND(4):IFR=R1 THEN810ELSER
1=R
820 NZ=NZ+1:A=0:HPUT(TX,TY)-(TX+
28,TY+28),2,PSET:TX=X2(R)-16:TY=
Y2(R)-4:IFA2>9THENA2=A2-1ELSEIFA
2>4THENA2=A2-.4 ELSEA2=A2-.2
830 IFA2<1THENA2=1
840 PLAY"02FEA":RETURN
850 HPUT(TX,TY)-(TX+28,TY+28),2,
PSET:PLAY"02V30BAGFEDC0V15BAGFE
DCDCDCDC":NS=NS+1:IFNS>4THENSNS=4
860 PALETTE13,63:HCOLOR13:HPRINT
(12,16),"NUMBER ZAPPED":HPRINT(
25,16),NZ:PI=PI+1:IFPI>4THENPI=0
870 NZ=20*NZ:HPRINT(15,17),"BONU
S":HPRINT(20,17),NZ:SC=SC+NZ:NZ=
0:FORI=1TO2400:NEXT
880 PALETTE13,0:HLIN(94,127)-(2
32,134),PRESET,BF:HLIN(120,135)-
(199,144),PRESET,BF:GOSUB220:G0
TO60
890 SOUND150,3
900 GOTO900
910 FORI=0TO15:READC(1):PALETTEI
,0:NEXT
920 DATA 32,2,33,9,25,63,11,43,
63,7,40,36,0,38,16
930 FORI=1TO4:READX1(I),Y1(I),X2
(I),Y2(I):NEXT
940 DATA 160,70,160,17,186,96,29
6,96,160,122,160,182,134,96,28,9
6
950 FORI=1TO4:READBX(I),BY(I):NE
XT
960 DATA 156,30,274,92,156,158,5
0,92
970 FORI=1TO4:READWX(I),WY(I):NE
XT
980 DATA 154,5,290,90,154,176,20
,90
990 FORI=0TO4:READPC(I):NEXT
1000 DATA 43,35,5,18,63
1010 HSCREEN2:POKE&HF9A,16:HCLS
0:HGET(124,92)-(132,100),4:HCIRC
LE(128,96),3,6:HPAINT(128,96),6,
6:HGET(124,92)-(132,100),3
1020 HCLS0:HGET(114,82)-(142,110
),2:HCIRCLE(128,96),14,15,4:HCO
LOR15:HLIN(114,96)-(142,96),PSE
T
1030 HPAINT(128,94),1,15:HPAINT(
128,97),15,15
1040 HCOLOR0:HLIN(128,97)-(128,
102),PSET:HLIN(124,97)-(126,102
),PSET:HLIN(132,97)-(130,102),P
SET
1050 FORX=120TO136STEP4:HRESET(X
,95):NEXT:HLIN(124,93)-(132,93)
,PSET
1060 HGET(114,82)-(142,110),1
1070 HCLS0:HGET(128,96)-(141,108
),13:0$="BR24U2L2R4":FORX=120TO
132:HDRAW"C12S12:BM"+STR$(X)+"",9
6:XD$:"NEXTX:HGET(128,96)-(141,
108),11
1080 HCLS0:D$="F4H2E2G4":FORX=12
9TO131:HDRAW"C12BM"+STR$(X)+"",96
:XD$:"NEXTX:HGET(128,96)-(141,1
08),12:DRAW"S4"
1090 HCLS0:D$="F3G3H3E3":HDRAW"S
8C1BM128,96:XD$:S4":HPAINT(128,
98),11,11:HCOLOR9:HLIN(124,99)-
(132,105),PSET,BF:HRESET(128,102
):HGET(128,96)-(135,100),14
1100 HCLS0:D$="E4F4L8":HDRAW"BM1
28,96C10S12:XD$:S4BM136,93:XD$:"
:HPAINT(138,90),14,10:HPAINT(140
,92),6,10
1110 HGET(127,85)-(153,96),15
1120 HCOLOR0,0:HCLS0:FORI=1TO24:
HSET(RND(320),RND(192),6):HSET(R
ND(320),RND(192),7):NEXTI:D$="E2
4F24G24H24":HLIN(130,68)-(190,1
25),PRESET,BF
    
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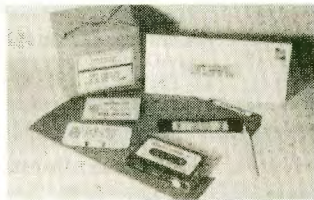
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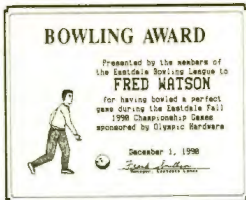
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```

1130 HDRAW"C10BM136,96:XD$":HPA
INT(160,96),11,10
1140 HCOLORS:HLINE(146,80)-(146+
28,112),PSET,BF:HCOLOR4:HLINE(14
6,80)-(146+28,112),PSET,B
1150 HCIRCLE(160,96),9,0:HPAINT(
160,96),4,0:HGET(150,88)-(168,10
3),9:HLINE(160,96)-(161,88),PRES
ET,B:HGET(150,88)-(168,103),5:HP
UT(150,88)-(168,103),9
1160 HLINE(160,96)-(167,96),PRES
ET:HGET(150,88)-(168,103),6:HPUT
(150,88)-(168,103),9
1170 HLINE(160,96)-(161,104),PRE
SET,B:HGET(150,88)-(168,103),7:HP
UT(150,88)-(168,103),9
1180 HLINE(160,96)-(153,96),PRES
ET:HGET(150,88)-(168,103),8:HPUT
(150,88)-(168,103),5,PSET
1190 HGET(131,69)-(189,124),10
1200 D$="R3D1G2R2U1E1F1D1R1U2R1F
1G1D1L1U1L4U1E2L2U1"
1210 FORX=18TO24STEP1::HDRAW"C2S
24BM"+STR$(X)+"",+STR$(X-14)+"":X
D$:"NEXT:HDRAW"C12;BM24,10:XD$;
"
1220 HDRAW"S4BM44,24:E4F4L8"
1230 HDRAW"BM64,19:F3G3U6"
1240 HPAINT(28,14),3,12
1250 HCIRCLE(0,192),55,8:HPAINT(
4,188),8,8:FORI=1TO11STEP.5:X=RN
D(53):Y=140+RND(52):HCIRCLE(X,Y)
,1/2,0:NEXTI
1260 RETURN
1270 PLAY"02":A=C(4):B=C(5):C=C(
10):D=C(11):FORI=1TO12
1280 PALETTE4,A:PALETTE5,B:PALET
TE10,C:PALETTE11,D:A=4:IFA<0TH
ENA=0:PLAY"03C"
1290 B=B-4:IFB<0THENB=0
1300 C=C-4:IFC<0THENC=0
1310 D=D-4:IFD<0THEND=0
1320 PLAY"01V"+STR$(31-1*2)+"A"
1330 NEXTI:IFHB=0ANDBM=1THENBM=0
:HPUT(BX,BY)-(BX+8,BY+8),4,PSET
1340 X=131:Y=69:IFNS<1THENGOSUB1
460ELSEGOSUB1450
1350 HB=0:GOSUB1370:GOSUB1360:RE
TURN
1360 FORI=0TO5:PALETTEI,C(I):NEX
T:FORI=8TO15:PALETTEI,C(I):NEXT:
RETURN
1370 HLINE(12,38)-(90,50),PSET
,BF:IFNS<1THENRETURN ELSEFORI=1T
ONS:HPUT(4+(I*16),38)-(19+(I*16)
,50),14,PSET:NEXTI:RETURN
1380 NS=0:HLINE(264,15)-(300,24)
,PSET,BF:HPRINT(32,2),SC
1390 GOSUB1370:PLAY"01L255T255":
POKE65496,0:FORV=31TO1STEP-2:PAL
ETTE0,RND(63):PLAY"V"+STR$(V)+"E
FCA":NEXTV:POKE65497,0:PALETTE0,
0
1400 IFSH>0THENHPUT(SX,SY)-(SX+2
8,SY+20),2,PSET
1410 IFWZ>0THENWZ=0:HPUT(WX,WY)-
(WX+13,WY+12),13,PSET
1420 IFBM>0THENHPUT(BX,BY)-(BX+8
,BY+8),4,PSET
1430 HCOLOR1:HPRINT(15,12),"GAM
E OVER":FORI=1TO3000:NEXT:HLINE(
121,95)-(133,103),PSET,BF
1440 X=131:Y=69:GOSUB1450:GOTO40
1450 HPUT(X,Y)-(X+58,Y+55),10,PS
ET:RETURN
1460 HLINE(X,Y)-(X+58,Y+55),PRES
ET,BF:RETURN
1470 *ZAP 1.0
1480 *(C)1989 BY NICK BRADBURY
    
```

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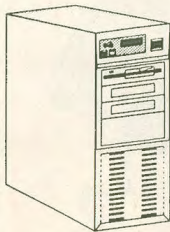
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