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February 1985

P. 176

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The RAINBOW®

THE COLOR COMPUTER MONTHLY MAGAZINE

CoCo Power!

Our Utilities Issue

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The SAILOR MAN

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The first screen objective is to catch enough of Elsie's kisses (those Red Heart Shaped Things) to fill in the squares on the Sailor's house. If you can time your punch just so, you can send the punching bag over to knock the bucket down and, with a little bit of luck, right onto **Bigfatbadguy's** head. This will give you a little (but not much) time to catch all those RHSTs.

You must avoid contact with **Bigfatbadguy** who is actively pursuing you. You must also be careful of **Olduglysea-woman** who will appear at higher difficulty levels to chuck empties at you. Either avoid the flying bottles or punch them (with the fire button) to keep from being knocked into the water.

The second screen objective is to collect enough notes to play Elsie a little love song. You may jump off and onto the other end of **Fatguyeatingahamburger's** teeter totter to fly up a deck and even two decks if you manage to catch hold of **Smartaleckklid's** grab handles. Time it right and away you go.

The third screen objective is to collect enough letters (thrown by Elsie's cries for H-E-L-P) to complete a ladder all the way to the crow's nest where Elsie is calling you. Beware of the Crow, however, who thinks you are after her eggs!

On all screens, eating a can of collard greens (labeled "S" for Collard and grasped by punching the can just right) will give you amazing speed, strength and agility and allow you to send **Bigfatbadguy** into the drink with a single punch.

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Radio Shack AC-3	125
Radio Shack DC Modem I	89
Radio Shack DC Modem II	160
Radio Shack DC Modem 2212	315

PRINTERS

Radio Shack TRP100	229
Radio Shack DMP105	160
Radio Shack DMP110	305
Radio Shack DMP430	660
Radio Shack CGP220 Ink Jet	545
Silver Reed EXP500 D.W.	430
Star Gemini 10X	289
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Amdek Video 300 Green	145
Amdek Video 300 Amber	159
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Taxan 116 Amber	129
Radio Shack VM-2	139

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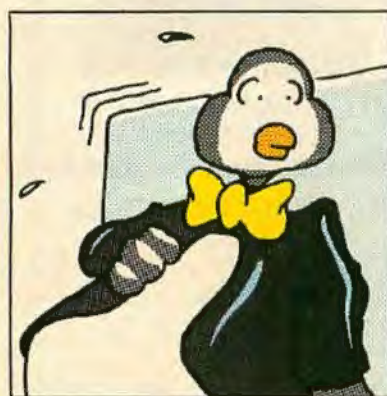
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Under The RAINBOW



18



33



66

NEXT MONTH: Our business and finance issue. Long-time contributor Jorge Mir will be back! And, along with our RAINBOW regulars we'll also have Susan Davis, Tim Harris and Brian Lantz. In addition to a solid payroll program, we show you how to prepare a personal income statement and how to measure your performance in the stock market. We'll also look at treasury bill investments and we'll provide a program to show you how to buy in quantity to save money. We'll also have a BASIC09 mailing list program, and we'll launch our Third Annual Rainbow Adventure Contest!

But our CoCo isn't an all work and no play machine, so look for a variety of other useful articles and listings, and games, too. Reach for the March RAINBOW for more on the Color Computer than is available from any other source!

FEATURES

- Floating Point Math/Steven R. Broadwater** _____ **18**
MATH TUTORIAL *Understanding and applying these math routines*
- Join The Penguin Patrol/Paul Wagorn** _____ **33**
GAME *Keep away from the coneheads*
- Weather . . . Or Not?/Marty Goodman** _____ **42**
DATA COMMUNICATIONS *Process satellite signals into graphics*
- Space Race/Daniel Hamilton** _____ **66**
GAME *Calculate your way through the solar system*
- Computer Cupid/T. Gray** _____ **76**
GAME *CoCo plays the matchmaker*
- Buffer Stuffer/Richard W. Rutter** _____ **90**
ML UTILITY *Enhance keyboard input*
- Put Programs On Automatic/Jeffry Dwight** _____ **128**
LOADING UTILITY *Makes ML programs self-EXEC*
- Simplify And Sharpen Displays/John D. Boyle** _____ **131**
BASIC TUTORIAL *Ease writing of programs involving displays*
- CoCopadd/Joel Robbins** _____ **140**
UTILITY *Makes CoCo a math whiz*
- Cooking With CoCo/Colin J. Stearman** _____ **146**
EXPANDING BASIC *Part VIII, conclusion*
- Fix Your CoCo 2 Disk Controller/Marty Goodman** _____ **149**
TUTORIAL *Save time on repairs*
- Cassette Merge Program/John D. Boyle** _____ **158**
TAPE UTILITY *How not to let the bugs bite*
- CoComon Junior/Steve Roberts** _____ **164**
ML UTILITY *Speed typing of machine language programs*
- Get It Together With Disk Merge/Paul Gani** _____ **175**
DISK UTILITY *Better than BACKUP*
- FILECOPY — A Handy OS-9 Utility/Gerry Schechter** _____ **242**
BASIC09 UTILITY *Relief for type-weary fingers*
- Graphics Bazaar/Paul Vernon Miller** _____ **246**
GRAPHICS *Experience different sights and sounds*
- Block Out Troublesome Granules/Charles C. Zimmer** _____ **250**
DISK UTILITY *Addendum to last month's article*

PRODUCT REVIEWS

- Product Review Contents _____ **185**

COLUMNS

[-] BASIC Training / <i>Joseph Kolar</i> _____	236
<i>Using tables to assist in programming</i>	
[-] Bits And Bytes Of BASIC / <i>Richard White</i> _____	152
<i>Analyzing more BASIC</i>	
Building February's Rainbow / <i>Jim Reed</i> _____	16
<i>Odds and ends from the managing editor</i>	
[-] Byte Master / <i>R. Bartly Betts</i> _____	110
<i>Staging the final scene of the 51-column screen</i>	
CommLink / <i>R. Wayne Day</i> _____	39
<i>A guide to the do's and don'ts of modeming</i>	
[-] Education Notes / <i>Steve Blyn</i> _____	64
<i>The value of comparison shopping</i>	
Education Overview / <i>Michael Plog, Ph.D.</i> _____	181
<i>Using your computer to help develop classroom material</i>	
[-] GameMaster's Apprentice / <i>George Firedrake and Karl Albrecht</i> _____	85
<i>Use imagination and creativity with role playing games</i>	
Print#-2 / <i>Lawrence C. Falk</i> _____	12
<i>Editor's notes</i>	
School Is In The Heart Of A Child / <i>Bob Albrecht and Ramon Zamora</i> _____	253
<i>Having fun with number patterns</i>	
Turn Of The Screw / <i>Tony DiStefano</i> _____	56
<i>A look at how the Multi-Pak Interface works</i>	
[-] Wishing Well / <i>Fred Scerbo</i> _____	118
<i>Let CoCo talk you into a better education</i>	

RAINBOWTECH

Downloads / <i>Dan Downard</i> _____	260
<i>Answers to your technical questions</i>	
hogg_wash / <i>Frank Hogg</i> _____	263
<i>Yet another CoCo 2?</i>	
KISSable OS-9 / <i>Dale Puckett</i> _____	269
<i>Potpourri! A medley of hints and tips</i>	
OS-9 Utility / <i>Gerry Schechter</i> _____	275
<i>Tidy up listings with LISTFILE</i>	
Personable Pascal / <i>Daniel A. Eastham</i> _____	278
<i>Pointers and the heap</i>	
OS-9 Utility / <i>Charles Robitaille</i> _____	282
<i>Get a boot out of OS-9</i>	

DEPARTMENTS

Advertiser Index _____	288	Reviewing Reviews _____	190
Back Issue Information _____	119	Scoreboard _____	178
Corrections _____	281	Scoreboard Pointers _____	180
Letters To Rainbow _____	6	Submitting Material	
The Pipeline _____	136	To Rainbow _____	88
Rainbow Info _____	245	Subscription Information _____	24
Received And Certified _____	188	These Fine Stores _____	286

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February 1985

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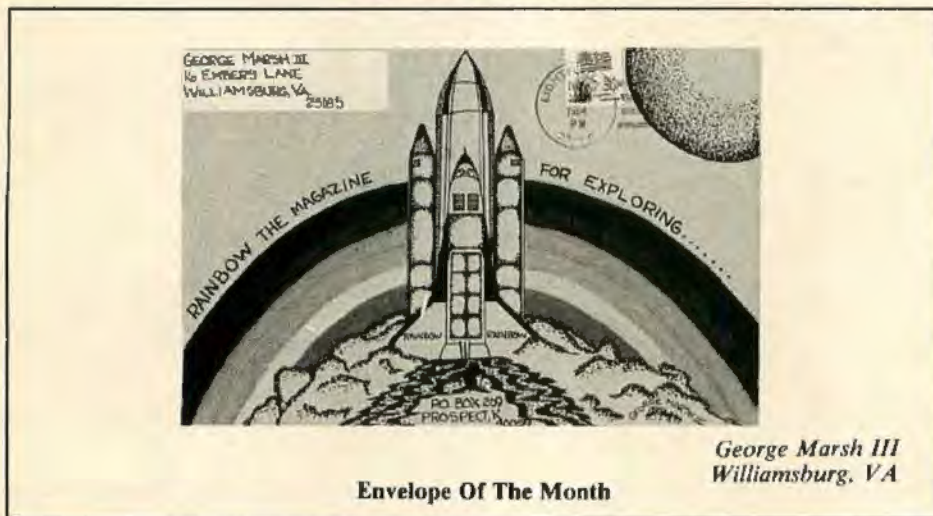
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LETTERS TO THE RAINBOW

ARTS AND LETTERS



Envelope Of The Month

George Marsh III
Williamsburg, VA

IN PURSUIT OF SCHOLARLY SOFTWARE

Editor:

There has always been an interest in promoting the use of Color Computers in education in *THE RAINBOW*. You have run highly successful programming contests in the past. I would like to propose that you combine the two into an educational software programming contest.

The Color Computer has a decided lack of educational software available for it compared to other popular systems. All of the educational software catalogs that are mailed to me as a teacher have precious little for the Color Computer. The impression created is that there is virtually no software.

You probably can't help what makes it into the software catalogs we get, but a successful contest would produce winners for publication in your annual September back-to-school issue, and the top dozen or two programs could then be made available

in book/cassette combination similar to what you did with your Adventure game contest.

Anything would help. Please consider the idea. Thank you.

Paul French
Burlington, IA

INFORMATION PLEASE

Editor:

While recently devouring the December 1984 issue of *THE RAINBOW*, I came across the advertisement "Announcing . . . The Rainbow Bookshelf." I am interested in your products, although I do have a question or two.

You advertised *The Rainbow Book of Simulations*, which had both a book and a tape. Along with that was also *The Rainbow Book of Adventures*, which also had both the book and tape. Is it necessary

to have the book to have the tape, or vice versa? Or does that book consist of the programs, etc., while the tape does not?

I am interested in purchasing them, but I am curious about the difference/similarities. Please advise so that I may order accordingly.

Also, do you have any other books from the Bookshelf?

Thank you for such a great magazine and keep up the great work.

Dave Helfrich
New Port Richey, FL

Editor's Note: Both books have all the listings and instructions needed to use each program. The tapes have *only* the programs; you still need the book for operating instructions. *The Complete Rainbow Guide To OS-9* is the latest Rainbow Bookshelf offering. A second Adventure book and a second Simulations book are among works in progress.

COURSE ON MORSE?

Editor:

I am writing to you to see if I can find any tapes on Morse code for the TRS-80 Color Computer — learning, sending or receiving?

I enjoy *THE RAINBOW*, keep it up.

Oscar H. Ash, Jr.
Willoughby, OH

COCO CHOO-CHOO

Editor:

I would like to know if anyone has in the past or is currently utilizing their CoCo to control a model railroad? If so, please write me at 1492 Chaffee Court, 60007.

Patrick Quinnett
Elk Grove Village, IL

'BEEPING' WITH THANKS

Editor:

I [wish to] express thanks and compliments to Marc Labbe of Biddeford, Maine, for his hints and tips in the December 1984 RAINBOW magazine, Page 6.

Thank you Marc, my computer beeps everytime I press the keyboard.

Paul Elias
Chicago, IL

Editor:

In your December 1984 issue under "Hints and Tips" in "Letters To The Rainbow" there is a letter from Marc Labbe that makes a key-beep. If you change *POKE 1541,4* to *POKE 1541,0* this produces more of a key-click sound.

I saved it to tape and load and run it every time I power up. This doesn't slow up the listing of a program nearly as much as the key-beep.

John R. Reed
Easton, MD

HINTS AND TIPS

Editor:

Here is a hint for your readers. To make shorter sounds in BASIC, *POKE 140*, (a number 1-255 for the tone): *EXEC43345 ENTER*.

```
10 FOR J = 2 TO 100 STEP 5
20 FOR I = 1 TO 255 STEP J
30 POKE 140,I:EXEC43345
40 NEXT I
```

Paul Wagorn
Carp, Ontario

INTRODUCTION LINE

Editor:

I would like to pass on to your readers this tip I have found very useful.

Since most programs do not use Line 0 as a program statement, I insert a *REM* statement listing the program name, publication, month, year and page number. This enables me to find the listing or supporting documentation for debugging or what have you. For example:

```
0 REM ROAD RACE;RAINBOW 11/84,36
```

If Line 0 is being used, I just insert the *REM* statement as the last line of the program.

Wayne C. Bell
Bangor, PA

TV GUIDE

Editor:

Here are some computer "programs" that beginners, as well as experienced hackers, might enjoy.

Innovation — PBS
The New Tech Times — PBS

The New Literacy — PBS
Educational Computing — PBS
Family Computing — Lifetime (Cable)
The Computer Programme — PBS

Check your local public TV stations and cable system for times.

Mike Sims
Nanuet, NY

BREAKING THE SPEED LIMIT

Editor:

I received a letter from Mr. Glenn P. Alfrey who has a problem saving a program to tape. It is evident that Mr. Alfrey is trying to save the program while the computer is in the high speed mode.

It would be a good idea for you to remind your readers that whenever a program uses a *POKE 65495,0* statement, they should always *POKE 65494,0* before trying to save on cassette in order to reset the computer to its normal speed.

Jacques Bourgeois
Longueuil, Quebec

COMPUTER CONSORTIUM

Editor:

ECCO, the Educational Computer Consortium of Ohio, is now accepting proposals for presentation for its Fifth Annual Educational Computer Fair, to be held on Friday and Saturday, October 11-12, 1985 in Cleveland.

Classroom teachers, administrators, university faculty and those with practical computer education experience are encouraged to submit proposals. We are searching for proposals in all content areas and grade levels, preschool through college, for both beginning and advanced computer educators. We are particularly interested in applications into all areas of the curriculum.

To obtain the brief proposal form, send a request to Alice Fredman, Director, ECCO, 1123 S.O.M. Center Road, 44124.

Vendors are invited to contact ECCO for information about commercial displays.

Alice Fredman
Cleveland, OH

BULLETIN BOARD SERVICE

Editor:

My school is interested in setting up a bulletin board. If anyone has a BBS at their school, please write me at P.O. Box 1123, 32742 and tell me about it.

Richard Beck IV
Kissimmee, FL

Editor:

We would like to announce the Great Gamma Color 80 BBS of the colonial capital of Virginia. The BBS number is (804) 887-5302 and is operating 24 hours.

We have many downloadable programs; our database has weekly football standings, members' movie reviews and many others.

We have electronic shopping with Radio Shack products from Williamsburg Radio Shack with owner Dennis Welch sponsoring our BBS. We welcome all types of computers. Our mailing address is The Great Gamma BBS, 16 Embers Lane 23185.

George Marsh
Williamsburg, VA

Editor:

North Shore BBS will be on line 24 hours a day, seven days a week. We have downloads, uploads as well as electronic mail and all features of *Colorama BBS* software. For more information call (302) 227-4375 or write North Shore BBS, Eric Flores (SYS-OP), U.S.C.G Indian River, 19971.

Eric Flores
Rehoboth Beach, DE

Editor:

The Syracuse High School Computer Club is operating a BBS at (316) 384-7446. Hours are from 5 p.m. to 7 a.m., M.S.T.

Greg Davidson
Syracuse, KS

Editor:

I have been operating a BBS in San Jose since last December. I bought the BBS from Shawn Jipp (the old 733-6809 number). My number is (408) MAX—BBSS or (408) 629-2277 and operates 24 hours, seven days a week. The BBS signs on with the logo of MicroBur BBS on a *Color 80 BBS* program.

Terrance D. Burnes
San Jose, CA

Editor:

We would like to announce The Peninsula CoCo Board now in service in the Peninsula area of Virginia. It is being run on a 64K CoCo with two DSDD TEAC drives, but is open to everyone. We are using the *Color 80 BBS* software. The board is open seven days a week, 24 hours a day. It supports downloading, uploading, messages and a data file at 300/1200 Baud. The phone number is (804) 868-0922.

Bill Satterwhite
Tabb, VA

Editor:

I run the Lighthouse BBS in Renton. My address and phone number is 3813 NE 8th Court, 98056, (206) 255-5150.

Marshall Butler
Renton, WA

PRINTER PRESCRIPTION

Editor:

In the December 1984 issue, Page 8, "Letters To Rainbow," Rogers George IV, Terrace, Minn. has a ribbon replacement problem for "Impact Data Printer."

Computer Friends, 6415 SW Canyon Court, Suite 10, Portland, OR 97225, has a wide variety of cartridges, loaded or empty, and ribbon reloads. I suggest he write them; ask about the MacInker — it's great.

THE RAINBOW is still fantastic. Keep it up.

J. Stewart Campbell
Ocean City, NH

BOUQUETS

Editor:

Often you print letters expounding the merits of THE RAINBOW, and I must agree, THE RAINBOW is the one for me, too. A poll on a local CoCo BBS indicates that THE RAINBOW is the favorite of all the CoCo users in the area.

However, the reason I'm writing this letter is to applaud one of your advertisers. Endicott Computer Software And Accessories of Huntsville, Ala. I have been purchasing products from Endicott for several months and their products, prices and service are always as advertised.

Recently, I received a software package that contained a flawed diskette. In a short telephone conversation with an Endicott employee, I was told to return the package to them. I did so, and in less than two weeks I received a brand new replacement. Considering the shipping time (two ways) I feel their attention to my problem was superb and worthy of emulation by the majority of the mail-order houses that are vying for our business today.

S.M. Whitehouse, Jr.
Clearwater, FL

Editor:

I recently purchased a Video Pal Video and Audio Interface from RGS Micro, Inc. in Montreal, an advertiser in THE RAINBOW.

It was delivered by certified mail and arrived in five days. Unfortunately, some of the pins on the 40-pin header were damaged in shipment, so I returned it to them. Within a week, I received an undamaged unit.

The instructions were printed on two sheets of paper (four pages) and included a parts layout diagram. The instructions were detailed and easy to follow. The unit functions as advertised (driving an Amdek 300A Monitor).

Total elapsed time for this unit to travel across Canada four times was 13 days, which is excellent service indeed. I highly recommend RGS Micro.

D.E. Wilson
West Vancouver, British Columbia

Editor:

Being a person who gets up on his hind legs and screams to the high heavens when I am wronged puts me under an obligation to comment when I am unusually well treated!

I bought Dennis Derringer's *Master Design*. It worked, but not perfectly. A letter to him brought by return mail a new version suited to the somewhat different combination of equipment that I use — without charge!

Having purchased his *Pro-Color-File Enhanced*, I had difficulty getting it to work. I am not as computer literate as I would like to be, and had difficulty understanding the directions. The extreme patience that Dennis Derringer showed me when I called

him, soon had me on the right track — and now that I understand how to make it go, I am aware that the directions actually covered every question I had. It's a fine program, very versatile, and with a national users group.

Hugo Spatz
Port Charlotte, FL

KUDOS

Editor:

Thank you so much for bringing RAINBOWfest to Irvine, Calif. I am really looking forward to it.

I would like to say that I subscribed to another Color Computer magazine before finding THE RAINBOW. THE RAINBOW is by far the best CoCo magazine on the market. Thank you for all the programs and all the things you've taught me about my CoCo.

Becky Bergsma
Corona, CA

PRAISE FOR PASCAL

Editor:

This is just a note commending you on Daniel Eastham's "Personable Pascal" articles.

I've really been enjoying them, they're an excellent diversification for the magazine. Thanks!

Mark Mosty
Kerrville, TX

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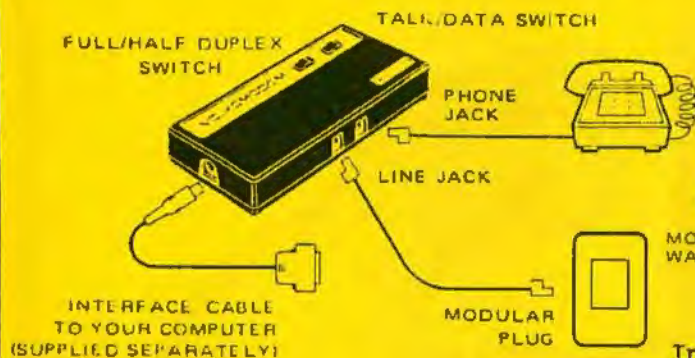
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Inputs	MARK (OFF) 0 to -25V SPACE (ON) +2.5 to +25V
Data Format	Serial, binary, asynchronous
Operate Mode	Manual dial, manual answer, auto-matic answer/originate mode select
Data Rate	0 to 300 bps, full duplex or half duplex
Modulation	Phase coherent, frequency shift-keyed (FSK)

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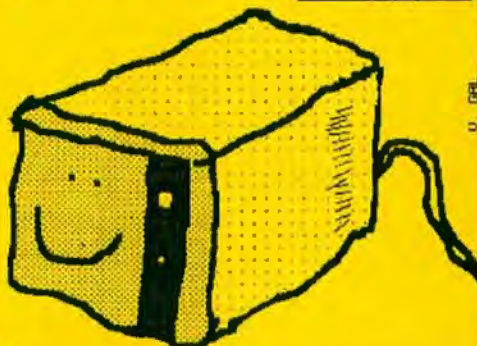
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**WRITE FOR
OUR CATALOG**



Our favorite computer — Radio Shack's CoCo — is the best selling machine Tandy Corp. has ever had and is expected to continue its leadership in the foreseeable future, according to top planners in the firm's computer merchandising area.

"In terms of units sold, the Color Computer is far and away the best selling computer we have ever had," Mark Yamagata, director of computer merchandising-personal computer products, told THE RAINBOW in an exclusive interview.

"Not only is it our best seller, but all our plans, buying strategy and marketing decisions, anticipate that it will continue to be the number one computer in sales in the Tandy line," he added.

However, in a whimsical aside, Yamagata noted that, effective almost immediately, "there will be no more TRS-80 Color Computers manufactured." The reason? All of Tandy's new computers — as well as most of its present line — will be known as "Tandy" computers from now on. "So, it now becomes the Tandy Color Computer," Yamagata explained.

Indeed, in a wide-ranging interview with THE RAINBOW, Yamagata and Barry Thompson, Color Computer product line manager, exuded enthusiasm about plans for continued support and expansion of the Color Computer line — now Tandy Color Computer line — in both the immediate and prospective future.

As to the immediate future, Thompson points out that considering the scope of the CoCo market, buying decisions have to be made as much as a year in advance. Thus, in December 1984, Tandy is already beginning to make decisions on how many CoCos it will sell for the holiday buying season next year.

Yamagata gestured toward Thompson: "He's still here and that's what he's doing — buying Color Computers for next Christmas. Lots of them. As long as he's here, we'll be buying Color Computers."

"And I'm not going anywhere," Thompson confirms.

Both Thompson and Yamagata acknowledge that they see the Color Computer as a consumer product whose sales will become somewhat more seasonal than they have been historically. Because of this, many new products for CoCo will appear in the fall rather than the spring.

"But we will continue to bring new products and programs for the Color Computer to the stores as soon as they become available," Yamagata says. "It is just that the real push each year will be for products appearing in the fall catalog rather than in the one we do for the spring."

"The fact that we do not announce a whole bunch of new things for the Color Computer in the spring catalog does not mean that we are in any way soft on the CoCo," says Thompson. "It is just that many things were announced in the fall because we knew then that we would produce them. Some, of course, have not been brought to the stores yet."

Thompson believes there is still a huge, untapped market for "home" computers. And he believes Tandy will get a huge share of that market — as it has already done.

"When you look at it, only some two to three percent of American homes have home computers," says Yamagata. "That leaves a market that is huge by any comparison. And, I believe we have demonstrated that we will have a large share of that market — as we do now."

Thompson points out there have been some industry "experts" who have compared the home computer market with the Citizen's Band craze of several years ago. But, he adds: "This has passed the CB radio stage and passed the CB radio philosophy. So many people thought that home computers would die out like CB radio, but that has not happened."

"Of course, in order for this to continue, the home computer has to be viewed as a personal productivity tool. One of the things we are trying to do is enhance an individual's use of a computer in the home or small business as a device which can increase that person's personal productivity."

Because of this, both Yamagata and Thompson put little credence in reports that the day of the eight-bit computer is numbered.

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- No hardware modifications required

THE ORIGINAL

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

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...

— Color Computer News, Jan. 1982

TELEWRITER-64

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

64K COMPATIBLE

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

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Termint, etc).

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

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

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

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

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

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

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

— The RAINBOW, Jan. 1982

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"If you get what you want done, at a cost that you want," Thompson says, "no one cares whether he is using an eight-bit or 16-bit machine. The 'average' new user doesn't care if there are eight bits or eight million — so long as the job gets done. We know the CoCo can do the job."

This, interjects Yamagata, is further proof that the home computer market is, essentially, a consumer market. The typical consumer is not into the hardware, the details of programming or other aspects of computing as is the hobbyist. "He wants to get the job done," Yamagata believes.

But, as Thompson points out, the Color Computer is, in many ways, a 16-bit machine anyway. Yet "we don't advertise it that way — maybe because we're a little more conservative, or a little more truthful," he says.

Of great interest, Yamagata points out, is that more and more "name" software firms are beginning to work with Tandy. One of them, Imagic, has a program due out soon.

"Why are these people coming to us more and more?" Yamagata asks. "Because they see a very healthy and an increasing share of the market. We still don't release our sales figures, but the message is pretty plain in the marketplace.

"The Color Computer is clearly the leader in the home computer field and we intend to do what we can to keep it that way."

So, what about the future?

"Of course, we plan to extend and expand the Color Computer," Yamagata says. "We would be foolish if we were to cut out the most successful computer we manufacture.

"Naturally, there will be some changes and additions to the line, as time goes by," he adds. "But, remember, one of the major benefits of a Tandy computer has always been that it is upwardly compatible so that software that runs on a Color Computer today will run on a Color Computer tomorrow. This, of course, pertains to our own software as well as the software from people who do not use undocumented calls into the ROM.

"I think this is a very important consideration in the computer market. It is something we have considered very important at Tandy and it should certainly be a major consideration for people who buy computers."

The one watchword of the future? "This is our — and one of the world's — most successful computers, in terms of sales, customer acceptance and value," says Yamagata.

"Anyone who had a product like that would be a fool to do anything less than continue to support it 100 percent. We may be a lot of things here, but foolish certainly isn't one of them."

— Lonnie Falk



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The screen's top line shows operating mode, unused memory size, memory on/off, and caps-lock on/off. It also gives helpful prompts.

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KEY-BEEP can be on/off. Unacceptable keystrokes cause a lower pitched BOP! This ERROR-BEEBOP can be on/off.

Talks to other computers with Full or Half Duplex; Baud Rate of 110, 150, 300, 600, 1200; Parity as even, odd, mark, space, none; 7 or 8 bit Word; any Stop Bits; all 128 ASCII characters; true line Break; XON/XOFF protocol; and optional line-at-a-time transmission. Able to send and receive text, block graphics, BASIC and ML programs. A 64K machine holds up to 46,600 characters (34,900 in HI-RES).

DUAL PROCESSING lets you review & edit while more data is coming in.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

You'll also use Autoterm for simple word processing and record keeping

You can display directories, delete files, transmit directly from disk, and work with files larger than memory. Easily maintain a disk copy of an entire session.

Compatible with TELEWRITER (ASCII) & other word processors.

SMOOTH WALKIN'

AUTOTERM moves smoothly and quickly between word processing and intelligent terminal action. Create text, correct your typing errors; then connect to the other computer, upload your text, download information, file it, and sign-off; then edit the received data, print it in an attractive format, and/or save it on file.

Editing is super simple with the cursor. Find strings instantly, too! Any operating parameter, such as screen width, can be altered at any time. Uncompleted commands can be cancelled.

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The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

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"AUTOTERM is the Best of Class."

Graham, *RAINBOW*, 6/83

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BUT IF YOU DON'T KNOW LOGO Send for our LOGO STARTER program...

Teachers agree: LOGO is the best way to introduce children to computers. Now, with LOGO STARTER you won't have to read a book or instruction manual. Just load the LOGO STARTER tape. Your child will draw exciting designs right from the start. You won't waste your time on a lot of tedious typing. And your child will be on the way to computer literacy. (Requires Radio Shack Color LOGO)

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Busy executives! Students! Increase reading speed dramatically. Best available speed reading program for the CoCo. Reading material appears on the TV screen at the speed you select, training you to read faster. You can even change speed while reading. Complete with 6 different text selections and a quiz for comprehension, plus a drill to improve visual span & perception.

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A naughty, sexy computer game for 2 to 6 couples. (Write us—we'll send a copy of the Review.)

"Would definitely liven up most parties."

—Rainbow Magazine

All programs on cassette tape for 16K Color Computer. Extended BASIC not required. Prices include postage (PA residents add 6%). Send check to P.O. Box 210, Jenkintown, PA 19046

B & B Software

BUILDING FEBRUARY'S RAINBOW

Our Utilities Issue . . .

Maybe An Educational Program Contest . . .

And, Let's Keep The One-Liners Coming . . .

This is our utilities issue. Those who took part in our survey at the RAINBOWfest in Princeton put utilities at the top of the list of things they'd like to see more of in THE RAINBOW. So, even though we had several utilities last month, we decided to give you even more of what you're most asking for. Also in answer to popular demand, two are in OS-9 and one is in BASIC09. Some of the other utilities are for cassette users, while others are for disk. We do hope you find some choice pickings from this month's offerings.

For a long while, we had intended this to be our Adventure contest kickoff edition. And, yes, we already have a number of prizes lined up for our Third Annual Rainbow Adventure Contest. We'll just wait a bit and sound the starting gun next month as something lighter to complement the material in our March business and financial issue. If you can't wait to get started, plunge on in; the rules will be similar to last year's.

Speaking of contests, what do you think of one for educational programs? Paul French, of Burlington, Iowa, proposes such a competition in this month's Letters to the Editor. Sure, we've considered such a contest, but maybe his letter is what we needed to go into action. What do you think? What sort of rules? Who should we get to do the judging? Share your thoughts with us. While you're at it, maybe you have an idea for another contest. And, while we're asking, what sort of extra treat would you like to see in RAINBOW's fourth anniversary issue in July? As many of you know, we always include a surprise in the anniversary issue. Last year, we had the Scratch and Sniff Adventure. The year before: a soundsheet with three computer programs recorded on it ready to load in and run. This year? Maybe your idea's time has arrived.

While we're talking contests, don't forget our continuing competition: The First Great Rainbow One-Liner Contest! In the September 1984 installment of this column, we introduced a standing contest. No deadlines. Few rules. Some guidelines. Well, we get new entries daily, but since many of you are just joining us, we want you to know you can enter, too. Just send us the best you can put together in one line of BASIC. We think these one-liners, several of which appear in each issue of THE RAINBOW, are a great learning aid, as well as just plain fun. It's a treat to see what can be done in just one line number. As long as new entries keep coming in, we plan to keep publishing the best of the crop. Enter as often as you like.

Repeating the guidelines. Programs must work in Extended BASIC and have only one line number. They must be entirely self-contained: no loading other programs, no calling ROM routines, no ML PDKs. Please don't try to "sneak in" machine language; the program must work as if typed in from a cold start. Don't pack so tightly that we can't LIST or LLIST the entire line — after all, we want to share your work with RAINBOW readers. Keep documentation to 25 words or less. Give the one-liner a title that hints at what it does. Saving it on cassette is the best way to submit your entry, and a printout helps, but provide a cover letter, too. As in any contest, packaging often makes the difference; entries penciled in on the back of a chewing gum wrapper are unlikely to fare well. Nonetheless, if you must break a rule or two, go ahead; we don't want to miss out on the world's greatest one-liner because of some arbitrary guideline. Lastly — just for the record — we'll consider your act of entering the contest as consent to publish your incomparable original. Whew, that's a lot of guidelines for a wide-open, no-deadline, ignore-the-rules-if-you-have-to contest.

I'll conclude with my usual one-liner: If you haven't sent in your entry, in the form of a subscription to THE RAINBOW, why not do so right away; our judges believe you'll declare it the top prize winner in the CoCo competition — no contest!

— Jim Reed

Graduate With DEFT Pascal



As a result of the programming language requirement of the Advanced Placement (AP) Tests, Pascal has become the standard language used in High Schools and Colleges today. On the Color Computer, DEFT Pascal is the standard.

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FLOATING

The floating point math package included in the Color BASIC 1.1 ROM contains an error. This article explains the bug in the Color BASIC ROM and how it can be fixed when running in the 64K mode. It also explains what "floating point numbers" are and explains how the floating point math routines can be utilized.

Floating Point Format

The floating point format used by the Color Computer is similar to the 'E' notation used by BASIC. The statement $X = 1.5 E+03$ in a BASIC program means that the value of 'X' is:

$$1.5 \times 10^3 = 1.5 \times 1000 = 1500$$

In this statement, the value 1.5 is called the mantissa and +03 is called the exponent. The exponent represents a power of 10.

The Color Computer's floating point format also represents numbers in mantissa/exponent form. However, both the mantissa and the exponent must be stored in binary, and the exponent represents a power of 2, not 10.

In decimal numbers, the position of a digit relative to the decimal point indicates its magnitude. For binary numbers, the same kind of positioning can be done relative to a "binary point." The weighting is assigned as follows:

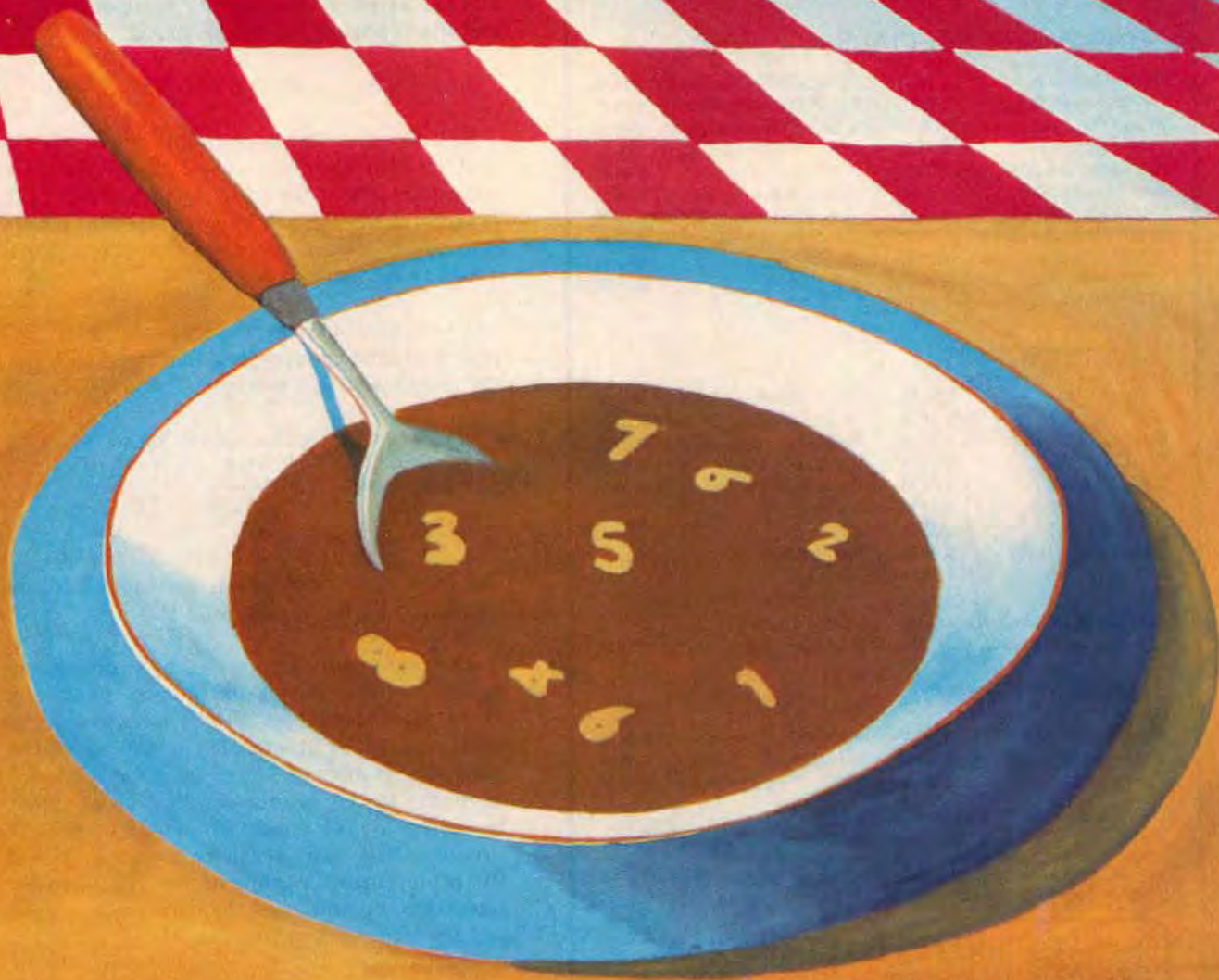
2^3	2^2	2^1	2^0	.	2^{-1}	2^{-2}	2^{-3}	2^{-4}
X	X	X	X	.	X	X	X	X
8	4	2	1		0.5	0.25	0.125	0.0625

Using this weighting, the value 5.5 could be represented with a mantissa of 101.1 and with an exponent of 0. By convention, however, the mantissa is adjusted so no digits

(Steve Broadwater has extensive experience in writing 8080 assembly language software for data acquisition and automatic control applications. He is an engineer with a large public utility corporation, where he is involved in the design and installation of telecommunications equipment.)

POINT MATH

By Steven R. Broadwater



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to the left of the binary point are set and the first digit to the right of the binary point is set. The adjustment is made by rotating or shifting the mantissa to the left or right as many times as required to correctly position the most significant bit. Since rotating the mantissa once to the right is the same as dividing it by two, the exponent must be incremented by one each time the mantissa is rotated to the right, and must be decremented each time the mantissa is rotated to the left.

In this example, the mantissa becomes 0.1101 and the exponent becomes 011, or 3. This form can be seen to be equivalent in that the value of the mantissa is now:

0×2^0	=	0×1	=	0
1×2^{-1}	=	1×0.5	=	0.5
0×2^{-2}	=	0×0.25	=	0
1×2^{-3}	=	1×0.125	=	0.125
1×2^{-4}	=	1×0.0625	=	0.0625
				<hr/>
				0.6875

and the value of the quantity represented by the mantissa and the exponent taken together is:

$$0.6875 \times 2^3 = 0.6875 \times 8 = 5.5$$

By following this convention, all of the floating point routines can simply assume the binary point is to the immediate left of the most significant bit of the mantissa. Therefore, it is not necessary to store the binary point itself in memory. When this convention is utilized, the value is said to be "normalized."

The Color Computer uses one byte (eight bits) to represent the exponent, and four bytes (32 bits) to represent the mantissa of any number. The mantissa appears:

.1XXX XXXX	XXXX XXXX	XXXX XXXX	XXXX XXXX
Most Significant Byte	Next Most Significant Byte	Next Least Significant Byte	Least Significant Byte

The most significant bit has a weight of 2^{-1} ; the least significant bit has a value of 2^{-32} .

The exponent is represented by expressing its magnitude as a 2's complement 8-bit integer. That is, a magnitude of +1 is expressed as \$01, 0 is expressed as \$00, -1 is expressed as \$FF, etc. Then, \$80 is added to the 2's complement integer. The result is the representation of the exponent stored in memory. So, an exponent of +1 will be stored as \$81 (since \$01 + \$80 = \$81). Zero will be stored as \$80, and -1 will be stored as \$7F (\$FF + \$80). By representing exponents in this fashion, the most significant bit indicates the sign of the exponent. If it is set, the exponent is positive; if it is clear, the exponent is negative.

How the sign of the mantissa is represented depends on where in memory the number is stored. There are two 6-byte areas reserved in low memory where numbers are stored when math functions are about to be performed and results are placed. These 6-byte areas are known as floating point accumulators and are called FPAC1 and FPAC2.

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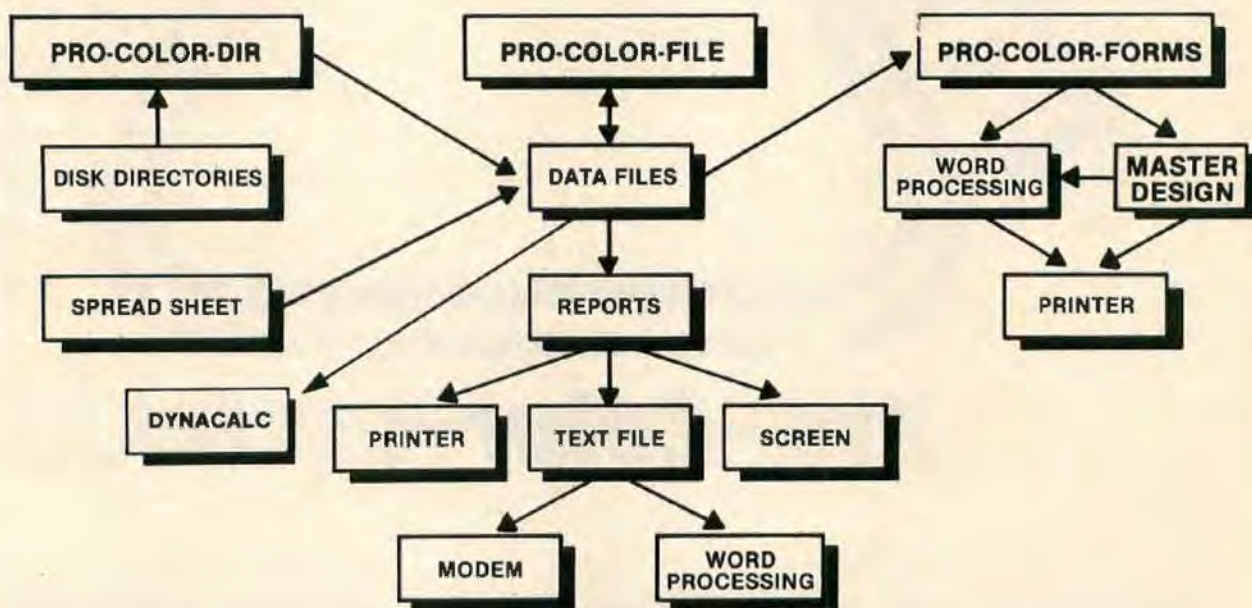
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Address (Hex)		Definition
FPAC1	FPAC2	
\$004F	\$005C	Exponent
\$0050	\$005D	Mantissa — MS
\$0051	\$005E	Mantissa — NMS
\$0052	\$005F	Mantissa — NLS
\$0053	\$0060	Mantissa — LS
\$0054	\$0061	Mantissa — Sign

In the floating point accumulators, there is one byte used for the exponent, four bytes used for the mantissa, and one byte used for the sign of the mantissa. Only the most significant bit of the sign byte is used. If it is clear, the mantissa is taken to be positive; if it is set, the mantissa is negative. The other seven bits of the sign byte are meaningless. The number 5.5 stored in FPAC1 would appear as:

Address	Data Byte
\$004F	\$83
\$0050	\$0B0
\$0051	\$00
\$0052	\$00
\$0053	\$00
\$0054	\$30

The exponent \$83 = 1000 0011. Since the most significant bit is set, the exponent is positive. The value of the exponent is given by \$83 - \$80 = +3.

The mantissa is \$B0000000, or

.1011 0000 0000 0000 0000 0000 0000 0000

and has a value of 0.6875 as shown above.

The sign byte is \$30 or 0011 0000. Since the most significant bit is clear, the mantissa is positive. The other seven bits in the sign byte don't matter.

BASIC reserves space in memory in which to store values of variables used in a program. However, to conserve memory, only five bytes are used to store a value anywhere in memory *except* in the two accumulators. The most significant bit of the mantissa is discarded (since it's always set), and the most significant bit of the sign byte is moved into its place. Thus, the number 5.5 stored at location \$1E7D appears:

Address	Data Byte
\$1E7D	\$83
\$1E7E	\$30
\$1E7F	\$00
\$1E80	\$00
\$1E81	\$00

A value of -5.5 will be stored as follows:

Address	Data Byte	Address	Data Byte
FPAC1			
\$004F	\$83	\$1E7D	\$83
\$0050	\$0B0	\$1E7E	\$0B0
\$0051	\$00	\$1E7F	\$00
\$0052	\$00	\$1E80	\$00
\$0053	\$00	\$1E81	\$00
\$0054	\$0B0		

One special case remains to be discussed. How is the value '0' represented? At first glance, a mantissa of all zeros would appear to work, but this representation does not conform to the convention that the most significant bit of the mantissa must be set. Instead, the exponent is set to \$00, and the floating point routines always assume that the value of the number is zero when the exponent is zero, regardless of the value of the mantissa.

Now that the standard or normalized format of floating point numbers is defined, the range of values that can be represented with this format can be determined. The absolute value of any number must fall in the range:

$$2.9387359 \times 10^{-39} \text{ to } 1.7014118 \times 10^{38}$$

If an attempt is made to define a variable's value below the lower limit of this range, the value of the variable will be taken as zero. Violating the upper limit generates an OV Error in BASIC.

Floating Point Routines

The Color BASIC ROM contains software routines that allow addition, subtraction, multiplication and division of numbers expressed in floating point format. BASIC uses these routines, and it's also possible to use them in an assembly language program.

There are six floating point routines of interest. Their entry points (that is, the addresses where the routines begin) are listed below, together with a short description of the function of each. Each has also been assigned an arbitrary name to facilitate the following discussion. An assembly language program must either refer to a routine by using the address of its entry point, or must contain an *EQU* or *SET* statement that defines the name.

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By Tim Nelson

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Name	Entry Point	Function
FLADD	\$B9C2	ADD FPAC1 to X, result in FPAC1
FLSUB	\$B9B9	SUBTRACT FPAC1 from X, result in FPAC1
FLMPY	\$BACA	MULTIPLY FPAC1 and X, result in FPAC1
FLDIV	\$BB8F	DIVIDE X by FPAC1, result in FPAC1
FLOAD	\$BC14	move X to FPAC1 and modify format
FLSTO	\$BC35	move FPAC1 to X and modify format

The general procedure for using the four math routines consists of three steps:

- 1) Place the value of one of the inputs in FPAC1 using the FLOAD routine,
- 2) Place the address of the exponent of the second input in the X register,
- 3) Jump to the desired floating point math subroutine, which will perform the operation and leave the result in FPAC1.

Since the format of a floating point number in one of the floating point accumulators is different than the format of the same number stored anywhere else in memory, both FLOAD and FLSTO automatically convert a value into its proper format. Therefore, these two routines *must* be used when transferring a number to or from either of the accumulators.

For the purposes of discussion, assume that a floating point variable called 'A' is stored at location \$6000 (the address of the exponent of 'A' is \$6000), and that a variable called 'B' is stored at location \$6100. The values of 'A' and 'B' have been previously assigned. Suppose that 'A' and 'B' need to be added together and the result, called 'C', is to be stored at \$7000. Assembly language instructions to accomplish this addition are:

```
LDX    $6000
JSR    FLOAD
LDX    $6100
JSR    FLADD
LDX    $7000
JSR    FLSTO
```

The first instruction loads register X with the address of the exponent of 'A'. Then the subroutine FLOAD copies the five bytes that represent the value of 'A' into FPAC1. FLOAD also modifies the format by moving the first bit of the mantissa to the sign byte in FPAC1, and restores the most significant bit of the mantissa (always set) to its proper place.

Next, X is loaded with the address of the exponent of 'B' and the floating point addition subroutine FLADD is called. FLADD performs the addition, adjusts the exponent and mantissa of the result to normalized format, and leaves the result in FPAC1.

Finally, X is loaded with the address where the exponent of the result will be stored. The subroutine FLSTO places the most significant bit of the sign byte in the place of the most significant bit of the mantissa and copies the result to the desired location.

The other floating point math routines FLSUB, FLMPY and FLDIV are used as shown in the following examples:

```
C = A - B:      LDX    $6100
                JSR    FLOAD
                LDX    $6000
                JSR    FLSUB
                LDX    $7000
                JSR    FLSTO

C = B - A:      LDX    $6000
                JSR    FLOAD
                LDX    $6100
                JSR    FLSUB
                LDX    $7000
                JSR    FLSTO

C = A x B:      LDX    $6000
                JSR    FLOAD
                LDX    $6100
                JSR    FLMPY
                LDX    $7000
                JSR    FLSTO

C = A / B:      LDX    $6100
                JSR    FLOAD
                LDX    $6000
                JSR    FLDIV
                LDX    $7000
                JSR    FLSTO

C = B / A:      LDX    $6000
                JSR    FLOAD
                LDX    $6100
                JSR    FLDIV
                LDX    $7000
                JSR    FLSTO

FPAC1 =
A + B + C:      LDX    $6000
                JSR    FLOAD
                LDX    $6100
                JSR    FLADD
                LDX    $7000
                JSR    FLADD
```

Pay special attention to the subtraction and division examples. To obtain the desired result, 'A' and 'B' must be used in the proper order. Also note that since all four math routines leave the result in FPAC1, chained math operations are easily performed as shown by the last example.

Math Error

As previously mentioned, there is a bug in the floating point software package in the Color BASIC 1.1 ROM. It's in the floating point addition (FLADD) routine and may also be encountered when using FLSUB. Although it's not necessary to understand how the floating point math routines function internally in order to use them in an assembly language program, it would be helpful to understand a little of how the FLADD and FLSUB routines work in order to understand the bug and how to avoid it.

FLADD first moves the value that register X points to into FPAC2, changing its format as required. Then, the exponent of FPAC1 is placed in the B register and the exponent of FPAC2 is placed in the A register.

FLSUB also begins the same way. Then FLSUB simply changes the sign of the mantissa stored in FPAC1. Since

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the operation "X - Y" is the same as the operation "X + (-Y)," FLSUB can simply branch into FLADD at this point.

FLADD now checks to see if the value in either accumulator is zero. If not, FLADD is ready to add the contents of the two accumulators. In order to do the addition, the exponents of the two accumulators must be the same. When the two exponents match, all of the digits in each mantissa carry the same weight as do the corresponding digits in the other mantissa, and the 6809's ADD and ADC instructions can be employed to perform the required multi-byte addition of the two mantissas. FLADD subtracts the two exponents to see if they match; if the result is zero, the mantissas are ready to be added. If the result of the subtraction isn't zero, one of the two values must be unnormalized, that is, its mantissa and exponent must be adjusted until the two exponents match. However, FLADD runs into two problems when it tries to do the unnormalization.

The first problem relates to the magnitude of the two values. Since a mantissa is 32 bits long, if the difference between the two exponents is more than 32, one of the two numbers is insignificant in relation to the other. FLADD doesn't consider this possibility, however; regardless of the magnitude of the difference between the two exponents, it unnormalizes one of the two mantissas. The two mantissas are added, even though one contains all zero digits. This failure to avoid unnecessary unnormalization and addition, while not causing incorrect answers to be returned, slows down the FLADD routine.

The second problem with FLADD is the bug referred to above that causes incorrect answers. FLADD uses the

results of the subtraction of the exponents to determine which is larger as well as to see if the exponents initially matched. The subtraction operation automatically sets the 6809's flags based on the result, however, FLADD misinterprets the meaning of the flags.

Consider this example: The floating point representation of 31 is stored in FPAC2. The exponent of this value is \$85, or +5. As seen above, FLADD subtracts the exponent of FPAC1 from the exponent of FPAC2. The following table indicates the state of the flags after the subtraction is executed over the full range of possible values of the exponent of FPAC1:

FPAC2 Exponent	- FPAC1 Exponent	= Result	Flags Set
\$85	\$FF	\$86	N,C
..
..
\$85	\$86	\$FF	N,C
\$85	\$85	\$00	Z
\$85	\$84	\$01	none
..
..
\$85	\$06	\$7F	none
\$85	\$05	\$80	N
..
..
\$85	\$01	\$84	N

The result of the subtraction is used to determine which accumulator contains the higher number. A BMI

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instruction is used to make the distinction; that is, branch if the 'N' flag is set. FLADD should execute the branch only when the value in FPAC1 is larger than the value in FPAC2. Thus, the branch should be executed only when the exponent of FPAC1 is between \$86 and \$FF inclusive. In the table above, the 'N' flag is set when FPAC1 is, in fact, larger. However, the 'N' flag is also set when FPAC1 is very small.

When BASIC attempts to find the value of the expression "31 - 1E-38," it returns an answer of -1E-38. The exponent of 1E-38 is \$02. From the table, the 'N' flag will be set when the exponents are subtracted and the branch instruction will be executed when it shouldn't be. In other words, the Color Computer incorrectly identifies 1E-38 as being larger than 31. On the other hand, when BASIC attempts to evaluate the expression "31 - 1E-37," it correctly returns an answer of 31. Since the exponent of 1E-37 is \$06, the 'N' flag is not set when the exponents are subtracted and the branch instruction is not executed.

Note that it's the magnitude of the difference of the exponents that's the problem, not the magnitude of either of the two numbers taken alone. This BASIC will also respond with incorrect answers when asked to evaluate "2.5E+21 - 1.2E-18" or "2.5E+37 - 1.2E-01."

The table above demonstrated both the problem and its solution. While the 'N' flag is not a reliable indication of which of the exponents is larger, the 'C' flag is set only when the FPAC1 exponent is higher. Therefore, the bug can be fixed by changing the BMI instruction (op code \$2B) at \$B9D6 to a BCS (branch if 'C' flag is set) instruction (op code \$25). A POKE instruction won't work since this address is in ROM. However, in a Color Computer with 64K RAM chips, the BASIC ROMs can be copied into RAM at the same addresses, the ROMs can be turned off, and then the bug can be fixed.

The following routine illustrates how this can be accomplished:

	ORG	\$7C00	
START	ORCC	#550	MASK IRQ & FIRQ
	LDX	#58000	X => 1st EXTEND BASIC
LOOP	LDA	,X	A = ROM CONTENTS
	STA	\$FFDF	GO TO MAP TYPE 1
	STA	,X+	COPY BYTE TO RAM
	STA	\$FFDE	GO TO MAP TYPE 0
	CMPX	#5C000	END OF COLOR BASIC?
	BNE	LOOP	NOT YET — DO NEXT BYTE
	STA	\$FFDF	TURN ROMS OFF
	LDA	#525	OP CODE FOR BCS
	STA	\$B9D6	REPLACE BAD INSTRUCTION
	ANDCC	#5AF	UNMASK IRQ AND FIRQ
	SWI		
	END		

The newer Color BASIC 1.2 ROM fixes the bug in the same way. The byte at \$B9D6 has been changed from \$2B to \$25. Those who have the newer ROM can rest assured their Color Computers won't give wrong answers when adding or subtracting. However, the process will still take longer than it should.

For those wishing further information, the February 1982 issue of the *Color Computer News* contains a "Comment Corner" feature written by Mr. Andrew Phelps of the Micro Works. It consists of comments that can be used with a disassembly of the floating point routines to explain how they function internally. His article was very helpful and I recommend it highly.

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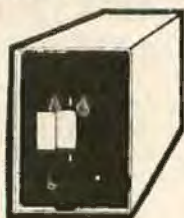


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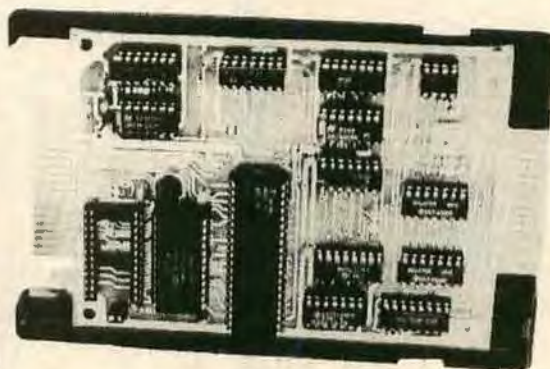
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Looie Wants You To Join The Penguin Patrol

By Paul Wagorn

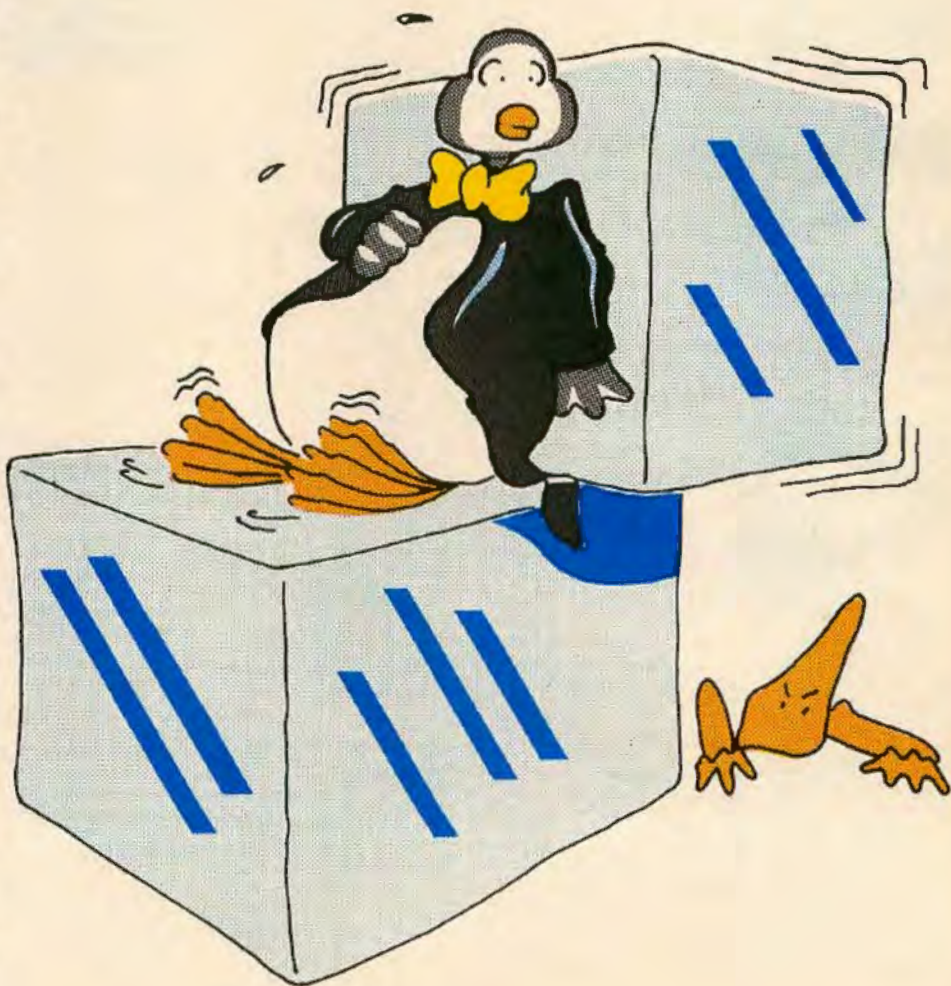
Those of you who regularly visit your downtown arcade already know what fun it is to put your quarter in your favorite "Pengo" game and try to push the ice blocks into those mean sno-bees. Well, *Penguin* is somewhat like that, except you don't have to put in quarters! It's an action-packed, Hi-Res arcade-style game.

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While all of this is going on, a timer is slowly ticking away. You have approximately 20 seconds until a tone starts to beep. After the tone starts to beep, you have another eight seconds to destroy both coneheads, or face the consequences!

You also have something else going for you. If you bump into a wall, any



(Paul Wagorn, a senior at Earl of March High School in Carp, Ontario, is a self-taught CoCo enthusiast. He enjoys writing games and practical programs.)

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123 Zenith 12" Green Screen, 640 dotsx200 dots resolution, 15 MHz band width. **\$114** (\$7 shpg.)

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NEW: 151 Roland 13" Color Monitor with speaker, 270 dotsx200 dots resolution, 15.75 MHz band width. **\$247** (\$12 shpg.)

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DC-1 Disk Controller reads and writes to 35 and 40 track single and double sided drives with all models of the color computer. (J & M) **\$134** (\$2 shpg.)

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coneheads lined up on that wall are temporarily stunned, giving you time to squash the innards out of them.

One conehead is better than the other; he moves faster, doesn't have to

rest as long after eating an ice block, and stays stunned for less time than the inferior conehead (not the kind of guy you'd want to meet in a dark alley!).

The speedup *POKE* is used in Line

7, so if your computer hangs up with the speedup *POKE*, take it out.

I hope you have as much fun playing *Penguin* as I do. One more thing: good luck, you'll need it!

12	.....	74
21	.....	215
35	.....	97
51	.....	133
70	.....	239
END	.....	47

The listing:

```

0 POKE 65494,0
1 CLS:PRINT:PRINT:PRINT:PRINT:PRINT:PRINT
  PENGUIN

      BY

      APOLLO":FORI=5
9T0100:PLAY"T=I;O5;A-;C;D":SCREE
N0,1:SCREEN0,0:NEXTI
2 PLAY"03"
3 PLAY"T4;CAGAFEAADFDEGADAP1T403
L4AP14L2AL4GFL4CL3CL4DFB-AP4FG04
L4DC03AB-AAGL3B-L8AL2F"
4 CLEAR3,16383
5 DIMB(4,4),BG(4,4),BL(3,3),SG(4,4),DB(3,3)
6 COLOR3,1
7 POKE65495,0:
8 PMODE1,1:PCLS
9 DRAW"S8BM4,14C2FR3URLD2R4L4UH2
F2DR2U4D4R2UE2G2LRDR3EDC1D5C3DGL
10HUE3R6F3":PAINT(18,26),2,3
10 PSET(13,26,3):PSET(15,26,3):P
SET(20,27,3):PSET(22,27,3):PSET(
18,28,4)
11 GET(2,2)-(32,32),SG:PCLS
12 DRAW"S8BM14,4C2R3F3D7GL7HU7E2
G3C3D4GU4GD5C1DBM+13,0U4C3U4FD4F
U4"
13 PAINT(16,8),2,2:PSET(14,10,3)
:PSET(14,12,3):PSET(20,10,3):PSE
T(20,12,3):PSET(16,16,3):PSET(18
,16,3):PSET(12,18,4):PSET(14,20,
4):PSET(16,20,4):PSET(18,20,4):P
SET(20,20,4):PSET(22,18,4):PSET(
8,28,3):PSET(8,30,3):PSET(8,32,3
):PSET(6,32,3)
14 PSET(4,32,3)
15 PSET(24,28,3):PSET(24,30,3):P
SET(24,32,3):PSET(22,32,3):PSET(
26,32,3):PSET(28,32,3):PSET(10,3
2,3)
16 GET(2,2)-(32,32),B

```

```

17 PCLS:DRAW"S8C3BM16,0R2F3DFDFD
G2L8H2UEUEUE3LC1L5D11R5C4DL3R5C1
RC4R4L3U":PAINT(18,20),2,3:PSET(
14,18,4):PSET(22,18,4):PSET(12,2
4,3):FORI=14T022:PSET(1,22,3):NE
XT:PSET(24,24,3)
18 GET(2,2)-(32,32),BG
19 PCLS:COLOR3,1:LINE(8,8)-(26,2
6),PSET,BF:COLOR2,1:LINE(10,10)-
(24,24),PSET,B:COLOR4,1:LINE(12,
12)-(22,22),PSET,BF:COLOR3,1:LIN
E(14,14)-(20,20),PSET,BF:PAINT(1
5,15),4,3:CIRCLE(16,16),3,1,1,0,
.25:GET(2,2)-(28,28),BL
20 PCLS:FORI=1T047:Y=(RND(6)-1)*
32+4:X=(RND(7)-1)*32+4:PUT(X,Y)-
(X+28,Y+28),BL:NEXT
21 TIMER=0:SCREEN1,0
22 X=(RND(7)-1)*32:Y=(RND(6)-1)*
32
23 X1=(RND(7)-1)*32:Y1=(RND(6)-1
)*32:IF X1=X AND Y1=Y THEN 23
24 X2=(RND(7)-1)*32:Y2=(RND(6)-1
)*32:IF(Y2=Y AND X2=X)OR(X2=X1
AND Y2=Y1) THEN 24
25 LINE(235,0)-(255,191),PSET,B
26 DRAW"BM238,18C3R4FD3GL4U5D10C
1DC3R5L5D4R2L2D4R5L5DC1DC3D7U7F6
DU7DBC1DC3L2GLGD6FR3EU3L3R4C1DBL
2C3D7GL3HU7D8C1D3C3R5L2D7LU7D7L2
R5D1C1D1L5C3D7U7F6DU7"
27 PUT(X1,Y1)-(X1+32,Y1+32),BG:P
UT(X2,Y2)-(X2+32,Y2+32),BG:PUT(X
,Y)-(X+32,Y+32),B:PLAY"T301;L4EL
BGBO2GL4.EL4F#L8EDP8DP8P8D1L4EL8
GB02GL4.EL4F#L8EDP1"
28 H=0:V=0:IFPEEK(341)=247THENH=
0:V=-32ELSEIFPEEK(342)=247THENH=
0:V=32:ELSEIFPEEK(343)=247THENH=
-32:V=0:ELSEIFPEEK(344)=247THENH
=32:V=0
29 IFG1=1THENX1=-1:Y1=-1
30 IFG2=1THENX2=-1:Y2=-1
31 IFY=0ANDV=-32GOSUB80
32 IFY=32*5ANDV=32GOSUB80
33 IFX=0ANDH=-32GOSUB80
34 IFX=6*32ANDH=32GOSUB80
35 IFX1=X AND Y1=Y ANDG1<>1 THEN
  63 ELSE IF X2=X AND Y2=Y ANDG2<
  >1 THEN 63
36 IF TIMER>=40*60 THEN 63
37 IF TIMER>=30*60 THEN PLAY"T25
5;03;1;7"

```



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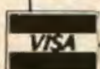
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```

38 A=X+16+32*SGN(H):B=16+Y+32*SG
N(V)
39 IFPPOINT(A,B)=3 GOSUB56
40 IFPPOINT(X+H+16*SGN(X),Y+V+16
*SGN(Y))=2 ANDH<>0 AND V<>0THEN
63
41 IFX+H>=200ORH+X<0ORV+Y>=180OR
V+Y<0THENH=0:V=0
42 LINE(X,Y)-(X+32,Y+32),PRESET,
BF:X=X+H:Y=Y+V:PUT(X,Y)-(X+32,Y+
32),B
43 IFG1=1ANDG2=1THEN74
44 IF F1<0 THENF1=F1+1:GOTO50
45 IFG1=1THENS0ELSEIFH1=-1THENH1
=0:GOTO28ELSEH1=(RND(3)-2)*32:V1
=(RND(3)-2)*32:H2=(RND(3)-2)*32:
V2=(RND(3)-2)*32
46 IFX1+H1>=200ORX1+H1<0ORV1+Y1=
>190ORV1+Y1<9THEN50
47 IFPPOINT(X1+16+32*SGN(H1),16+
Y1+32*SGN(V1))=3 THENF1=-4
48 LINE(X1,Y1)-(X1+32,Y1+32),PRE
SET,BF:X1=X1+H1:Y1=Y1+V1:PUT(X1,
Y1)-(X1+32,Y1+32),BG
49 IFX1=X ANDY1=Y THEN63
50 H2=(RND(3)-2)*32:V2=(RND(3)-2
)*32:IFG2=1THEN28ELSEIFF2<0THENF
2=F2+1:GOTO28
51 IFX2+H2>=200ORX2+H2<0ORV2+Y2>
=32*6ORV2+Y2<0THEN28
52 IFPPOINT(X2+16+32*SGN(H2),16+
Y2+32*SGN(V2))=3THENF2=0
53 LINE(X2,Y2)-(X2+32,Y2+32),PRE
SET,BF:X2=X2+H2:Y2=Y2+V2:PUT(X2,
Y2)-(X2+32,Y2+32),BG
54 IFX2=X ANDY2=Y THEN63
55 GOTO 28
56 SC=SC+20:PLAY"T255;V31;01;1;3
;;04;1;5;3;2;4":XB=X+H:YB=Y+V
57 IFYB=0ANDH=0THENRETURN
58 IFYB=>32*5ANDV=32THENRETURN
59 IFXB=0ANDH=-32THENRETURN
60 IFXB=>32*6ANDH=32THEN RETURN
61 I=PPOINT(XB+16+32*SGN(H),YB+1
6+32*SGN(V)):IFI=3THEN RETURN:EL
SEIFI=2THEN 67
62 LINE(XB,YB)-(XB+30,YB+30),PRE
SET,BF:XB=XB+H:YB=YB+V:PUT(XB,YB
+4)-(XB+30,YB+30),BL:GOTO57
63 PLAY"01T255;1;1;1;1;1;2;2;2;2
;3;3;3;4;4;4;5;5;6;6;7;8;9;12;02
;1;4;7;9;12;03;1;5;8;12;04;1;6;1
2;05;1;12;T3;01;L4;DD;L8;D;L3;D;
L4;F;L8;E;L4;E;L8;D;L4;D;L8CL2D"
:CLS:PRINT"SCORE : "SC:IFSC=>H
S THEN HS=SC
64 PRINT:PRINT:PRINT"HIGH SCORE
: "HS:PRINT:PRINT:PRINT"LEVELS C
OMPLETED : "LE

```

```

65 A$=INKEY$:PRINT"PRESS ANY KEY
TO PLAY AGAIN"
66 PLAY"T255;01;1;2;3;4;1;2;3;4;
1;2;3;4;1;2;3;4;5;6;7;8;9;8;7;6;
5;4;3;2;1;2;3;4;5;6;7;6;5;6;7;6;
5;6;7;8;9;7;5;3;1;1;1":IFINKEY$=
""THEN66ELSEESC=0:G1=0:G2=0:LE=0:
GOTO6
67 SC=SC+200:A=XB+32*SGN(H):B=YB
+32*SGN(V)
68 IFA=X1 AND B=Y1 THEN G1=1:ELS
EG2=1
69 IFA=X1 ANDB=Y1 THENPUT(X1,Y1)
-(X1+32,Y1+32),SG:ELSEPUT(X2,Y2)
-(X2+32,Y2+32),SG
70 PLAY"T255V3101;1;1;1;2;2;2;3;
3;3;4;4;4;5;5;6;6;7;8;8;9;10;11;
12;02;1;2;3;4;5;6;7;8;9;10;11;12
;03;1;3;5;7;9;11;12;04;1;5;9;12;
05;1;12"
71 LINE(A,B)-(A+32,B+32),PRESET,
BF:PUT(A,B+4)-(A+30,B+30),BL
72 LINE(XB,YB)-(XB+32,YB+32),PRE
SET,BF
73 GOTO28
74 T=TIMER:PLAY"T255;05;12;12;12
;12;10;10;10;9;9;9;8;8;8;7;7;7;6
;;;6;6;5;4;3;2;1;04;12;10;9;8;7;
6;5;4;3;2;1;03;12;10;8;6;4;2;1;0
2;12;8;4;1;01;12;1"
75 CLS:PRINT@0,SC:PRINT@32*8,"LE
VELS COMPLETED : "LE+1:LE=LE+1:F
ORI=1T040-T/60:T=T+60:SC=SC+10:P
RINT@128,"TIME LEFT:"INT(40-T/60
):PRINT@0,"SCORE: "SC:PLAY"T
25502;1;3;4;3;6;7;7;8":NEXT
76 PLAY"P4;02T3;L8;BBBABB03D02B
L4ABP8L8BBB8B8BAGAGL4BP4P8L8BAGED
L4EL8EEF#ED01B02L4DEL8GEP2L4EL8F
#D"
77 A$=INKEY$:PRINT@360,"PRESS AN
Y KEY"
78 IFINKEY$=""THEN78
79 SCREEN1,0:G1=0:G2=0:SC=SC+500
:TIMER=0:GOTO 20
80 PLAY"T25502;1;3;5;7;9;7;5;3;1
;3;5;7;9;7;5;3;1;3;5;7;9;7;5;3;1
;1;1;3;4;1;2;3;4;3;2;1;2;3;4;1;1
;1;1;1":IFH=0THEN84
81 IFX1=X THENF1=-10:PUT(X1,Y1)-
(X1+32,Y1+32),SG
82 IFX2=X THENF2=-5:PUT(X2,Y2)-(
X2+32,Y2+32),SG
83 GOTO41
84 IFY1=Y THENF1=-10:PUT(X1,Y1)-
(X1+32,Y1+32),SG
85 IFY2=Y THENF2=-5:PUT(X2,Y2)-(
X2+32,Y2+32),SG
86 GOTO41

```

A Guide To The Do's And Don'ts Of Modeming

By Wayne Day
Rainbow Contributing Editor

By the time you read this, likely all of the Christmas presents will have begun to get a lot of usage, especially if a modem or a new terminal program had been hung in the stocking!

Quite a few new users will have shown up on CompuServe's Color SIG (Special Interest Group), where I serve as the systems operator (SYSOP), and they will begin to learn about the "new" world of telecommunications.

So now might be a good time to review some of the "do's" and "don'ts" of modeming.

First off, get familiar with your equipment and software setup. Knowing your hardware and software capabilities, and limitations, will save you valuable connect time, which is even more important if you're calling long distance or connected to one of the commercial information services.

(Wayne Day, a traffic engineering signal technician, is the SYSOP of The Color SIG of CompuServe, the world's largest consumer information service. He is also a certified paramedic and works part-time for an Emergency Medical Service provider. His amateur radio operator call sign is WASWDB.)

Read the documentation that comes with the software, paying special attention to instructions on how to capture data (if your software supports that function).

For example, some programs require you to open a buffer manually in order to save anything you receive online, while others allow the host system (the

"... get familiar with your equipment and software setup. Knowing your hardware and software capabilities, and limitations, will save you valuable connect time..."

computer you're calling) to open and close your receive buffer automatically. This latter method is known as "capture characters" since the host sends a particular character to your software, telling it to start "capturing" the data that follows.

On other terminal programs, however, you need to defeat word-wrap and high resolution character screens prior to capturing data in the buffer. Again, the

point is to read those instructions very carefully.

Knowing the operating hours of those BBSs is important, since it might save you a long distance phone call if the system is unavailable. In November, we listed a group of 92 known BBS systems that were of special interest to the CoCo user, and this month we bring you an update, bringing the total up to 115 operating BBS systems.

Other "Do's" to remember:

If you're calling a single-user BBS, be considerate of other users and don't dawdle on the system unnecessarily. Others may be waiting to call (and, you might wind up having to wait sometime).

Make note of any message content policies that the SYSOP may establish, and abide by his wishes. Some BBSs restrict commercial messages and others prohibit them entirely. Ditto on "adult" language.

On the other hand, there are the "don'ts:"

Don't try to "crash" the system, just to see if it can be done; robbing others of the chance to use a BBS is pretty

childish. Since most BBS systems make a note in the user log each time someone logs on, you may find that you're no longer welcome on the board next time.

Don't ask folks to help you out with something, and expect them to be mind readers. Asking a question like "I wrote a program and it doesn't work. Why?" doesn't give anyone enough information to work with. The more information you can put in a question, the better your chances for a good answer!

Don't forget to read all of the messages on a BBS system. Quite often you'll stumble across some piece of obscure information that will really save the day — two weeks later!

And finally, don't forget to have plenty of paper and a pencil nearby to take notes on other BBS systems that you might be interested in, as well as a place to jot down that neat little poke everyone's been talking about!

Whew!

Letters, Letters, Letters

Q: Is it possible to allow another CoCo user to call up my modem, then let him store programs on my disk drives, and use my printer? The reason I ask is that many students at the university I am attending could benefit from a service such as this, while I could make some spare money.

A: Sure, it's possible ... that's basically what services such as The Source and CompuServe do — allow you to use *their* computer and disks.

On a CoCo, you'd need an auto-answer modem (to answer your phone automatically and connect it to the computer), as well as a remote terminal driver, such as *REMOTERM* (sold by Star-Kits) or Dan Downard's *REMOTE.BIN*, published in *THE RAINBOW* in November 1984.

The remote terminal driver basically lets the person calling in on the modem act as if he were sitting at the keyboard of your computer; all of the data he types on his terminal is the input to your computer, and all of the output from your computer goes to his terminal.

There are some limitations, though. Graphics screens cannot be displayed in this manner, since you will be limited to using the normal ASCII character set (*CHR\$ 0-127*). Additionally, any programs that use *PRINT@* statements must be converted to normal *PRINT* statements, since there is no way to control the other user's cursor or screen position. That also means that a *CLS* won't work, either.

If you're setting up something like this with a friend, there's no problem since you know who it is that has control over your computer. Remember, though, that since he acts like he's sitting at your keyboard, he can even do a *DSKINI* and wipe out all your disks!

Therefore, if you're going to be doing this with more than one person, or providing the service commercially, consider the security requirements you'll have to make:

For example, user 'A' should not have access to user 'B's' files, to protect confidentiality.

No user should be able to harm the system itself. That means you'll have to provide some way to protect against a *DSKINI* or *POKE* into the wrong place, and that usually means a remote

"The remote terminal driver basically lets the person calling in on the modem act as if he were sitting at the keyboard of your computer . . ."

time-sharing monitor, such as the *TSMON*, part of the Radio Shack OS-9 Operating System.

Q: Your column ("CommLink", October 1984) made the first mention I've ever seen of using a party line for data transmissions. How disastrous is it if someone else on the line picks up the phone? Can they tell something is going on, or will they try to call a repairman to fix the funny noises?

A: There's a two-fold answer to this question: a practical one, and a legal one. First, the legal considerations.

Consider this scenario: It's 2 a.m., and you've finally gotten in to that popular BBS on the West Coast. You've got a lot of downloading to do, and waiting for your chance on the BBS has been a drag.

About halfway through your first download, your neighbor, the one on your party line, is awakened by the smoke detector in his house — he has a fire, and obviously needs to call the fire department, but can't. It seems there are some funny noises on the phone line.

Far-fetched? Possibly, but not too far-fetched.

The simple fact is that all states have laws that require you to hang up the receiver of a party line immediately

when told the line is needed for an emergency call to a fire department, or police department, or for medical aid. In Texas, it's an offense that brings a fine of not more than \$500 or imprisonment for a term not exceeding one month, or both (Southwestern Bell Telephone Company Phone Book, 1984).

If you're online, the chances are you won't hear someone on a party line picking up the telephone.

Direct-connect modems must be registered with the Federal Communications Commission, and the F.C.C. restricts direct-connect modems to the extent that they may not be connected to a party line or pay telephone.

Thus, two big reasons why a party line can be hazardous to your modemming health.

Let's consider a one-party line, where someone picks up an extension telephone in some other part of the house.

Depending on what you are doing (downloading using an error-correction protocol like XMODEM or just sending and receiving straight ASCII data), someone picking up one of the other phones in your house can have from a slight to a disastrous effect on your telecommunications session.

From personal experience, there have been times when someone else picked up a phone in my house, and I never knew it (our neighbor still wonders about those funny tones on our line!).

During testing of a new terminal program that uses the XMODEM protocol, we have picked up the phone and shouted into it, played music into it, and generally banged it around, with no ill effects other than causing an error in the transmission of the current packet of information, which was re-sent and received OK after we quit trying to goof it up.

Other times, though, before the installation of the computer's own phone at my house, I've been bumped off by someone picking up the phone — blew me completely off the system I was talking to.

So, it's an iffy situation; sometimes it won't harm anything, and other times it's bad news.

The ultimate solution might be to have a second line installed if modem use and more normal telephone usage conflicts crop up. It's been a lifesaver (mine) at my house!

Two Questions, One Basic Answer

Q: I called one of the numbers you

listed in the BBS Roundup (*The Rainbow*, November 1984) and got a message saying that the number had been disconnected. Can't you keep up with the numbers you list?

Q: How come you didn't list any of the Coco BBSs in my area?

A: Let's kill two birds with one stone here, and explain a bit about how I go about collecting the BBS numbers published with this column.

Since no one can be everywhere at one time, it's only possible to list the BBS phone numbers that we become aware of, usually through messages on the Color SIG on CompuServe, on other BBSs, and in letters to *THE RAINBOW*.

Likewise, if a BBS goes out of business, we usually don't hear about it until someone writes in, or leaves us a message saying "you blew it!"

Therefore, we need your help in making the BBS listings in *THE RAINBOW* the most accurate and up-to-date that we can. If there's a CoCo BBS in your area, let us know about it. If one goes off-line, you could also drop us a line to let us know.

Every couple of months, we'll try and publish a list of revisions such as the one included at the end of this month's column to keep you up to date. Additionally, I maintain a current list in the SIG's database on CompuServe, so CompuServe subscribers can get the whole shooting match at one time. That list is usually updated at least monthly.

Before I put a BBS on the list, I call it to make sure that, indeed, there is a BBS there, that our information is correct, and that the BBS is open to the public.

Some Random Thoughts

John Lovell, the SYSOP of The CIC BBS in Miami, has a series of modifications to the *Bee Color BBS* program, and he's making arrangements to make those changes available to SYSOPs who are already running the *BEE* program. Give his BBS a call (305 751-6809) if you're interested in knowing more.

If you're a new user to CompuServe, you might find yourself baffled by the hundreds of things you can do on the system. Well, there's a book written just for you, *How to Get The Most Out of CompuServe* (Bantam Books, New York, \$12.95). The authors, Charles Bowen and Dave Peyton, are SYSOPs on two of CompuServe's Special Interest Groups, and have compiled the most

comprehensive sourcebook for CompuServe users yet. It's available at most book stores, or directly through CompuServe (Go PCS-54).

February In Irvine

I hope you've made your plans to be at the RAINBOWfest in Irvine, Calif., February 15-17 at the Irvine Marriott Inn, because I'd like the chance to meet you, spread a little bit of gossip, and hear from you as to how I can best serve you through this column.

It will be my privilege to host two seminars during RAINBOWfest: the first one on "Exploring CompuServe and The Color SIG," and the second one dealing with "Local BBS Systems" and how the Coco user, and SYSOP alike, can get the most out of them.

Besides the lectures, we'll have a booth set up where we'll be online to The Color SIG most of the day, so if

you're a CompuServe user, or just interested in learning more about CIS, be sure and drop by.

Coming Up

In the April issue, if all goes well, we'll look at interfacing your CoCo to an amateur radio (ham) station, to transmit color slow-scan television signals, as well as more news in the world of modeming.

Remember, you can contact me one of four ways:

Wayne Day
P.O. Box 79074-0074
Fort Worth, TX 76179

CompuServe: 76703,376
MCI Mail: 201-7723

or through the editorial offices of *THE RAINBOW*. Please remember to enclose a SASE if you desire a quick response.

Color Computer / FLEX / OS-9 BBS LIST Addendum updated 12/1/84

A/C	Number	City	BBS Name	Remarks
(203)	334-5778	Bridgeport, CT	Mission Control	
(209)	674-5391	Madeira, CA	Personalized Programming	
(209)	835-6496	Tracy, CA	Silicon Rainbow Prod	
(212)	423-4623	Woodhaven, NY	Saturn Electronics	
(215)	866-1805	Bethlehem, PA	Colorama	
(217)	359-9577	Urbana, IL	CCSH BBS #1	HQ SYS
(303)	297-9127	Denver, CO	Trash Heap TBBS	
(305)	XXX-6809	Hialeah, FL	Coco Corner	DELETED
(312)	278-9513	Chicago, IL	Howard Med Sys	
(408)	629-2277	San Jose, CA	Microbur BBS	
(408)	646-1850	Monterey, CA	Pen-Co BBS	Note 10
(416)	652-3480	Toronto, ON	True North Database	Note 9
(513)	396-7467	Cincinnati, OH	CINSOFT	
(514)	658-3087	Chambly, Que	Color-80 #7	Note 9
(602)	899-1350	Chandler, AZ	Coco Pub	JDOS
(602)	996-8828	Scottsdale, AZ	Motorola Coco Bugs	
(609)	399-7108	Ocean City NJ	Colorama	
(617)	872-5170	Framingham, MA	Framingham Connection	
(701)	839-0390	Minot, ND	Country Micro BBS	Correct City
(716)	473-2334	Rochester, NY	Colorama	
(803)	791-7389	Columbia, SC	Midlands-80 Comp Club	
(804)	868-0922	Tidewater area, VA	Peninsula Color Board	
(813)	345-8100	(unknown), FL	CocoNet	
(914)	738-6857	Pelham, NY	M&M's Public BBS	
(914)	961-8049	Westchester, NY	Westchester BBS #2	

NOTES: 9 — Evenings and Weekends (generally after 1700 on weekdays)
10 — 1800-2000 Mon-Fri / 2200-0700 Sat /
1400-1600 Sun

Download the lowdown with WEFAX

Weather . . .

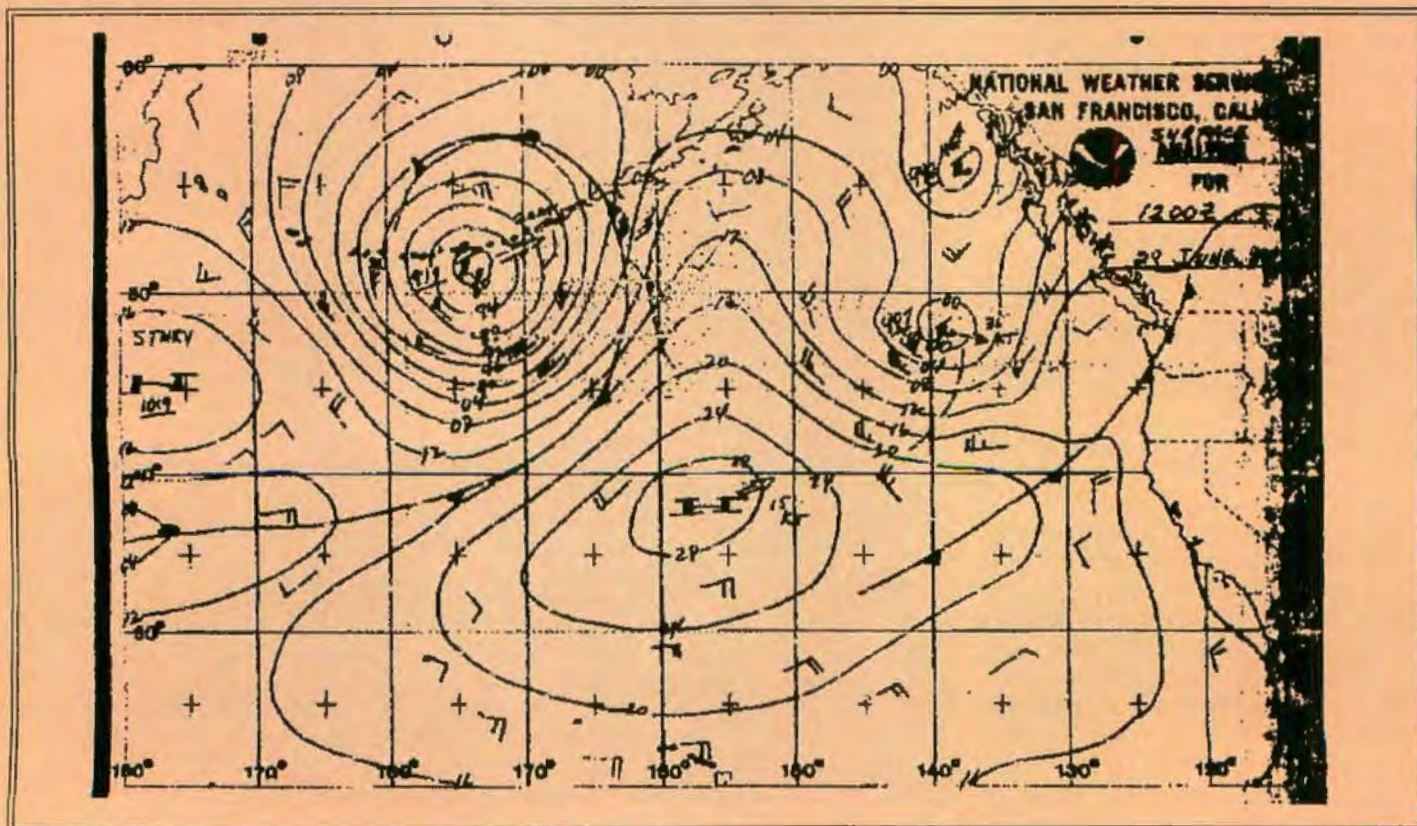
Hovering roughly 22,300 miles above the equator is a remarkable device. Since 1974, this Geostationary Operational Environmental Satellite (GOES) and its predecessors have been sending pictures of the earth, taken in visible and in infrared light, down to earth stations via a microwave link. Every day, a dozen or more images of the cloud cover over our part of the planet are processed by a government ground station, the images enhanced, and state and national boundaries added. These enhanced images are then "uploaded" back to the satellite by microwave. The satellite retransmits the enhanced images to a number of other earth stations around the country.

(Marty Goodman has, among many other things, been involved with various Color Computer software and hardware projects.)

One such secondary station is near me in Redwood City, Calif. There, meteorologists examine these precious photographs, and are able to draw two synoptic charts per day of weather fronts and such. (A "synoptic chart" is that map with all the wavy lines indicating areas of equal temperature, warm and cold fronts, and sometimes wind and sea information as well.)

The enhanced satellite photos and the hand-drawn synoptic charts are sent in facsimile (fax) format (a 40-year-old electronic protocol for picture transmission used by wire services as well) over a telephone line to a transmitter. In my case, that transmitter is located at Point Reyes, Calif. This fax signal is then rebroadcast, primarily for ships at sea, on a number of high frequency shortwave bands.

Twice a day in my area, a series of visible and infrared photos of my part of the world taken from space, along



Or Not?

By Martin H. Goodman, M.D.

with superb meteorological charts, are sent out over shortwave frequencies. Until recently, it took, in addition to a shortwave receiver, \$5,000 worth of mechanical facsimile machines to turn that warbling fax signal back into a picture.

About The Authors

As you might well imagine, my good friends, the authors of *Graphicom*, have an abiding interest in graphics data. They decided to use the processing capabilities of the CoCo and its amazing built-in analog signal processing capabilities to turn a fax signal back into a picture and turn that picture into hard copy.

When they were done, they had a tiny assembly language program (only about 2K long) that uses the zero crossing detector of the cassette port of the CoCo to receive a fax signal from any BFO-equipped shortwave receiver and

process it, turning that signal into a 54K-byte picture inside the CoCo.

Now, a 54K image is exactly nine times more information than the CoCo can display on the screen at one time, so the program they wrote, *WEFAX*, has built-in routines to allow the user to pan the CoCo Hi-Res screen over that larger "virtual" image.

They also supplied routines for saving the pictures to *Graphicom* format picture disks (two pictures to a disk, 54K is a lot of data!), and for transferring those pictures from the computer's memory to paper using an Epson dot-matrix printer. It will not surprise users of *Graphicom* to learn that all program control is via a joystick and one fire button.

Technical Details

Due to the 64K RAM memory limitation of the CoCo,



my friends were only able to process roughly one-half of the vertical and horizontal data contained in the fax transmission. Even so, the images produced are of remarkable quality. (See the sample pictures included with this article.) Indeed, when they took the pictures down to the Weather Service office in Redwood City, it turned out the CoCo WEFAX hard copy was equal, if not superior, in quality to the hard copy produced by some of the \$5,000 mechanical fax machines there.

Rather than totally throw away every other line of received fax data, the WEFAX program does a remarkable thing. During reception of the picture, it uses every other line to construct on the CoCo Hi-Res screen a 6K compressed, representative image of what it's receiving. When reception is complete, you are then switched to the 54K image and your pan function.

As you will see in the official WEFAX documentation that follows, a minimal amount of hardware is needed to interface a shortwave receiver to the CoCo cassette port. This simple circuit, consisting of two LEDs (used as zener voltage limiting diodes), a single resistor, and a single capacitor, is used solely as a voltage limiter and DC filter. All other processing of the signal is done by the CoCo's internal hardware and the magic of the WEFAX software.

Required Hardware

A 64K, one disk drive equipped Color Computer (any model) and one joystick are required. An Epson dot-matrix printer is needed to produce hard copy. Almost any general communications shortwave receiver with a BFO

(and preferably LSB and USB selection capability) will do to receive the pictures. Your receiver does need a minimum of frequency stability in order to receive a clear WEFAX picture, but most receivers costing more than \$150 will suffice.

What Frequencies To Try

There are hundreds of stations all over the world broadcasting weather map data. WEFAX was written explicitly for weather map reception, and while it does receive other fax data (like UPI wirephoto information), images produced are likely to be somewhat blurry and/or distorted. To get you started, here are some of the more useful frequencies to listen to to find WEFAX data. All frequencies are in kilohertz.

East Coast, Station NAM in Norfolk, VA. 3357 kHz, 4975 kHz, 8080 kHz, 10865 kHz, 16410 kHz, 20015 kHz

West Coast, Station NMC in Point Reyes, Calif. 4346 kHz, 8682 kHz, 12730 kHz, 17151 kHz

West Coast, Station WWD in La Jolla, Calif. 8646 kHz, 17411 kHz

The Program And Its Source Code


The documentation follows the BASIC listing. Carefully type this program in *exactly* as it appears. Be sure *not* to alter even the line numbers. The program has a built-in checker for errors, which, when you run it, will tell you if you made an error typing in the data statements, and the line number where the first error appeared. Those of you receiving RAINBOW ON TAPE will, of course, be spared this agony. When you have the program typed in correctly, typing RUN will make it work.

For those who do not receive RAINBOW ON TAPE, the program WEFAX/BAS is available for downloading from CompuServe's Color Computer Special Interest Group (SIG) in database XA2. In addition, also posted in XA2 is WEFAX.ASM, the full assembly language source code (written with a version of the Micro Works SDS Macro 80C). This will be of interest and value to those who wish to insert their own printer routines for different printers. These people should carefully study the existing routine. It prints successive rows of dots in overlapping fashion. To produce a reasonable picture, the printer you support must be capable of doing this, too. For those without this editor-assembler system, note the printer routine is a separate module at the end of the program, allowing you to easily substitute your own routine even if you don't have the source code.

For those who cannot download the source code from CompuServe, I will provide you with a copy if you send me a disk, a mailer, return postage and \$10 for handling. Address requests to Marty Goodman, 1633 Bayo Vista Ave., San Pablo, CA 94806.

I will also provide you with an experimental version of the program that not only receives, but is capable of sending a fax image as well. However, I must make it clear that I will *not* support either program, or answer *any* questions about it, because I'm not the original author, and neither I nor the authors have time to do so. Your comments are, of course, welcome, but it is very unlikely we will be able to respond to questions.

Both the authors and I would be delighted to receive any enhancements you may write for the program,

<p>TEAC PANASONIC MPI</p>  <p>HALF HEIGHT</p>	 <p>SLIM LINE DISK DRIVES</p>
<p>DIRECT DRIVE, 1/2 HT. 40 track, 5ms t/t, DSDD DRIVE 0, SINGLE DOUBLE SIDED DRIVE SYSTEM . \$399. DRIVE 0 & 1 DUAL DOUBLE SIDED DRIVE SYSTEM . \$519. Above prices for Panasonic or TEAC. Call for brand availability if you have a preference.</p>	
<p>MPI FULL HEIGHT, 40 track, 5 ms t/t, DSDD. DRIVE 0, SINGLE DOUBLE SIDED DRIVE SYSTEM . \$299. DRIVE 0 & 1 DUAL DOUBLE SIDED DRIVE SYSTEM . \$469.</p>	
<p>All drives include case and power supply, J&M controller, all cables and Disk BASIC Manual. All connections are gold plated. Dual drives come assembled in dual case with dual supply and rear gold plated data connector.</p>	
<p>J&M controller with JDOS and manual \$129. J&M controller with RSDOS and manual. \$129. J&M controller without DOS ROM chip \$109. JDOS ROM with manual \$ 30.</p>	
<p>LIBRARY CASE Holds 70 diskettes, key lock, 7 dividers, tinted acrylic case \$15.</p>	
<p>DISK BANK by Media Mate. Holds 50 diskettes, 5 dividers smoked cover tan base. . \$ 12.</p>	
<p>How to order All items have a 90 day or better replacement policy by us. Include a complete product description of items desired. Add \$3. per order for S&H. Add \$1.75 for COD. For MasterCard or Visa orders add 3% of total including shipping. Indiana residents add 5% sales tax.</p>	<p>OZONE ENGINEERING 4769 South 200 East Kokomo, IN 46902 Ph. 317-453-0989 5-10 p.m.</p>

especially alternative printer routines. I'd like to see a routine for the C. Itoh Prowriter printer. I haven't had time to write one yet for myself. If you send us such a routine, you'll be on our "list" for receiving other goodies.

The Documentation

I'll let the authors themselves provide you with further instruction on using their *WEFAX* program. Following this listing is material mainly consisting of *Graphicom* screens the authors meticulously and laboriously drew, just in order to better share this program with you.

190	.....	217
430	.....	111
904	.....	161
916	.....	84
926	.....	82
938	.....	57
END	.....	179

The listing:

```

10 REM THIS PROGRAM IS PUBLIC DO
MAIN
20 PCLEAR4
30 F1=651:REM 60 LPM ADJUST
40 F2=901:REM 90 LPM ADJUST
50 F3=1027:REM 120 LPM ADJUST
55 POKE150,1:REM PRINT=9600 BAUD
60 CLS
70 PRINT" WEATHER FACSIMILE RE
CEIVER"
80 PRINTSTRING$(32,"-");
90 PRINT
100 PRINT"THIS PROGRAM WILL RECE
IVE FM FAX";
110 PRINT"AT 60, 90 & 120 LINES/
MINUTE."
120 PRINT"CONNECT THE CASSETTE E
AR (BLACK)";
130 PRINT"PLUG TO THE RADIO'S EA
R JACK OR"
140 PRINT"CONNECT IT ACROSS THE
SPEAKER."
150 PRINT"CHECK THAT THE RADIO I
S TUNED IN";
160 PRINT"AND THAT THE BFO IS TU
RNED ON."
170 PRINT"AFTER THE PROGRAM IS R
EADY YOU"
180 PRINT"CAN USE THE TUNING MET
ER TO"
190 PRINT"ADJUST THE RADIO."
200 PRINT
210 PRINT"PLEASE WAIT..."
220 AD=&H600:LI=900
230 READA$,CS
240 IF A$="X" THEN 320
250 FOR I=1 TO 64 STEP 2

```

```

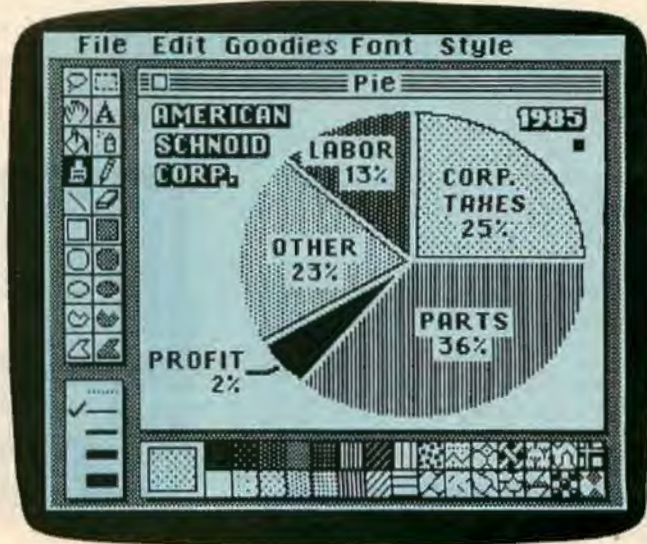
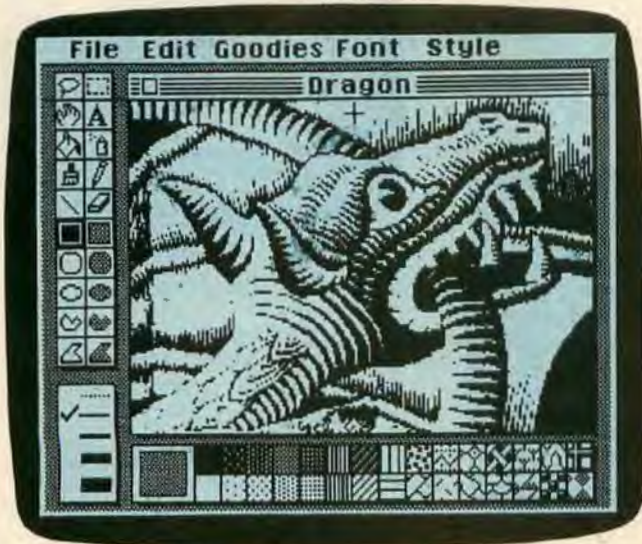
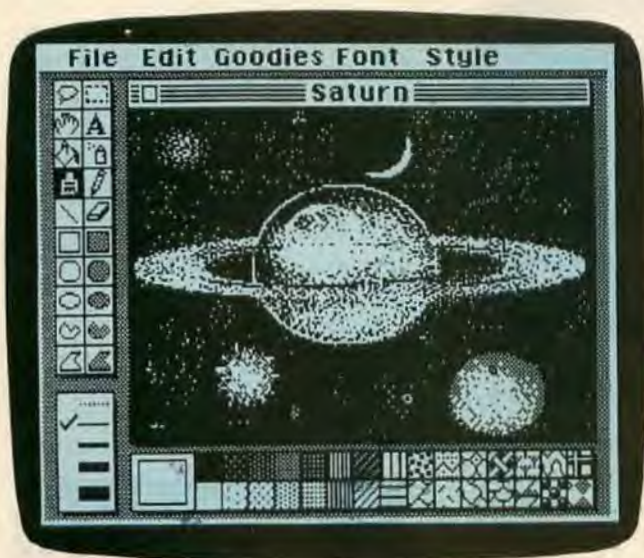
260 A=VAL("&H"+MID$(A$,I,2))
270 POKE AD,A:CS=CS-A:AD=AD+1
280 NEXT
290 IF CS THEN PRINT"DATA ERROR
IN LINE";LI:END
300 PRINT@462,944-LI
310 LI=LI+1:GOTO 230
320 A=INT(F1/256):POKE&H600,A:PO
KE&H601,F1-256*A
330 A=INT(F2/256):POKE&H608,A:PO
KE&H609,F2-256*A
340 A=INT(F3/256):POKE&H610,A:PO
KE&H611,F3-256*A
360 PRINT"RECEIVE *60* *90* *120
* LPM"
370 PRINT
380 PRINT" *PRINT TO EPSON PR
INTER*"
390 PRINT
400 PRINT" *REVERSE VIDEO THE P
ICTURE*"
410 PRINT
420 A$=CHR$(PEEK(&HC000))+CHR$(P
EEK(&HC001))
430 IF A$<>"DK" THEN PRINT:PRINT
:PRINT:GOTO470
440 PRINT"DISK *VIEW* #1 ***
#2 ***"
450 PRINT"PICTURE *LOAD* ***
***"
460 PRINT"STORAGE *SAVE* ***
***"
470 PRINT
480 PRINT"TUNING I-----I"
490 PRINT"METER: 1500 2300"
500 PRINT
510 PRINT"JOYSTICK RESTART
SCAN"
520 PRINT"USE WHEN PHASE HOL
D PHASE"
530 PRINT"RECEIVING: <-- SCA
N -->";
540 EXEC CS
900 DATA0285050A0004D00E703820704
0033009904000800002600720F718634
B7FF030F,1740
901 DATA660F671700E3260EB7FFDEBE
C0066F846F01AD9FC004B7FFDF7FFF40
7F098610,3846
902 DATACE03D78E0400A6848A40A780
8C060025F51703338D0220DE8D57080B
0002840D,2661
903 DATA1000002821216000281041B22
048F021C440332090E660011090E7700
1D090E88,1154
904 DATA001C80800000788D28139568
03D61A9C6803D5808000006786022002
86039761,2490

```

905 DATA8D0F131568034B1A1C68034A
B08000004E17027235109F628D2ADD64
BD773410, 2244
906 DATA1700908D1F10936427073510
17008420E71700EEBD4D27EBAEE43003
EC84ADBB, 3021
907 DATA3510206F8D18FC015A445454
8D1B2607C1082302C60839C10423FBC6
0439B7FF, 2850
908 DATADEAD9FA00AB7FFDF39B7FFDE
BEC000B7FFDFBC444B39B6FF00840139
8DF827FC, 4792
909 DATA9766398DF19166270B8E222E
301F26FC8DE49766399E628D6B916422
04D16424, 3391
910 DATA073005E6842AF0398D619165
22F3D16525EF39CE04008D536D012A04
96651F89, 3174
911 DATA3402E0E45CE7E4C6203D33CB
8D366D012A0496641FB93406E6842A10
33C6E6C4, 3524
912 DATAA68D001FA7C4E78D00192014
E6C6CB40E7C64CA16123F533CB20A6E4
6A6226EC, 4040
913 DATA326339CFEC84841FC41F39A6
0244444444E602C40F39B6FF205A2705
B1FF2027, 3274
914 DATAF839C6208DF02708C6408DEA
27028DE654D16727158E05409667D767
E686CA40, 3880
915 DATAE7869667E686C4BFE7863986
34B7FF03863CB7FF0186D6B7FF208680
B4FF0027, 4605
916 DATA053DAC842008DC52DD56DC50
DD54862AB7FF208680B4FF0027043D12
200ACC26, 3373
917 DATA02DD56CC0E00DD548634B7FF
019E4086D6B7FF208680B4FF0027038E
0001862A, 3555
918 DATAB7FF208680B4FF0026029E42
301F26FCA69439DF483A3386DF4C8601
A7844F5F, 3616
919 DATADD4AB6FF205CC1262504A101
2005B1FF2027F2D74E1DA18BD34ADD4A
9348251B, 3557
920 DATADD4AD64EF7FF02D14F698424
0430012005CC0001E70112C606200F86
01B4FF00, 3018
921 DATA260617FE7716FD8EC6049C4C
25B4DC48934A2F07A18BB3000126F917
FF2D399E, 3332
922 DATA52DE448660208C5F9E50DE46
862020838DF55F8DEA8DF0C6608DE48D
EAC6C020, 4425
923 DATADE5F2006C6082002C610308D
FD123ACE00408608E680E7C04A26F9BD
49861197, 3397
924 DATA4F8E26029F52CE0E00DF5033

C820DF54308901209F568DB8DE54DF50
9E569F52, 3497
925 DATA8CFE0225E6397FFF22CEFFC6
A75AA75CA75EB60444C6074424063341
A7C02002, 3602
926 DATAA7C15A26F23986F0B7FF22CE
FFC6A75AA75DA75FB60E20DC8690F601
5BC13F26, 4381
927 DATA015C3D584958498E2602308B
B6015AB13F26014C3086203800000000
00000000, 1695
928 DATA00000000000000008DBD8DCDFC
015A340617FD6BFC015A10A3E127028D
BB17FD83, 2983
929 DATA27E9398DA18E260263808CFE
0225F939108E0E00C620A680A7A05A26
F9308840, 3427
930 DATA108C260025EE39108E0E00C6
20A6A0A7805A26F9308840108C260025
EE392602, 2740
931 DATA262226426E026E226E42B602
B622B642C6002002C611D760D661C103
26028D24, 2738
932 DATA17FF43318CD88609AEA13422
966181032606BD9C8D7620048D728DAB
0C603522, 3091
933 DATA4A26E539B7FFDEFEC006CC02
00EDC4CC1102ED428E0E00AF44AD9FC0
04B7FFDF, 4263
934 DATAD660260FC600A6854C1026FB
E95CC11723F439C62BA6854C1026FBDA
5CC14323, 3644
935 DATAF439C6ED2002C6F7340417FE
D9D665C00686033DDB64EBE0D7608602
97618D0C, 4102
936 DATA7FFF407F098617FC8D26FB39
3476B7FFDEBEC006D661E7846F01CC0E
00ED04CE, 4147
937 DATAFFFF9660C6183D1083013325
03C30002334183001224F9C30013E703
1F30E702, 2785
938 DATA108E0018AD9FC0048D1F6C04
EC02108311012602CB025CC1122303C6
014CED02, 2497
939 DATA313F26E0B7FFDF35F617FC2A
260C7FFF407F098617FC2516FB3C3917
FE48B6FF, 3905
940 DATA228401263886FE976F8E2602
861B8D2386338D1F86178D1B8D24861B
8D158633, 2797
941 DATA8D1186018D0D8D1630890540
8CFE0225DB860DB7FFDEAD9FA002B7FF
DF398DA9, 3845
942 DATA860D8DEF861B8DEB864C8DE7
86008DE386038DDF866034128601975F
A684108E, 3786
943 DATA0058C6084969A05A26FA3089
00C024EC8E0058C608A680438DB95A26

CoCo Max



Take your CoCo to the MAX.

COLORWARE

CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!



We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.



UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system - much more than you ever imagined possible. And, you can do it in black & white or color.



All the sophisticated power of the bigger systems is there: *Icons*, *Pull-Down Menus*, full *Graphic Editing*, *Font Styles*, and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush*, *Spray* or *Fill* with any *Color*, *Shading* or *Pattern*. Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, ellipse, etc.) to create perfect illustrations with speed and ease. There's a *Pencil*, an *Eraser* and even a selection of *Calligraphy Brushes*. And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: *Trace Edges*, *Flip*, *Invert*, *Brush Mirrors*, etc. And all of the very latest super-capabilities like: *Undo*, which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.



THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and-Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-1/2 times the area of the window itself.

FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than 1/4 page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to 1/8 page size.

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



graphs, and computer art – for serious use or just for creative fun.



tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from \$149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-

THE COCO MAX SYSTEM

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen



has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen. Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-

pad into this new input and you have a whole new kind of control. The difference is remarkable.



A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

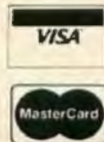
THE COMPLETE COCO MAX SYSTEM,
with software on **DISK**.....\$69.95
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Y-BRANCHING CABLE—If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo....\$27.95



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THE TOP 4 COCO GAMES...

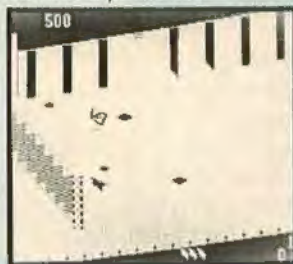


CUBIX

By Spectral Associates. Very much like the arcade smash! Jump little Cubix around the 3D maze trying to change the color of all the squares. With Death Globes, Snakes, etc. 32K Tape: \$24.95

ZAKSUND

From Elite Software comes this fantastic arcade style space action game with 3 different stages of moving 3-D graphics. You've never seen anything like this on your CoCo! Great sound too! 32K Tape: \$24.95

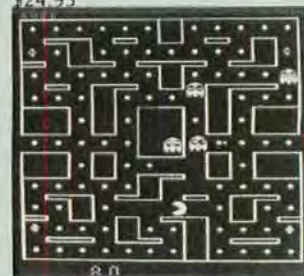


THE KING

Previously called 'Donkey King', you simply cannot buy a more impressive game for your CoCo. With 4 different screens and loads of fun! From Tom Mix Software. 32K Tape: \$25.95

GHOST GOBLER

From Spectral Assoc. This "PAC" theme game has been improved several times. It is definitely the best of its type. Brilliant color, action and sound, just like an arcade. 16K Tape: \$24.95



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JOYSTICK INTERFACE/RAPID FIRE/6 FT. EXTENDER ALL IN ONE! The Colorcade allows connection of any Atari type joystick to your CoCo (including the Wico Red Ball). These switch type sticks are extremely rugged and have a faster and more positive response. They will improve the play of almost any action game.

An adjustable speed rapid fire circuit is built in. Press your fire button and get a great burst of fire instead of just a single shot! You get a real advantage in shooting games that do not have repeat fire.

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WITH SIX FREE PROGRAMS ON CASSETTE!

The Colorware Light Pen plugs directly into your joystick port and comes with six fun & useful programs on cassette. Easy instructions show how to use it with Basic and it's compatible with light pen software such as Computer Island's "Fun Pack." Order yours today. Only \$24.95 complete.

TELEWRITER-64



DISK \$59.95
CASSETTE... \$49.95

Colorware researched the word processors available for the Color Computer. This is the best. Telewriter-64 is a truly sophisticated system that is marvelously easy to use. It works with any 16K, 32K or 64K system and any CoCo compatible printer.

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Why do more CoCo owners choose 'REAL TALKER'?

Sure it's priced right, but there's more...

Thousands of 'Real Talker' owners know 'Real Talker' beats ALL other Coco voice synthesizers in ease of use and flexibility. And, NO other Coco talker has a clearer, more intelligible voice. That's quite a lot of advantage when you consider Real Talker's unbeatable price. Yet, Real Talker has some important features that you simply will not find in other Coco talkers:

'Real Talker' is compatible with any 16K, 32K, 64K Extended or non-extended Color Computer. It works with any cassette or disk system and comes complete and ready to talk through your T.V. or monitor speaker. Price includes the 'Real Talker' electronic voice synthesizer in a ROM pack, software on cassette (may be transferred to disk), and user manual.

'SAY' command - You'll have your computer talking brilliantly in just minutes thanks to this powerful new command. Type SAY "ANYTHING YOU WANT" and your words are instantly spoken. It's that simple. Think how easy this makes creating speaking Basic programs. Adding speech to your existing programs is a snap too.

'CONVERT' - This is a truly powerful command for the basic programmer. CONVERT automatically transforms a machine language dependent speaking program into a stand-alone Basic program. In other words, you can effortlessly write speaking Basic programs that do not require a machine language translator in memory. This is a unique feature of 'Real Talker'. No other voice synthesizer gives you anything even remotely approaching this type of capability - even synthesizers costing considerably more.

Other features include software controlled pitch, unlimited vocabulary text-to-speech, and even a program that will recite any ASCII file (such as from Telewriter-64 & other word processors). You also get Colorware's unique full-screen phoneme editor program that let's you experiment with and modify speech at it's most fundamental level.



'Real Talker' is a full-featured electronic voice synthesizer unit built into a compact cartridge case. You simply plug it into the side of your computer.

NOW INCLUDED WITH 'REAL TALKER'.....

1. **'DR. TALK'**-This interactive "Eliza" type psychoanalyst program will discuss your innermost problems at length.
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\$5995

- 'REAL TALKER-1' (for the original Color Computer).....\$59.95
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TALKHEAD

If you have a 'Real Talker', do not deprive yourself of this absolutely incredible machine-language Talking Head simulation program. While other talking head simulations use a minimal cartoon-like face, TALKHEAD uses high resolution, full-screen, digitized images of an actual person's face to create a life-like animated effect.



SOFTWARE FOR THE 'REAL TALKER'

TALKHEAD can be easily commanded in Basic to appear on screen and say anything you want. Available on cassette or disk for only \$19.95, TALKHEAD requires 64K and a Colorware 'Real Talker'.

ONLY **\$19.95**

ACTUAL UNRETOUCHED PHOTO

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F8351230, 3277
 944 DATA014A26D2390000000000000000
 0000000000000000000000000000000000
 00000000, 380
 945 DATA, 1560

WEFAX Official Documentation

Have you ever wondered what the weather is doing far out at sea, but lacked the expensive equipment necessary to receive the charts?

Here is a low cost way you can. Just get a Radio Shack 64K Extended BASIC Color Computer, joystick and cassette recorder with cable.

The one other thing you need is a good shortwave receiver that can receive single sideband (SSB) transmissions. SSB is used because it's much more efficient than the regular AM and FM modes used by local broadcasters, but it does require a receiver that has a beat frequency oscillator (BFO) to make any sense of the signal. Many of the newer digital-readout portable shortwave radios (and some cheaper sets) have this, but you probably won't find it on a typical multiband radio or a "jam box." If your set has this capability, there will be a switch to turn the BFO on or off (on better receivers this will have separate CW and SSB positions). Follow the instructions you got with the radio for tuning in SSB transmissions.

WEFAX is written in machine code to get the required operating speed. The machine code for WEFAX is loaded into memory by a BASIC program. The data that makes up the second half of the listing is the actual machine code, along with an error checking number for each line.

Type in the program exactly as it is printed. Be careful to get all the spaces in the text of the menu. When typing is complete, save it two times on tape (or disk) and then type RUN. If you get an error, then reload the program and correct the error. Now save it, then RUN it again. When it loads properly you should see the menu page appear.

WEFAX RECEIVE MENU PAGE

```

RECEIVE ♦60♦ ♦90♦ ♦120♦ LPM
          ♦PRINT TO EPSON PRINTER♦
          ♦REVERSE VIDED THE PICTURE♦

DISK     ♦VIEW♦ #1 ♦♦♦ #2 ♦♦♦
PICTURE  ♦LOAD♦   ♦♦♦   ♦♦♦
STORAGE  ♦SAVE♦   ♦♦♦   ♦♦♦

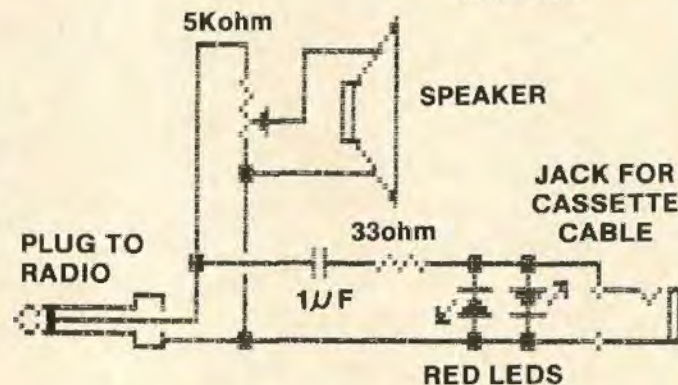
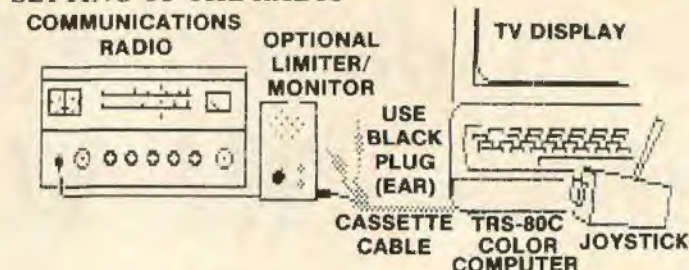
TUNING   I-----I
METER:   1500     2300

JOYSTICK          RESTART SCAN
USE WHEN          PHASE HOLD PHASE
RECEIVING:       <--  SCAN  -->
  
```

Setting Up The Radio

If you find that the computer interferes with the radio, try moving the two apart. Another thing you can try is coiling the cassette cable around a ferrite rod. It also helps to use shielded (coax) cable to an antenna 20 or more feet away.

SETTING UP THE RADIO



OPTIONAL LIMITER/MONITOR

The optional limiter/monitor shown here helps reception of signals with fading and noise. It also lets you monitor the signal at a comfortable (and adjustable) level while maintaining a good signal into the computer.

The Menu

The menu screen of WEFAX receive is in ways like the control panel of a mechanical facsimile receiver. Try moving the joystick around; you will see that various functions will be highlighted.

To select any function, move the joystick until the function you want is highlighted and tap the button to activate it. When that function is completed or if you don't select any function and tap the button you will pan over the picture (see PAN).

To abort any function, hold down the button until it stops (this may take a second or two for some of the functions like PRINT). Don't tap the button, just hold it down until the operation stops.

Tuning In A Fax Station

Here are two stations that broadcast continuously:

West Coast/Pacific: NPM (Hawaii) 14.823 MHz Lower Sideband

East Coast/Atlantic: NAM (Virginia) 8.027 MHz Upper Sideband

Turn on the radio's BFO (switch may say CW or SSB). Tune in the station and adjust for highest reading on the S meter (on some radios you may have to turn the BFO off temporarily to get a proper reading). Notice the jiggling pointer (black rectangle) on the tuning meter. Adjust the BFO control until the movement of the pointer is mostly contained between the 1500 and the 2300 Hz marks. Weather charts are mostly white so the pointer will spend more time on the 2300 Hz mark when tuned to the proper sideband.

Other signals: I █-----█ I
 1500 2300

Phasing interval: mostly black. I █-----█ I

Satellite picture: varying. I █--█--█ I

Effect of noise: random ███-███-███-███ I █

Signal + noise: █ I █-███-███-███ █ █

Receiving The Picture

Now select 120 lines per minute (for most stations), and tap the button, move the joystick to center bottom and you are now receiving a picture.

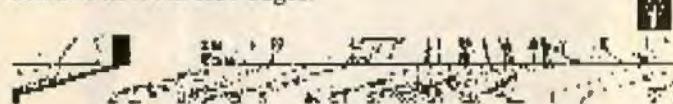
If you start when a chart is in progress, you may see the chart not properly centered.



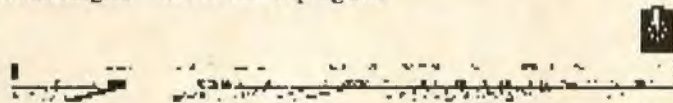
To center (phase) the incoming picture move the joystick in the direction that you want the picture to move.



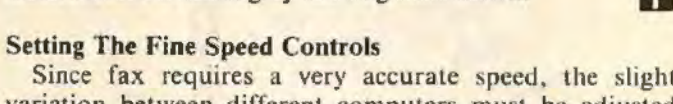
Return joystick to center bottom again and see if picture detail is in from side edges.



Move joystick to top center and wait a second for the scanning to start at the top again.

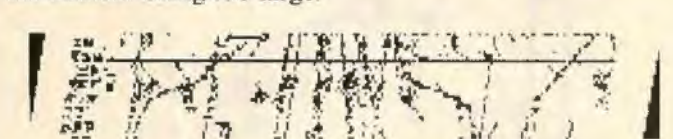


Then resume scanning by moving stick down.



Setting The Fine Speed Controls

Since fax requires a very accurate speed, the slight variation between different computers must be adjusted for. If the picture appears skewed on your computer, adjust the numbers in the BASIC loader. This is an example of the number being too large:



If you were using 120 speed, edit Line 50 and change the last one or two digits (for the example above try decreasing it by eight). Some experimentation will be needed to get it just right.

Type LIST 30-50. (Adjust these numbers)
 30 F1=645 :REM 60 LPM ADJUST
 Fine speed set 40 F2=898 :REM 90 LPM ADJUST
 50 F3=1024 :REM 120 LPM ADJUST

Write the number down on paper and RUN the program. When you have it exactly right, you will probably want

to SAVE the adjusted copy to avoid having to edit it each time. Note that each speed must be adjusted separately.

Pan Over Picture

Tapping the button when no function is highlighted shows you the picture in memory. Since the picture is much larger than can be displayed, the screen is made into a window which is used to pan over the Hi-Res picture. Move the joystick around to see the rest of the picture. Tapping the button again gets you back to the menu. (Note: if you do this before a picture is received or loaded, you will see a memory start up pattern.)



All the menu functions end with pan over picture. After any function you can tap the button to return to the menu.

Starting And Phasing

WEFAX Receive uses manual start, phasing and stop (abort). Many radios aren't frequency stable enough to make use of the World Meteorological Organization (WMO) remote control signals (300 Hz start, 25s 5% white phasing and 450 Hz stop). To start: select the speed appropriate for the station tuned in. When you hear a low tone followed by a "tweedling" sound, tap the button

***** [CCN] *****

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and move the joystick to center bottom. This is a phasing interval and the picture edge mark.



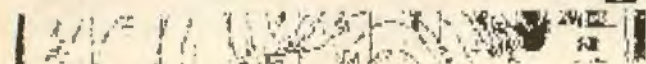
Phase the white break so that it is on the edge by moving the joystick in that direction.



Reset the scanning to the top.

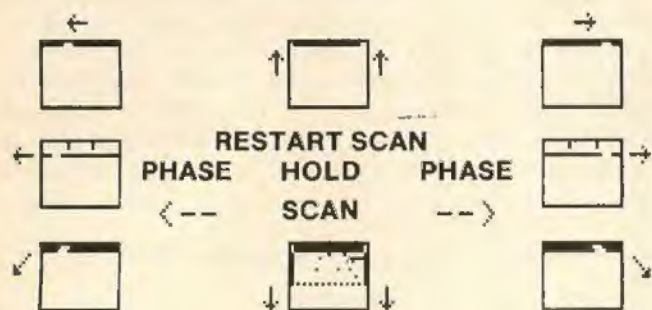


Return joystick to bottom to begin scanning.



Receive Picture

The joystick is used to control the starting and centering of the picture during receive.



The picture you see during receive is only one-ninth the size and resolution. When completed you will see a portion of a much larger picture (see PAN).



Print Picture

The *WEFAX* print routine was designed to work with the Epson MX-80 printer with Grafrax. It is also usable on the Epson FX-80 and RX-80 printers. The Color Computer uses a serial port and thus the printer must have the buffered serial option or an external serial interface. For fastest printout of pictures, the program is set to 9600 Baud; set the printer accordingly. (You could also change the Baud rate in the program, but this would slow down the printout of pictures.) To use another type of printer would require changing the machine code portion of the program.

down button until printing stops. This function does *nothing if the printer is off or absent*. Turn off the printer when the picture is done to minimize interference during reception.

Change this——| to change Baud rate:

55 POKE150, I : REM PRINT=9600 BAUD

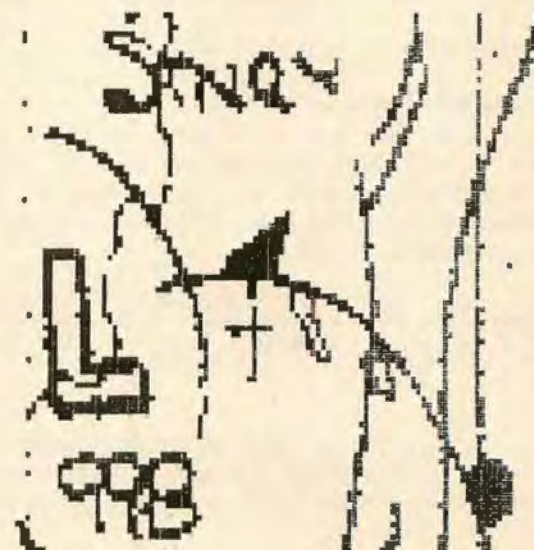
BAUD RATE:	9600	4800	2400	1200	600	300
VALUE:	1	7	18	41	87	180

Reverse Video The Picture

Charts are usually sent on a light background, however, if you get this



select: REVERSE VIDEO THE PICTURE to make it look like this.



This function is useful when printing because large black areas squeeze lots of ink out the ribbon and overheat the printer.

(Note, since this function does not change the information content of the picture, you can do it as many times as you want.)

The pictures may be reversed if you are tuned to the wrong sideband for the signal being received. When finished receiving you may want to retune the radio so you won't have to reverse it every time.

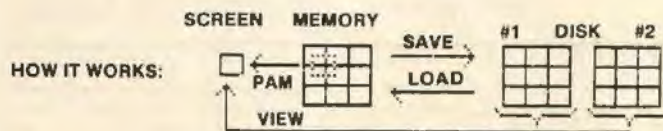
Disk Picture Storage

If *WEFAX* Receive is run on a computer with a disk system, the following functions will appear in the menu:

```

DISK      ♦VIEW♦ #1 ♦♦♦ #2 ♦♦♦
PICTURE  ♦LOAD♦   ♦♦♦   ♦♦♦
STORAGE  ♦SAVE♦   ♦♦♦   ♦♦♦
    
```

These functions allow you to quickly save the pictures for later viewing. No attempt was made to use tape save since it would be hideously slow. There are three disk functions that can be used. Two pictures may be saved on each disk. First, select one of the functions, then select the disk picture that you want it to access. Note: When you use *VIEW*, you must select one of the nine screens to view. On many charts the title is in the upper right-hand corner, so select the upper right-hand asterisk. For *SAVE* and *LOAD*, you select the whole picture and all the screens in it will be transferred.



There is enough room on each disk to hold both the two pictures and a few other things (like the *WEFAX* program). The pictures will not show up in the disk directory, and if you save too many other things there may not be enough room for the pictures. If there is not enough room the picture will not be saved (you won't see the nine screens flash by). To avoid possible problems, you should probably make up several disks for pictures and copy only the *WEFAX* program onto each.

Use the following procedure to set up a disk:

- 1) Insert a blank disk in drive 0. Type *DSKINI0,1* (press the *ENTER* key). This will initialize and erase the disk.
- 2) Replace that disk with one containing the *WEFAX*. Type *LOAD "WEFAX"* (press *ENTER*).
- 3) Reinsert the blank (initialized) disk. Type *SAVE "WEFAX"* (press *ENTER*).

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Coast Guard station NMC at Point Reyes, Calif. broadcasts facsimile pictures on 4344.1, 8680.1, 12728.1 and 17149.3 kHz at the following times:

GMT	Eastern	Pacific	
1500	10 am	7 am	Primary layer depth analysis, experimental period
1715	12:15 pm	9:15 am	Tropical analysis, surface analysis, satellite pictures
2000	3 pm	noon	Fax transmission schedule, 500 millibar contour and maximum wind, satellite pictures
2330	6:30 pm	3:30 pm	Tropical analysis, surface analysis, experimental period
0100	8 pm	5 pm	Surface forecast, sea state forecast, experimental period
0300	10 pm	7 pm	Sea surface temperature analyses, sea and weather forecasts
0500	12 am	9 pm	Surface analysis, extended surface forecast, experimental period

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A Look At How The Multi-Pak Interface Works

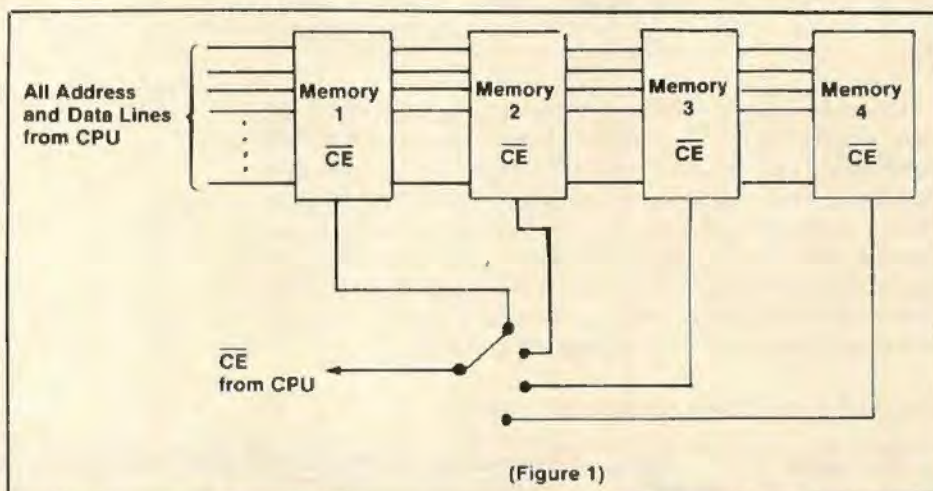
By Tony DiStefano
Rainbow Contributing Editor

This month we'll be looking at what makes Radio Shack's Multi-Pak Interface (MPI for short) tick, and finish off by adding a little LED numeric display to tell you what slot is active.

First off, a little background on the memory map of the Color Computer is necessary. Judging by the amount of questions I get, the concept of a "memory map" is very confusing to many. Hopefully, after reading this article, the memory map for the Color Computer will be better understood by all.

The CPU in this computer is the MC6809. It has 16 address lines. In binary numbers, 16 bits can have 65,536 different combinations, or 2 to the power of 16. That means the CPU can directly access 65,536 (better known as 64K) bytes of memory. The key word here is "directly." At any one time, the CPU will read or write within this boundary, but there is no rule that says we can't fool the CPU into accessing

(Tony DiStefano is well known as an early specialist in computer hardware projects. He lives in Laval Quest, Quebec.)



more. To the CPU, it looks like only 64K; to the user the amount of memory the CPU can access can be almost limitless. The secret (not a very big one) is bank switching.

A memory chip, be it RAM, ROM, EPROM or whatever, has what is known as a chip enable (CE for short) pin. This pin activates the chip for a read or a write. When this pin is not activated, the chip becomes invisible to the CPU; it is as if it was not there.

Now, think of several chips all in parallel, except for the CE pin. Put all

the CE chips on a switch so you can select one at a time (see Figure 1). Changing the switch would mean whatever memory chip was connected by the chip would be activated. This technique allows the user to have access to more than 64K of memory — how much more depends on how many switches you have.

Let's take this one step further. Instead of the manual switch, as in Figure 1, an electronic switch is put in, (see Figure 2) and if this electronic switch could be controlled by the

computer, it could switch to different chips all by itself. That way, the CPU could actually access more than 64K. All the CPU would have to do is change the electronic select switch.

This is done, of course, in software. The software must know there is more than 64K online. It must also know how to access this memory in reference to where the switches are. This is basically what the Multi-Pak Interface is — an extension of the CPU's memory capacity. It comes complete with mechanical and electrical switches, along with everything else you need to make it work, like a power supply, buffers, wires and connectors, etc.

Now that we know what it can do, let's look at how it does it. In order to understand how the Multi-Pak works, an understanding of the Color Computer memory map is necessary. Note that all versions of the CoCo and CoCo 2 have the same memory map. (Figure 3 shows the memory map.) This is a hardware memory map rather than a software map. The hardware map shows what chips are where and what areas are reserved for them. A software map would show what variables are where, i.e., printer Baud rate, input hook, cassette buffer and so on. Right now we are interested in the hardware map.

The following is a point by point description of the memory map as it is when you turn on the computer. The map can deviate from this with certain commands to the SAM (Synchronous Address Multiplexer) chip, but these are the default settings (on power up). The "\$" denotes a Hex number.

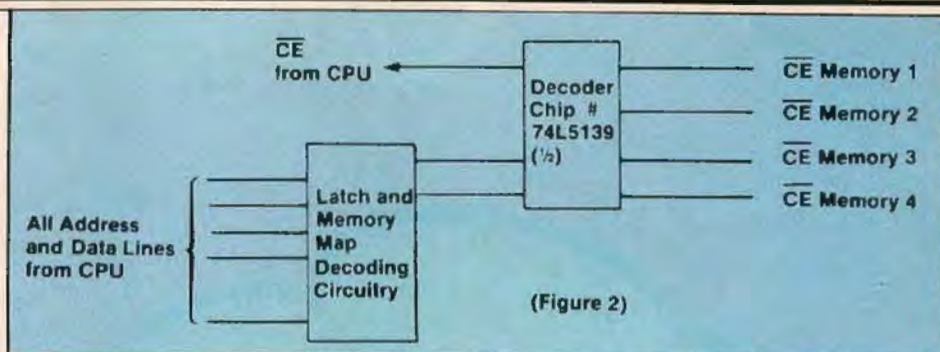
1) 0 to 32767 (\$0-\$7FFF) — This area uses the internal RAM chips. They can be one to two banks of 4K, or 16K DRAM (Dynamic Random Access Memory), or 1/2 of 64K DRAM.

2) 32768 to 40959 (\$8000-\$9FFF) — This area uses an internal 8K * 8 ROM chip. This space is usually taken up by Extended BASIC.

3) 40960 to 49151 (\$A000-\$BFFF) — This area uses another internal 8K * 8 ROM chip. This space is occupied by Color BASIC.

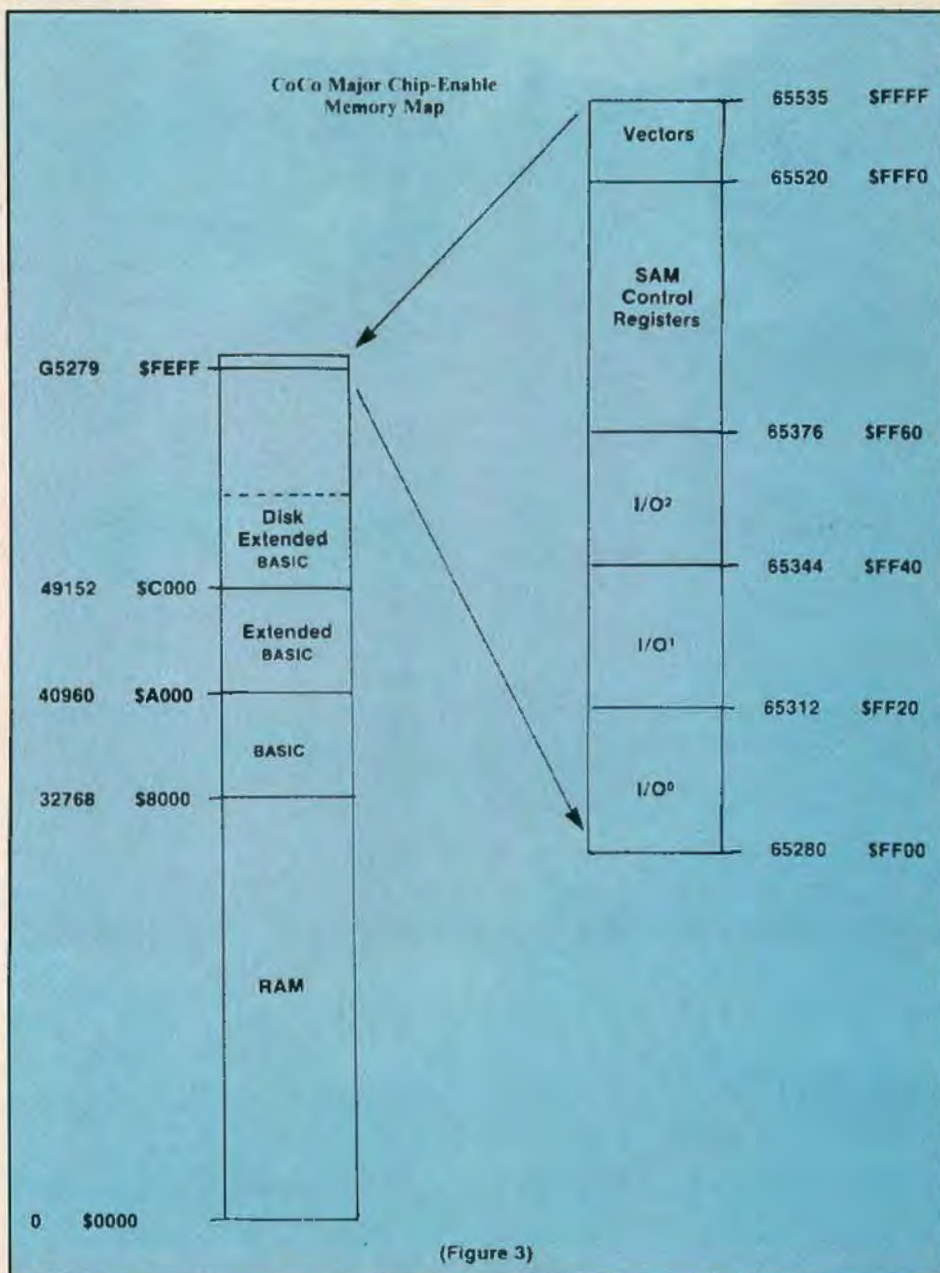
4) 49152 to 65279 (\$C000-\$FEFF) — This area is 16128 (\$3F00) long. It is one page (page = 256 or \$100) less than 16K. This area is reserved for external memory. It is accessible via the cartridge connector on the side of the computer. More on this later.

5) 65280 to 65311 (\$FF00-\$FF1F)



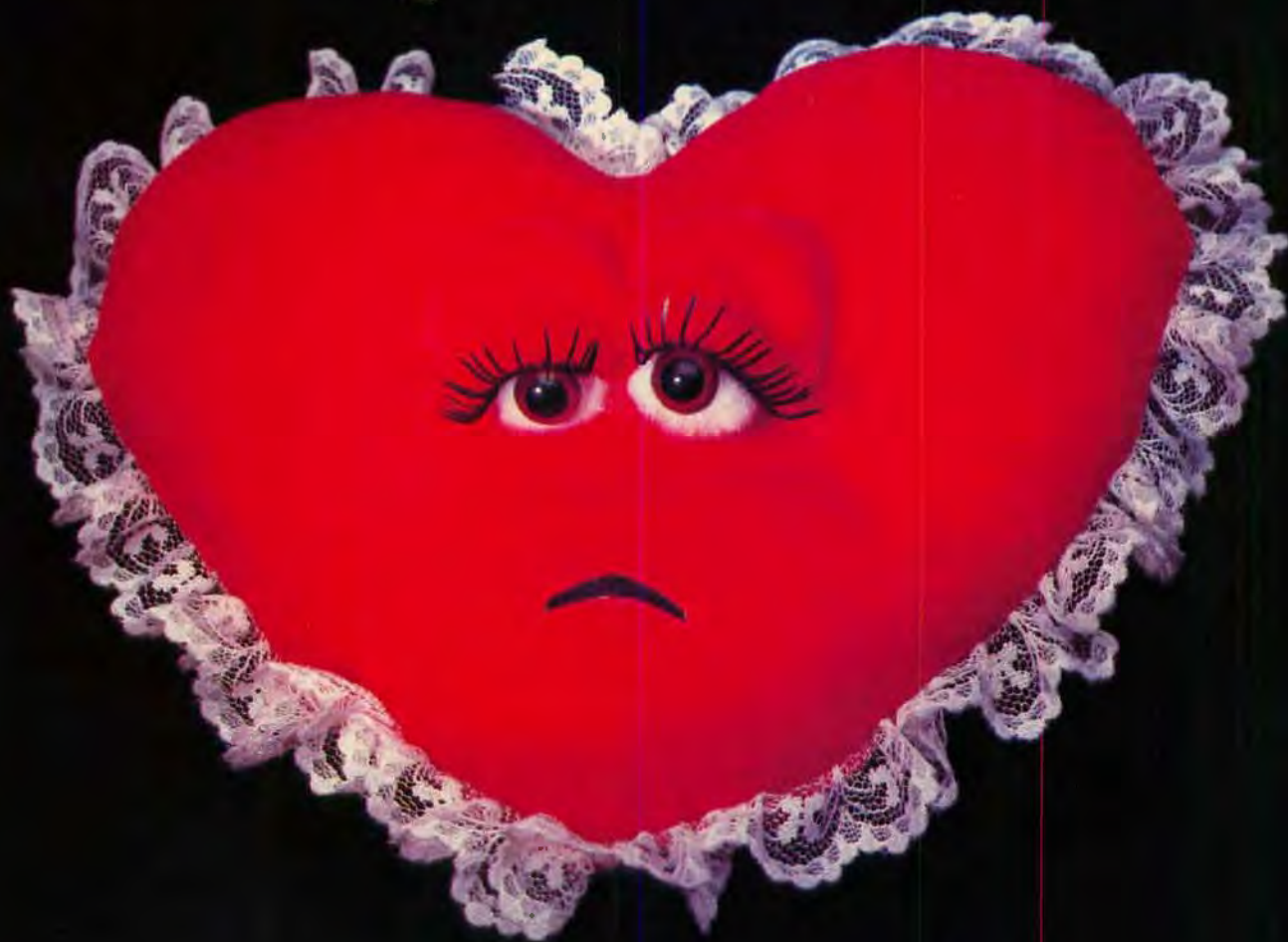
— This area is normally used as an I/O port. It is used to control a PIA (Peripheral Interface Adapter). This PIA is connected to the keyboard, analog MUX select lines, horizontal and vertical sync interrupt, joysticks and buttons.

6) 65312 to 65343 (\$FF20-\$FF3F) — This area is another internal I/O port. The second PIA in this computer, it controls the 6-bit D/A, cassette I/O, RS-232 I/O, RAM size, motor control, sound enable, single bit sound output, graphics mode control and

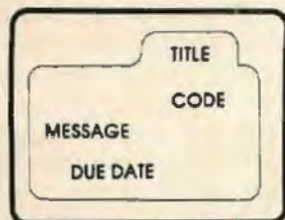


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cartridge interrupt input.

8) 65344 to 65375 (\$FF40-\$FF5F)
 — This area is the third I/O port and is reserved for external use. It is accessible via the cartridge connector on the side of the computer. More on this later.

9) 65376 to 65519 (\$FF60-\$FFEF?)
 — This area controls the SAM chip. The SAM chip generates all the system timing and all of the device selection.

10) 65520 to 65535 (\$FFF0-\$FFFF)
 — Finally, this area is the indirect pointers to the CPU interrupt vectors. Each pointer is two bytes long. Starting from the top, they are: Reset, NMI, SWI, IRQ, FIRQ, SWI2, SWI3 and the last one is Reserved. This area is controlled by the SAM chip and whenever it is accessed, the SAM chip will re-route (re-map) it to 49151 (\$BFFF), the top of the Color BASIC area. The reason for this is the CPU must use these vectors, and the only ROM that definitely comes with the computer is this one.

As you can see from the map, the areas that will concern the MPI are #4 and #8. They are accessible through the cartridge port.

Let's start with #4. The most common use for this area is the ROM-Pak. All of Radio Shack ROM-Paks use this area, however, not all of them use the whole 16K area available. Some use 2K or 4K, but most use 8K. In the case of the disk drive system, the software

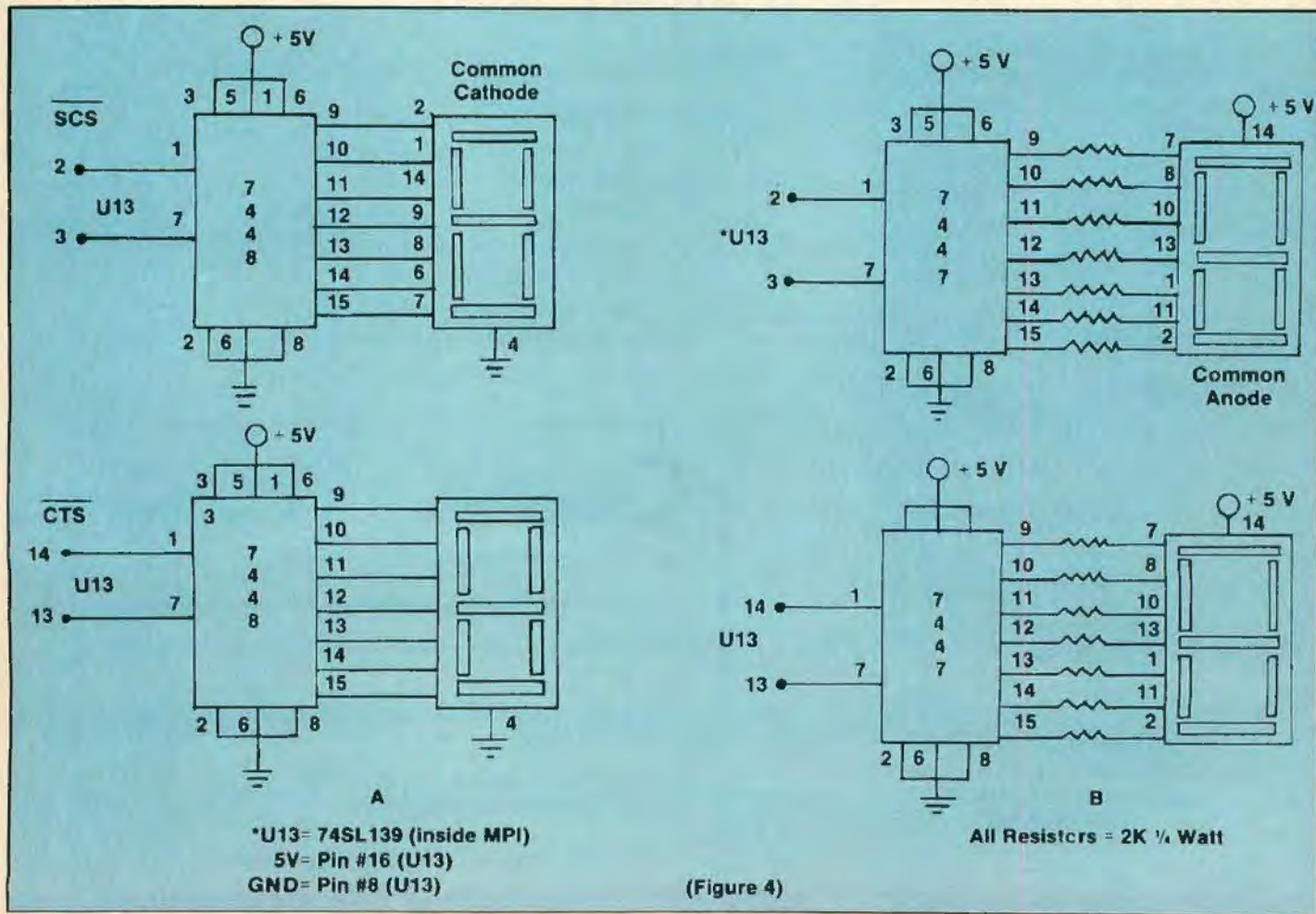


known as Disk Extended Color BASIC resides in this area. As a matter of interest, this software is kept on an 8K ROM chip, but only uses a little more than 6K of it. The rest of it is blank. The pin that controls (chip enable) this area on the cartridge connector is #32. It is called the Cartridge Select Signal (CTS) and is active LOW.

The second area available to the cartridge port is #8. It is generally used as an I/O port, but can be used for just about anything. The 32 byte length limits it to mostly I/O. Radio Shack game ROM-Paks do not use this area; the disk system does. It uses this area to communicate to the disk controller. Some of my projects also use this area. The pin that controls (chip enable) this area on the cartridge connector is #36. It is called the Spare Select Signal (SCS) and is also active LOW.

There are four slots in the MPI. This means you could put up to four ROM-Paks in there. They don't have to all be ROM-Paks; you could put in a ROM-Pak, a disk controller, a voicepak, an RS-232 adapter, an x-pad and your own "gizmo," just to name a few. They are all different, but fall into two categories: ones that use the SCS and/or CTS, and ones that use their own memory map decoding.

Let's look at the ones that do use these signals. The MPI has two ways of selecting which slot will be active: 1) The switch in front of the MPI. This is used as a "power up" default switch. When you turn the system on, the slot



that will be active will correspond to the switch's position. If you want the game in slot #2 to run, place the switch to #2 and turn the computer on. 2) The second way to select the active slot is by the built-in electronic switch. The electronic switch is nothing more than a memory-mapped byte. At this location, there is a latch so the associated circuitry can remember what slot is active. This latch is at 65407 (\$FF7F). Writing to this byte will change the active slot so it is equal to the value stored in that byte. To change the active slot, a poke or a store will do. You can also read the latch. The value returned will correspond to the active slot.

To make matters more complicated, the SCS and the CTS can be switched separately. Yes, the SCS can be in slot 1 and the CTS in slot 3. The electronic switch is divided into two parts, or nibbles. Each is four bits, making it eight bits, which is equal to one byte. The lower four bits controls the SCS and the upper four bits the CTS. A four-bit binary number can have 16 different combinations, but only the first four are used in the MPI. That makes four ports. The value needed to select a given port must start with zero. This is the first slot, even though the numbers start from one.

To select a slot, a little calculation is necessary. It is, of course, easier in Hex numbers. Here is a table that references the slots.

Slot #	CTS	SCS
1	0 (\$0)	0 (\$0)
2	16 (\$10)	1 (\$1)
3	32 (\$20)	2 (\$2)
4	48 (\$30)	3 (\$3)

To select a CTS and an SCS is simple: take the value from the CTS column

that corresponds to the slot number you want active, and add it to the value of the SCS that corresponds to the slot of that one. For example, if you want the CTS to be in slot 3 and the SCS in slot 2, the sequence would be as follows:

$$32 (\$20) + 1 (\$1) = 33 (\$21)$$

You would then *POKE* 65407,33 but you must remember when you change

"There are four slots in the MPI . . . you could put up to four ROM-Paks in there. They don't have to all be ROM-Paks; you could put in a ROM-Pak, a disk controller, a voice pak, an RS-232 adapter, an x-pad and your own 'gizmo,' just to name a few."

slot numbers, the computer might crash. It all depends on what software is running at the time. If, for instance, you were running Disk Extended BASIC and changed the CTS to another slot, a crash would occur and the disk software would no longer be there. If the slot that received control was auto-starting, it may start properly, depending on the status of the interrupts.

Now for the project. This is a simple 2-IC circuit. The IC I used in this project is the 7448. It is a BCD (Binary Coded Decimal) to seven-Segment decoder driver. This chip takes a four-bit binary number from zero to nine, and turns on the proper LED display segments to make them look like numbers. This IC can drive the display directly without resistors. It also uses the less expensive common cathode display (RS #276-075).

Unfortunately, the 7448 is not available at Radio Shack. The one available is the 7447 (RS #276-1805). There are two differences between the two: 1) it needs resistors to drive the display, and 2) it drives a common anode (more expensive) display. The choice is yours. If you can find the 7448, then use the common cathode display. If not, then use the 7447 with the common anode display (RS #276-053) and the resistors. Both schematics are shown in Figure 4.

I mounted the ICs and the displays on the same protoboard, as you can see from the photo. I will leave it up to you to mount the display where you want it. The display and the ICs do not have to be on the same board. You could always cut a square hole in the cover and mount the displays there.

To see if the display is working right, with all slots empty, place the front switch to slot #1 and turn the computer and MPI on. The display should read 00. Turn the switch to each position — #2, #3 and #4 — the display should read 11, 22 and 33, respectively. Try *POKEing* different values according to the Slot Table, and verify that the numbers change accordingly. From now on you will be able to see at a glance which slot is active.

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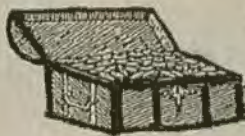
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by Steve Blyn

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The Value of Comparison Shopping

— a consumer education program for children

By Steve Blyn
Rainbow Contributing Editor

Consumer education was traditionally taught only in the higher grade levels; it was naturally assumed these students were closest to being out in the world and on their own. Although this is true, the topic has fortunately been introduced into the lower grades as well. Educators have learned that one is never too young to learn how to manage money wisely.

Young children are exposed to advertising through television. They see toys and cereals and other products meant to attract their attention. They want almost everything: "Daddy, buy me this, Mommy, buy me that." How familiar these phrases are to parents! And what do we answer? "We don't have room for that toy," or "You have one just like it," or the old standby "It costs too much money!" From the age of 2 or 3, our children begin to build an awareness of products, purchasing and prices.

(Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He and his wife, Cheryl, own Computer Island.)

Shopping for food is a job most youngsters take part in. Many accompany their parents to the supermarkets. There are many others who are able to shop alone at local groceries at surprisingly early ages. Consumer education should therefore begin when it is appropriate to the experiences of the students.

In the metropolitan New York area, the Wednesday and Sunday newspapers are full of ads and discount coupons for the local supermarkets. Hours can be spent combing the ads looking for the best bargains. It would be counter-productive to travel from market to market to get the best value on each particular item. By careful comparison pricing on selected items, people learn more efficiently to choose the better stores for their needs.

This month's program is designed to help middle grade students learn about comparison shopping in two stores. A list containing several grocery items and their prices in each store is presented.

The learner has two tasks to master. First, one must decide which store has the better price. This exercise gives practice in reading this type of list. Adults are quite familiar with such lists,

but they can confuse children in the beginning.

Next, the student must determine how much money is saved in the less expensive store. This is done by subtracting either mentally or on a separate piece of paper. The problem is counted right only if both questions are answered correctly. After 10 examples, a report card is given, and the player can begin again or end the program.

Lines 40 and 50 dimension the number of prices and articles. Each article has two prices. Lines 60-100 draw the screen and its information. Line 110 selects the random number (R). This determines which grocery item is picked for each question. This line also contains the counter (CT) for the total number of examples. The next line monitors the counter.

Lines 130-190 ask which store has the cheaper price on the item in question. Lines 200-230 check to see if the answer is correct. If it is, then lines 240-320 ask and check how many cents were saved at the less expensive store. If answered correctly, the student will receive 10 points.

After 10 questions, a report card is given on lines 420-470. Remember that

a question is only counted as correct if both parts are answered correctly. This was done mainly because of the large screen size. We could only fit in eight items and felt it was too easy to merely memorize which item was cheaper. If you desire, you may easily

alter the scoring by giving five points for each part of the two-part question.

This program is certainly not limited to supermarket shopping. The *DATA* lines are on 400 and 410. Line 400 has the two amounts and Line 410 has the item. You may substitute any items and

amounts of interest to your children or students.

An even better idea is to let the children have fun and learn by substituting their own items and values. One of the best ways to learn is by being an active participant in the program.



The listing:

```

10 REM"COMPARISON SHOPPING"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,NY,1985"
30 CT=0:GB=0
40 DIM A(8,2):' *THE AMOUNTS
50 DIM F$(8):' *THE ITEMS
60 CLS0
70 PRINT" STORE1      STORE2
ITEM":PRINT STRING$(32,188);
80 FORX=1TO8:FORY=1TO2:READ A(X,
Y):NEXTY,X:FORZ=1TO8:READF$(Z):N
EXTZ
90 FOR X=1TO8:FORY=1TO2:PRINT "
";:PRINTUSING "$##.##";A(X,Y);:P
RINT"      ";:NEXTY:PRINTF$(X):NEX
TX
100 PRINTSTRING$(32,179);
110 R=RND(8):CT=CT+1
120 IF CT>10 THEN 420
130 PRINT@352," WHICH STORE SEL
LS THE ";F$(R)
140 PRINT@384," AT A CHEAPER
PRICE";
150 REM"EN=PLAYER'S RESPONSE"
160 INPUT EN
170 REM"P1=PRICE AT FIRST STORE
AND P2=PRICE AT THE SECOND."
180 IF EN<1 OR EN>2 THEN 130
190 P1=A(R,1):P2=A(R,2)
200 REM"CHECK OUT THE ANSWER"
220 IF P1>P2 THEN N=2
230 IF EN=N THEN 250 ELSE 330
240 REM"IF CORRECT,ASK HOW MUCH
IS SAVED AT THAT STORE."
250 PLAY"L100;GFEGFEDC"
260 PRINT@416," ":PRINT@416,"RIG
HT! HOW MANY CENTS SAVED";
270 INPUT EE
280 IF EE<0 OR EE>99 THEN 240
290 CB=ABS(P1-P2)*100
300 CC=INT((CB)+.5)

```

```

310 IF EE=CC THEN PLAY"ABCABC":P
RINT@455,"CORRECT AGAIN !!";:G
B=GB+1:GOTO 340
320 IF EE<>CC THEN SOUND10,1:PRI
NT@448,"SORRY, YOU REALLY SAVED";
CC;"CENTS":GOTO340
330 PRINT"SORRY, STORE #";N;" IS
CHEAPER.":SOUND10,1
340 PRINT@485,"PRESS <ENTER> TO
GO ON";
350 EE#=INKEY#
360 IF EE#=CHR$(13) THEN 380
370 GOTO 350
380 FORT=1376 TO 1535:POKET,128:
NEXT T
390 GOTO 110
400 DATA 1.25,1.33,.84,.79,.64,.
59,2.25,2.39,.62,.49,2.65,2.48,.
87,.84,1.57,1.74
410 DATA CHEESE,CATFOOD,BEANS,CO
FFEE,CANDY,MILK,JUICE,BREAD
420 CLS5:PRINT@41,"REPORT CARD";
430 PRINT@134,"YOUR SCORE WAS";G
B*10; "%";
440 PRINT@357,"PRESS <ENTER> TO
GO ON";
450 EN#=INKEY#
460 IF EN#=CHR$(13) THEN RUN
470 GOTO 450

```

One-Liner Contest Winner . . .

You can do 3-D animation on the CoCo! This shortie draws a cube over and over, rotating it a few degrees each time.

Kraig Brockschmidt
Renton, WA

The listing:

```

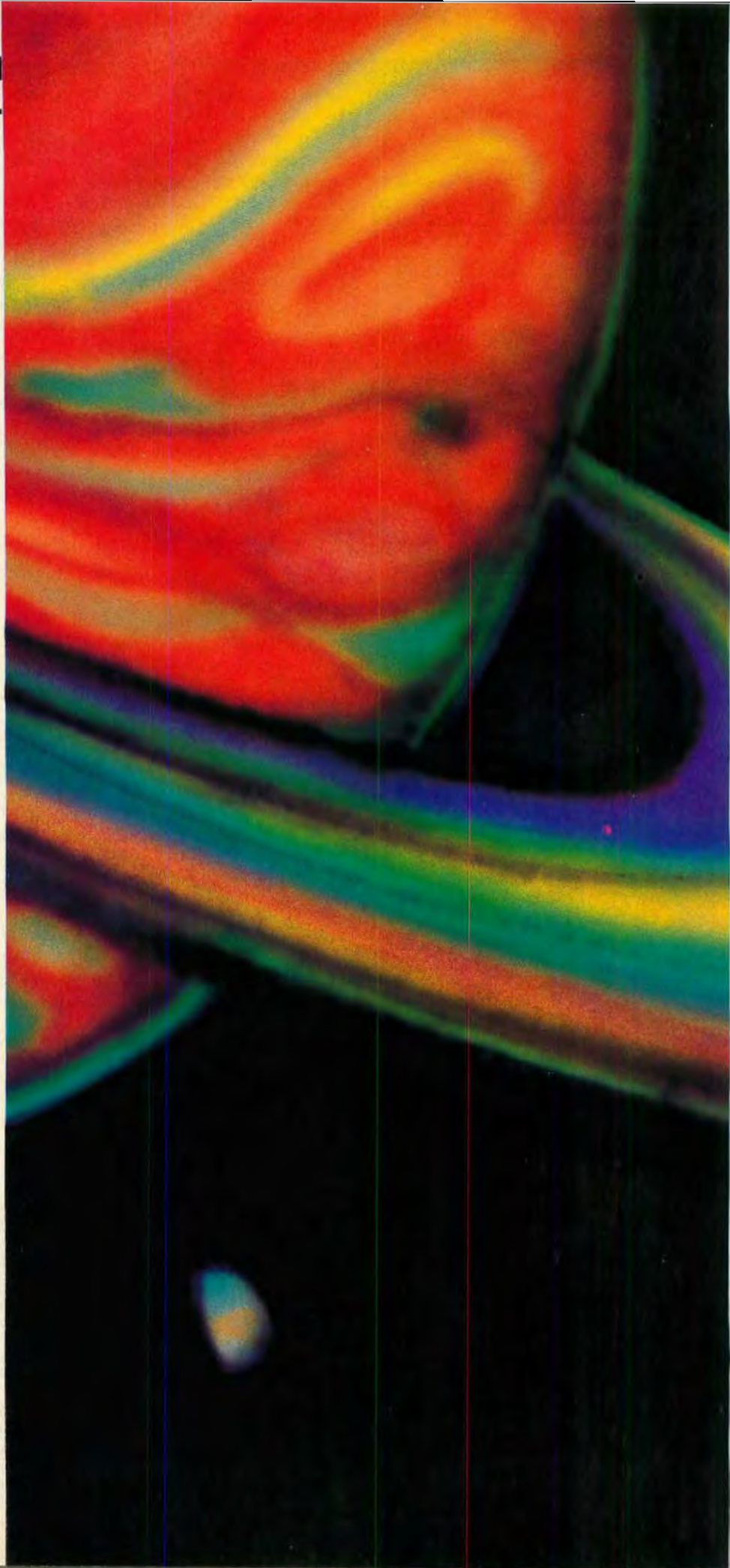
0 PMODE4:FORO=1TO4:X(0)=COS(A)*4
0+128:X(0+4)=X(0):Y(0)=SIN(A)*15
+75:Y(0+4)=Y(0)+42:A=A+1.6:NEXT:
A=A+1.3962:RESTORE:PCLS:FORO=1TO
12:READS,E:LINE(X(S),Y(S))-(X(E)
,Y(E)),PSET:NEXT:SCREEN1,1:GOTO:
DATA1,2,2,3,3,4,4,1,5,6,6,7,7,8,
8,5,1,5,2,6,3,7,4,8

```

(For this winning one-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *Rainbow Simulations Tape*.)

GAME

(Dan Hamilton is a free-lance programmer who authored several programs for Chromasette. He is currently exploring possibilities of a career in programming.)



'Calculate' your way through the solar system with

Space Race

By Daniel Hamilton

Welcome to *Space Race*. This is an interesting math game with a new twist. Instead of answering a math problem, you must enter an equation and the CoCo computes the answer. I borrowed the technique to accomplish this from Rich Dersheiner's *Mathgame* program published in the January 1984 RAINBOW.

The object of the game is simple: be the first player to pilot your spaceship from Earth to Pluto. Each player's turn consists of spinning for three random numbers, then building an equation from the numbers and the arithmetic operators: * / + -. You may only use each number or operator once to form your equation. When your equation is entered, the CoCo computes its value, and moves your spaceship a distance equal to this value. Only the integer portion of the value is used, and values less than zero are ignored. There are two rules that make the game more interesting.

- 1) If you stop on a planet, you automatically advance to the next planet.
- 2) If you stop on the same position as your opponent, your opponent is sent back to the previous planet.

This means the equation with the highest value is not necessarily the one that will most improve your position in the race. An exception to rule #2 is that planets are considered safety areas; you cannot be bumped back while you are on a planet.

The game can be played by two players, by one person against the computer, or enter "Computer" as the name of the first player and select the one player option, and the computer

will play a demonstration game against itself.

I must apologize for the lack of remarks and all the multiple statement lines. I abhor multiple statement lines because they make the logic difficult to follow, especially in lines with multiple *IF* and *ELSE*.

Unfortunately, the program as I originally wrote it ran over 16K, and I really wanted a game everyone could try, so I packed it all together and stripped out all the remarks to get a version that just barely runs in 16K.

A breakdown of the program follows:

Line 1	Dimension arrays: reseed random function	Line 25-26	Subroutine to move player 1 rocket
Line 2	Dummy line to compute input equation	Line 27-28	Subroutine to move player 2 rocket
Line 3-4	Locates dummy line	Line 29-30	Subroutine to bump back player 2
Line 5-9	Initialize variables:input names: select mode of play	Line 31-32	Subroutine to bump back player 1
		Line 10	Draws screen
		Line 11	Alternates players (beginning of main loop)
		Line 12	Spins for 3 random numbers
		Line 13	Stores numbers and operators and draws them on screen
		Line 14-17	Gets input equation
		Line 18-20	Checks syntax of input equation
		Line 21	Inserts input equation in dummy equation
		Line 22-24	Evaluate equation and move rocket (end of main loop)





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MINI-MOUTH



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Here are just some of the features Double Term + has to offer:

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BAUD Rates:

- 110-4800 (communicate)
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- Send all 128 characters from keyboard

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- Editor—Move forward and reverse thru buffer. Insert, type over, delete lines, characters or words. Block delete.

10 Macro keys

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- Half, Full Duplex or Echo
- Odd, Even, Mark, Space or No Parity
- 7 or 8 Bit Words
- 1 or 2 Stop Bits
- All Caps if needed
- Several Printer Formats
- Trapping of incoming characters

BAUD Rates:

- 110-4800 (communicate)
- 600-9600 (printer)

Screen Format:

- 32 x 16, 42, 51, 64 or 85 x 24
- Send all 128 characters from keyboard

Buffer:

- Merge text or programs
- 49K to 53K memory
- Four Buffer Send Modes
- Display Bytes Used/Remaining
- Editor—Move forward and reverse thru buffer. Insert, type over, delete lines, characters or words. Block delete.

10 Macro keys

- Automatic Capture of incoming files
- X on / X off capabilities
- Send True Line Break
- Transmit/Receive BASIC Programs, Files or Machine Code. No need to translate BASIC programs to ASCII Format.
- Save/Load Macros or Parameters to Disk
- Use 1 to 4 Disk Drives (w/SAVE, LOAD, DIR & Granule Display)
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Line 33-38 Subroutine to spin for 3 random numbers
 Line 39-44 Subroutine to build computer's equation
 Line 45-47 Subroutine to draw

Line 48 Subroutine to draw text on screen
 Line 49-54 Defines text character strings: defines

Line 55-63 Draws rockets and stores them in arrays
 Line 64-65 Data
 Line 66-67 'End of game' routine

10.....8	42.....190
22.....17	50.....110
27.....103	53.....154
35.....107	END.....96

The listing:

```

1 CLEAR150: DIMC$(58), A(1,6), B(1,6), C(1,6), D(1,6), E(1,6), F(1,6), G(1,6), H(1,6), M$(2), N$(2), P(2), Z(7), N(3): N=RND(-TIMER): GOTO3
2 V=*****: RETURN
3 E=PEEK(25)*256+PEEK(26)
4 IFPEEK(E)=173THEN5ELSEE=E+1: GOTO4
5 CLS0: PRINT@267, "space"+CHR$(12B)+"race";: SCREEN0, 1: GOSUB49
6 A=32: B=8: C=32: D=15: P(1)=0: P(2)=0: F=0: CLS: PRINT@256, " ";: INPUT"ENTER YOUR NAME"; N$(1): IFN$(1)="" THENN$(1)="PLAYER 1"ELSEIFLEN(N$(1))>8THENN$(1)=LEFT$(N$(1), 8)
7 CLS: PRINT@256, "PRESS: 1) TO RACE THE COMPUTER";: PRINT@328, "2) TO RACE A FRIEND";
8 A$=INKEY$: IFA$<"1"ORA$>"2"THENBELSEIFA$="1" THENN$(2)="COMPUTER": GOTO10
9 CLS: PRINT@256, " ";: INPUT"ENTER YOUR FRIEND'S NAME"; N$(2): IFN$(2)="" THENN$(2)="PLAYER 2"ELSEIFLEN(N$(2))>8THENN$(2)=LEFT$(N$(2), 8)
10 GOSUB45
11 IFF<>1THENF=1ELSEF=2
12 GOSUB33
13 FORI=1TO3: Z(I)=N(I)+48: NEXTI: Z(4)=42: Z(5)=47: Z(6)=43: Z(7)=45: LINE(40, 152)-(255, 191), PRESET, BF: DRAW"BM48, 160": FORI=1TO7: DRAWC$(Z(I)-32)+C$(0): NEXTI: IFN$(F)="COMPUTER" THENGOSUB39: GOTO21
14 G=40: H=183: T$="ENTER YOUR EQUATION": GOSUB48: H=191: T$="PRESS CLEAR TO MAKE CHANGES": GOSUB48: L=48: T=0: E$=""
15 B$="BM"+STR$(L)+"", 173; "
16 A$=INKEY$: DRAWB$+"NRBC0NRBC1": IFA$="" THEN16ELSEIFT=5THEN17ELSEFORI=1TO7: IFASC(A$)=Z(I) THENDRAW"BM"+STR$(32+I*16)+"", 160"+C$(0): DRAWB$+C$(Z(I)-32): E$=E$+A$: Z(I)=0: L=L+8: T=T+1ELSENEXTI

```

```

17 IFA$=CHR$(12) THEN13ELSEIFA$=CHR$(13) ANDT=5 THEN18ELSE15
18 DRAWC$(0)+C$(29): FORI=1TO5STEP2: IFMID$(E$, I, 1)<"0" THEN19ELSENEXTI: FORI=2TO4STEP2: IFMID$(E$, I, 1)>"0" THEN19ELSENEXTI: GOTO21
19 LINE(40, 175)-(255, 191), PRESET, BF: G=40: H=183: T$="THIS EQUATION HAS AN ERROR": GOSUB48: H=191: T$="PRESS CLEAR TO START OVER": GOSUB48
20 A$=INKEY$: IFA$="" THEN20ELSEIFA$<>CHR$(12) THEN19ELSE13
21 FORI=0TO4: A$=MID$(E$, I+1, 1): IFA$>"0" THENPOKEE+I, ASC(A$) ELSEIFA$="+" THENPOKEE+I, 171ELSEIFA$="-" THENPOKEE+I, 172ELSEIFA$="*" THENPOKEE+I, 173ELSEIFA$="/" THENPOKEE+I, 174
22 NEXTI: GOSUB2: V$=STR$(V): FORI=1TOLEN(V$): DRAWC$(ASC(MID$(V$, I, 1))-32): NEXTI: FORI=0TO4: POKEE+I, 173: NEXTI: LINE(40, 175)-(255, 191), PRESET, BF: IFV<1 THEN11ELSEFORI=P(F)+1TOP(F)+INT(V): ONF GOSUB25, 27: IFI=300 THEN66ELSENEXTI: P(F)=P(F)+INT(V)
23 IFF(F)/50=INT(P(F)/50) THENG=48: H=183: T$="** BONUS **": GOSUB48: PLAYM$(0): FORI=1TO50: ONF GOSUB25, 27: NEXTI: P(F)=P(F)+50: IFF(F)=300 THEN66
24 IFF(1)=P(2) THENIFF(1)/50=INT(P(1)/50) THEN11ELSEONF GOSUB29, 31: GOTO11ELSE11
25 FORY=32TO128STEP48: IFY=B THEN26ELSENEXTY: FORJ=1TO2: PUT(A, B)-(A+15, B+6), C, PSET: PUT(A, B)-(A+15, B+6), A, PSET: A=A+2: NEXTJ: IFA=232THENLINE(A, B)-(A+15, B+6), PRESET, BF: B=B+24: A=A-20: PUT(A, B)-(A+15, B+6), E, PSET: RETURNELSERETURN
26 FORJ=1TO2: PUT(A, B)-(A+15, B+6), G, PSET: PUT(A, B)-(A+15, B+6), E, PSET: A=A-2: NEXTJ: IFA=12THENLINE(A, B)-(A+15, B+6), PRESET, BF: B=B+24: A=A+20: PUT(A, B)-(A+15, B+6), A, PSET: RETURNELSERETURN
27 FORY=39TO135STEP48: IFY=D THEN28ELSENEXTY: FORJ=1TO2: PUT(C, D)-(C+15, D+6), D, PSET: PUT(C, D)-(C+15, D+6), B, PSET: C=C+2: NEXTJ: IFC=232THENLINE(C, D)-(C+15, D+6), PRESET, B

```

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8										
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```

F:D=D+24:C=C-20:PUT(C,D)-(C+15,D
+6),F,PSET:RETURNELSERETURN
28 FORJ=1TO2:PUT(C,D)-(C+15,D+6)
,H,PSET:PUT(C,D)-(C+15,D+6),F,PS
ET:C=C-2:NEXTJ:IFC=12THENLINE(C,
D)-(C+15,D+6),PRESET,BF:D=D+24:C
=C+20:PUT(C,D)-(C+15,D+6),B,PSET
:RETURNELSERETURN
29 LINE(C,D)-(C+15,D+6),PRESET,B
F:FORJ=39TO135STEP48:IFY=D THENP
(2)=P(2)-(212-C)/4:C=212:PUT(C,D
)-(C+15,D+6),F,PSETELSENEXTY:P(2
)=P(2)-(C-32)/4:C=32:PUT(C,D)-(C
+15,D+6),B,PSET
30 G=48:H=183:PLAYM$(1):T$="TOO
BAD FOR "+N$(2):GOSUB48:RETURN
31 LINE(A,B)-(A+15,B+6),PRESET,B
F:FORJ=32TO128STEP48:IFY=B THENP
(1)=P(1)-(212-A)/4:A=212:PUT(A,B
)-(A+15,B+6),E,PSETELSENEXTY:P(1
)=P(1)-(A-32)/4:A=32:PUT(A,B)-(A
+15,B+6),A,PSET
32 G=48:H=183:PLAYM$(1):T$="TOO
BAD FOR "+N$(1):GOSUB48:RETURN
33 LINE(40,0)-(255,6),PRESET,BF:
LINE(40,152)-(255,191),PRESET,BF
34 FORJ=1TO2:P$=STR$(P(J)):G=40+
(J-1)*112:H=6:T$=N$(J):GOSUB48:D

```

```

RAWC$(29):FORI=2TOLEN(P$):DRAWC$(
ASC(MID$(P$,I,1))-32):NEXTI,J:G
=176:H=167:T$=N$(F)+"S":GOSUB48
:H=175:T$="TURN":GOSUB48:H=183:T
$="TO SPIN.":GOSUB48
35 FORI=60TO140STEP40:CIRCLE(I,1
68),10:NEXTI:IFN$(F)="COMPUTER"
HENG=56:H=191:T$="*SPINNING*":GO
SUB48:GOTO37ELSEG=40:H=191:T$="P
RESS ENTER TO SPIN.":GOSUB48
36 A$=INKEY$:IFA$(<)CHR$(13)THEN3
6
37 LINE(40,184)-(255,191),PRESET
,BF
38 FORI=1TO3:FORJ=1TO10:N=3*RND(
3)-3+I:DRAW"BM"+STR$(18+I*40)+",
171;" +C$(0)+"BL8"+C$(16+N):PLAY"
L25501C":NEXTJ:N(I)=N:PLAY"05CBC
":NEXTI:FORI=1TO250:NEXTI:RETURN
39 G=56:H=183:T$="*THINKING - ST
AND BY*":GOSUB48:IFF=1THEN0=2ELS
EO=1
40 R=P(F)-P(0):S=P(0)-(INT(P(0)/
50)*50):M=0:RESTORE
41 FORX=1TO6:READI,J,K:V=N(I)*N(
J)+N(K):P=42:Q=43:GOSUB43:V=N(I)
*N(J)-N(K):Q=45:GOSUB43:V=N(I)*N(
J)/N(K):Q=47:GOSUB43:V=N(I)-N(J)
)*N(K):P=45:Q=42:GOSUB43:V=N(I)-
N(J)+N(K):Q=43:GOSUB43:V=N(I)-N(
J)/N(K):Q=47:GOSUB43:V=N(I)/N(J)
+N(K):P=47
42 Q=43:GOSUB43:V=N(I)/N(J)-N(K)
:Q=45:GOSUB43:NEXTX:LINE(40,161)
-(255,183),PRESET,BF:G=48:H=173:
T$=E$+"=":GOSUB48:RETURN
43 V=INT(V):IFV<=0THENRETURNELSE
IFP(F)+V=P(0)ANDS>R+M THENM=S-R:
GOTO44ELSEIF(P(F)+V)/50=INT((P(F)
)+V)/50)ANDP(F)+V+50>M+P(F) THENM
=V+50:GOTO44ELSEIFV>M THENM=V:GO
TO44ELSERETURN
44 E$=CHR$(N(I)+48)+CHR$(P)+CHR$(
N(J)+48)+CHR$(Q)+CHR$(N(K)+48):
RETURN
45 PMODE3,1:PCLS:FORI=12TO156STE
P24:READX:CIRCLE(X,I),14,,.9:PAI
NT(X,I),RND(2)+1,4:NEXTI:PMODE4,
1:SCREEN1,1:FORH=31TO175STEP24:R
EADG,T$:GOSUB48:NEXTH:FORI=23TO1
19STEP48:LINE(36,I)-(240,I),PSET
:LINE(16,I+24)-(220,I+24),PSET
46 FORJ=0TO49:IFINT(J/5)=J/5THEN
K=2ELSEK=0
47 LINE(240-J*4,I+1+K)-(240-J*4,
I-1),PSET:LINE(16+J*4,I+25+K)-(1
6+J*4,I+23),PSET:NEXTJ,1:PMODE3,
1:COLOR1,4:FORH=14TO158STEP24:RE
ADG,T$:GOSUB48:NEXTH:COLOR4,1:PM

```

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ODE4,1:PUT(32,8)-(47,14),A,PSET:
PUT(32,15)-(47,21),B,PSET:RETURN
48 DRAW"BM"+STR$(G)+", "+STR$(H)+
";":FORK=1TOLN(T$):DRAWC$(ASC(M
ID$(T$,K,1))-32):PLAY"L10005E":N
EXTK:PLAY"C":RETURN
49 C$(0)="C0U6RD6RU6RD6RU6RD6BR3
C1":C$(7)="BR2BU4U2RD2BD4BR5":C$(
10)="BR2U6D3NH2NG2NE2F2BDBR4":C
$(11)="BU3R5L3ND2U2RD4BDBR5":C$(
13)="BU3R5BD3BR3":C$(14)="URDBR7
":C$(15)="E5BD5BR3":C$(16)="BUU4
NF4ER3FD4GL3BR7"
50 C$(17)="BR3RU6NGD6RBR3":C$(18
)="BU5ER3FDG2L2GDR5BR3":C$(19)="
BU5ER3FDGNLFDGL3HBDDBR8":C$(20)="
BU6D3R4NU3NRD3BR4":C$(21)="BU6NR
5D2R4FD2GL3HBDDBR8":C$(22)="BUU4E
R3FBD2BLNL3FDGL3BR7":C$(23)="BU6
R5DG4DBR7":C$(24)="BUUEHUER3FDGN
L2FDGL3BR7"
51 C$(25)="BUFR3EU4HL3GDFR4BD3BR
3":C$(29)="BU2R5BU2L5BD4BR8":C$(
33)="USER3FD2NL4D3BR3":C$(34)="U
6R5FDGNL3FDGL4BR8":C$(35)="BUU4E
R3FBD4GL3BR7":C$(36)="U6R3F2D2G2
L3BR8":C$(37)="U6NR5D3NR4D3R5BR3
":C$(38)="U3NR4U3R5BD6BR3"
52 C$(39)="BUU4ER3FBD2NL2D2GL3BR
7":C$(40)="U6BR5D3NL5D3BR3":C$(4
1)="BR2R2LU6LR2BD6BR4":C$(42)="B
U2DFR3EU5BD6BR3":C$(43)="U6BR5G4
EF3BR3":C$(44)="NU6R5BR3":C$(45)
="U6F2RE2D6BR3":C$(46)="U6F5DU6B
D6BR3":C$(47)="BUU4ER3FD4GL3BR7"
:C$(48)="U6R4FDGL4D3BR8"
53 C$(49)="BUU4ER3FD3GNHNFGL2BR7
":C$(50)="U6R4FDGL3RF3BR3":C$(51
)="BUFR3EUHL3HUER3FBD5BR3":C$(52
)="BR2U6L2R5L2D6BR5":C$(53)="BUU
5BR5D5GL3BR7":C$(54)="BU6D2BFBDF
DRUBEUBEU2BD6BR3":C$(55)="NU6E2R
F2NU6BR3":C$(56)="UE4RUBL5DRF4DB
R3"
54 C$(57)="BU6DF2ND3RND3E2UBD6BR
3":C$(58)="BU6R5DG5R5BR3":M$(0)=
"T4L803GP0L32GP32GP3204L4CT2":M$(
1)="T3L401BB-AA-L2GT2":M$(2)="T
1202L4AP4L4AA03L1C02A03L3C02A03C
L1ECL3ECEL1G02GL3D3C02G03CL1ET2"
55 FORX=1TO6:READI,J,K:NEXTX:FOR
I=1TO8:PMODE3,1:PCLS:READA$:DRAW
A$:PMODE4,1:ONI GOSUB56,57,58,59
,60,61,62,63:NEXTI:RETURN
56 GET(0,0)-(15,6),A:RETURN
57 GET(0,0)-(15,6),B:RETURN
58 GET(0,0)-(15,6),C:RETURN
59 GET(0,0)-(15,6),D:RETURN

```

```

60 GET(0,0)-(15,6),E:RETURN
61 GET(0,0)-(15,6),F:RETURN
62 GET(0,0)-(15,6),G:RETURN
63 GET(0,0)-(15,6),H:RETURN
64 DATA1,2,3,2,3,1,3,1,2,1,3,2,2
,1,3,3,2,1,"BM3,6;C2E3NH3L2R8L2U
L4D2R4","BM3,6;C3E3NH3L2R8L2UL4D
2R4","BM3,6;C2E3NH3C4NL6C2R6L2UL
4D2R4","BM3,6;C3E3NH3C4NL6C3R6L2
UL4D2R4","BM10,6;C2H3NE3R2L8R2UR
4D2L4","BM10,6;C3H3NE3R2L8R2UR4D
2L4"
65 DATA"BM10,6;C2H3NE3C4NR6C2L6R
2UR4D2L4","BM10,6;C3H3NE3C4NR6C3
L6R2UR4D2L4",16,240,16,240,16,24
0,16,1,EARTH,223,MARS,1,JUPITER,
207,SATURN,1,URANUS,199,NEPTUNE,
1,PLUTO,14,0,234,50,6,100,230,15
0,6,200,230,250,6,300
66 PLAYM$(2):PCLS:G=32:H=100:T$=
"HOORAY HOORAY HOORAY":GOSUB
48:H=116:G=(88-LEN(N$(F))*8)/2:T
$=N$(F)+" WINS THE SPACE RACE":G
OSUB48:G=24:H=148:T$="PRESS ENTE
R TO PLAY AGAIN.":GOSUB48
67 A$=INKEY$:IFA$<>CHR$(13)THEN6
7ELSERUN

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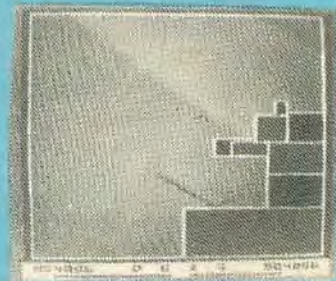
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This one is after a popular arcade game with a similar name. Simply frustrating—you'll love it. Done in high resolution graphics with Super Sound.

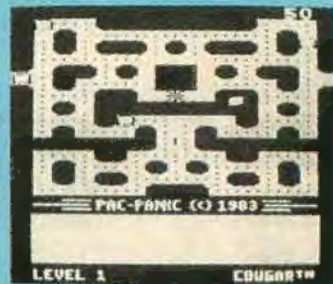
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PAK-PANIC

Pakman is steered thru a maze eating dots and powerpills. Pakman is pursued by four monsters who try to catch and kill him. If Pakman eats a powerpill he becomes powerful and can eat monsters. Monsters try to avoid a powerful Pakman. As monsters are eaten their ghosts appear on the top of the screen. When seven ghosts have appeared one will fly across the screen or they will link together forming a centipede that will travel thru the maze. Pakman has no power against ghosts and centipedes and must avoid them or be killed. **JOYSTICKS REQUIRED**

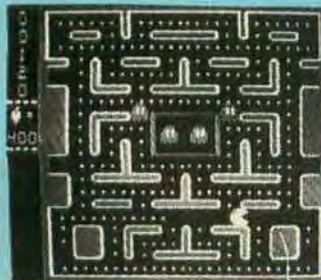
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MS. MAZE

MS. MAZE is remarkable in that it combines brilliant color, high resolution, detailed graphics, and music with a very playable game. Anything that could be done to make the Color Computer look and play like the arcade version has been done. MS. MAZE is without question the closest thing to the arcade Pac games that I have seen for the Coco.

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The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 11 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

- As many as 300 vocabulary words and definitions may be in the computer's memory at one time.
- Words and definitions may be saved on disk or tape.
- Remarks and/or comments can be saved with word files.
- A disk loading menu allows students to load disk files without typing file names.
- Word lists may be quickly alphabetized.
- The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.
- The printer segments allow full use of your printer's special features.
- The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fast-paced set of activities.

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FRACTIONS - A Three Program Package - 32 K EXT. BASIC TAPE \$30.95 DISK \$35.95

MIXED & IMPROPER

1. Review converting mixed numerals and improper fractions.
2. Practice converting mixed numerals to improper fractions.
3. Practice converting improper fractions to mixed numerals.
4. Practice of both types. (Mixed to improper & improper to mixed)
5. Review converting mixed numerals to mixed numerals. (Used in regrouping in subtraction)
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENCE

1. Definitions of terms and review of finding equivalent fractions.
2. Practice finding equivalent fractions.
3. Practice finding sets of equivalent fractions.
4. Review of finding if one fraction is equal to, not equal to, less than or greater than another.
5. Practice finding if one fraction is equal to, not equal to, less than or greater than another.

LOWEST TERMS

1. Review of placing fractions into lowest terms by finding the greatest common factor (GCF) of the numerator and denominator.
2. Practice finding the GCF of pairs of numbers.
3. Practice placing fractions into lowest terms by finding the GCF of the numerator and denominator.

TEACHER'S DATABASE

TEACHER'S DATABASE is a program designed to allow a teacher to keep a computerized file of information about his/her students. There are many features that make this program particularly attractive:

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted.

**REQUIRES 32K EXT. BASIC
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MATH DUEL

MATH DUEL is a challenging mathematics game that pits you against the computer in a game of wits. You must use all of your knowledge of factors, multiples and prime numbers to develop a strategy that allows you to gather more numbers and thus more points than the computer.

The game is deceptively simple. You select the size of the playing field that is composed of from 8 to 100 numbers. You must then choose numbers that will give you the maximum number of points and the computer the least number of points. There are only 6 rules.

1. Any number that you chose must have at least one factor still on the playing field.
2. You receive points equal to the face value of the number that you chose.
3. The computer receives points equal to the face value of all of the remaining factors of the number that you chose.
4. All of the numbers that were awarded to you or to the computer are removed from the field.
5. The game continues until there are no numbers with factors remaining.
6. At the end the computer receives points equal to the value of all of the remaining numbers.

32K EXT. BASIC TAPE \$24.95 DISK \$29.95

ESTIMATE

ESTIMATE is a program designed to help children to practice estimating the answers to addition, subtraction, multiplication and division problems on the Color Computer. It has many features that make its use particularly attractive.

- Up to 5 students may use the program at the same time.
- There are 5, user modifiable, skill levels.
- The acceptable percent error may be changed as a student's skill improves.
- A timer measures the number of seconds used to answer each problem and the total time used for a series of problems.
- If a problem has been answered incorrectly, the student is told the percent error and asked to try again.
- If a problem is answered incorrectly a second time, the student is told the correct answer and the range of acceptable answers is displayed.
- A report is given at the end of each set of problems that includes the number of problems done, the number of problems answered correctly on the first try and the average percent error.
- The (BREAK) key has been disabled so that child will not inadvertently stop the program from running. **REQUIRES 16K EXT. BASIC**

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PRE-ALGEBRA I INTEGERS

INTEGERS is a series of four programs designed to give students practice in working with addition, subtraction, multiplication, division and the comparison of integers. It has many features that make a very valuable tool for introducing and/or maintaining skills.

- Up to 4 students may use the program at the same time.
- There are 9, user modifiable, skill levels.
- Students are given two opportunities to answer a problem.
- A detailed report of student performance, including number correct on first try, number wrong, total time used and percentage score, is presented at the end of a series of problems.
- The programs will run on a 16K TRS-80 Color Computer with or without disk drive.

Four distinct problem formats are presented. The first presents problems in this format: $-12 + -9 = ?$ The second program presents a problem with missing numerals in this format: $-7 - ? = 18$. The third program presents a problem with a missing sign: $8 - ?6 = 14$. The last program asks the student to determine the relationship ($=$, $<$ or $>$) between two statements $3 - 9 (??) - 4 - 5$.

**32K EXT. BASIC
TAPE \$28.95 DISK \$33.95**

PRE-ALGEBRA II

The second **PRE-ALGEBRA PACK** is composed of two programs, **EQUATION SOLVER** AND **EQUATION DUEL**, that are designed to give students practice in using and solving equations. It has many features that make a very valuable tool for introducing and/or maintaining skills:

- In both programs students may choose the range of numerical values that will be included in the equations so that the difficulty may change as their skill increases.
- In **EQUATION SOLVER** the computer secretly generates a random equation, shows the numbers that it used in the equation and the answer and challenges the student to create his/her own equation that uses the same numbers and results in the same answer.
- In **EQUATION DUEL** the student and the computer race to see who will be the first to create an equation from the same set of random numbers.
- Both programs give detailed reports of the student's and the computer's performance in creating and solving equations including time used, score and percentage correct.

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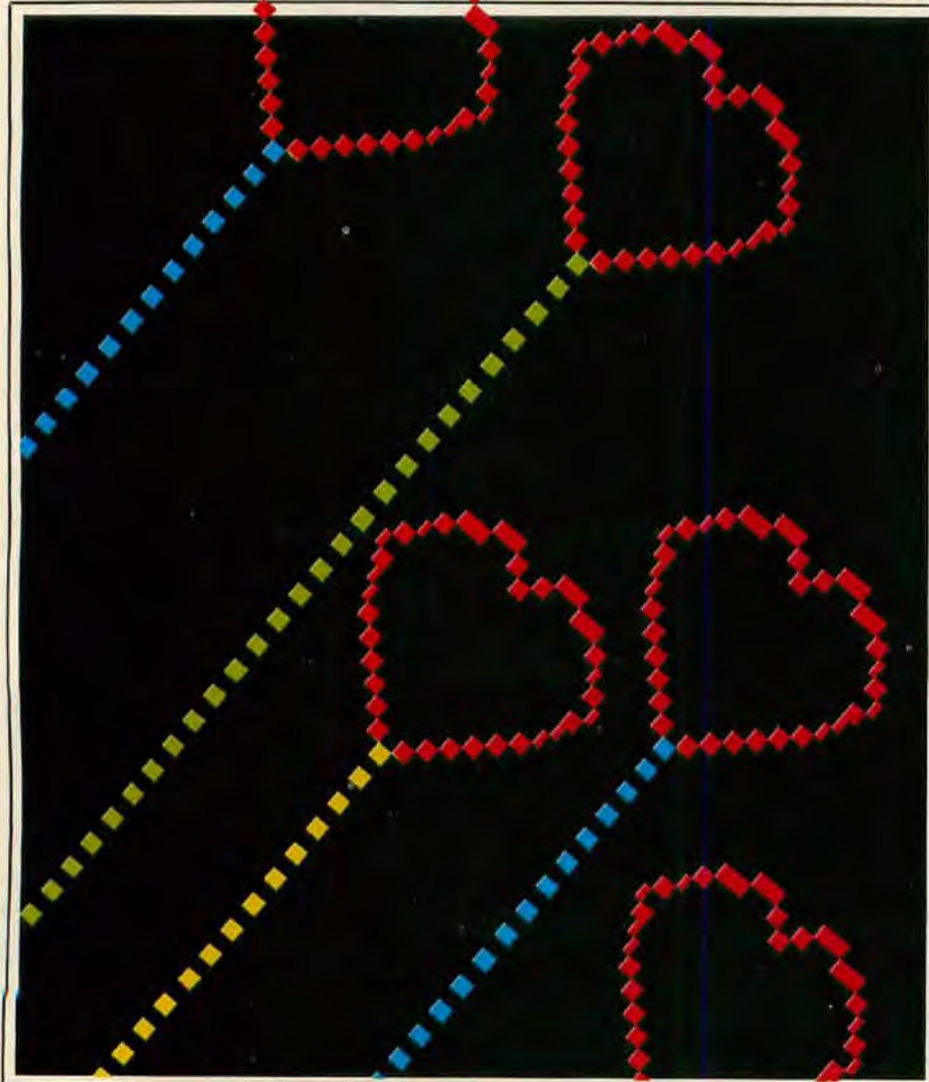
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In keeping with the gentle traditions that put February 14 in the business of love and romance, here's a program to make your heart flutter — it turns CoCo into a . . .



COMPUTER CUPID

By T. Gray



This game will help you sort out your love life and find the girl or boy of your dreams! The teen-tested program was written for a "Wake-a-thon" held at a junior high school. Popular with boys, girls and chaperones alike, *Computer Cupid* was played for hours that night, and has been requested many times since.

Once you are past the cover screen, you will be asked to enter some vital personal information: your name and sex. You must then rate your "ideal" match on a variety of characteristics, following the prompts from the computer (lines 925 on). This standard will be used later on in the program, so it is important you give this some thought.

The characteristics used for the ideal match are based on lists made by junior high school students. The original version of *Computer Cupid* allowed the user to enter characteristics. After consultation with the students, it was revised to make it shorter and simpler. Feel free to change the characteristics as you and your friends see fit (lines 980 through 1045).

On a Scale of 1 to 10

Now comes the fun part. Again following the prompts, enter the names of some potential partners. You can enter as many as you want, but more than 10 takes a lot of time. You will rate each of those potential partners, as you did for your ideal match, with a rank of one to 10 on each of the qualities specified. Should you get carried away and seriously overrate or underrate a person here, the program will let you know about it. The routine that searches for a "perfect 10" asks the user to alert one of our teachers here at Thorsby Junior High, who always claims he won't get married until he meets "the perfect woman." I've left his

(Tom Gray has bachelor's degrees in psychology and education. He teaches science and math at Thorsby Junior High School in Sunnybrook, Alberta.)

name in (Line 1155), but substitute *The Guinness Book of World Records*, or the name of your choice.

A Serious Side

The ratings for each person are now compared with your "ideal." Although some users of this program have made acid comments about the rating system, this section has a serious side. It is based on a method used by counselors to help people with serious life decisions. The client is asked to identify a number of important aspects of the problem, and weigh the seriousness of each aspect. Various solutions are then generated. Each solution is rated as to how well it satisfies each aspect of the "ideal" solution, and the results multiplied by the amount of each rating. The outcome is a score for each potential solution.

These scores have no particular value; they are used by the counselor as a basis for discussion to help with the decision-making process. I have personally used this method in my work and in my life, and have found it helpful.

However, *Computer Cupid* is simply

a parlor game, and is not meant to be anything but entertainment.

Back to BASIC

In *Computer Cupid*, the importance of a given characteristic (the rating on the "ideal") is multiplied by the rating on that characteristic for a given person. The results are added up for a total score for that person. Once all your prospects have been scored, the totals are compared, and the person with the highest score is selected as the best choice.

The name of your chosen one is teasingly and attractively displayed at the end of the program. *Computer Cupid* will be an enjoyable part of your Valentine's Day party, or just for fun the next time you have friends over.

List Of Variables

ANS\$	—	Response in replay subroutine
BL	—	Bottom line
C	—	Screen color
CH\$(X)	—	Characteristic or quality X
CHOICES	—	Name of highest-rated person

F	—	Flag used in weighting
FLAG	—	Flag used in name flash routine
IMP(X)	—	The importance of characteristic X
K	—	Counter in centering subroutine
L,L1,L2,L3,L4	—	Various screen locations
N	—	Rating input
NQ	—	Number of qualities
NT	—	Number of names rated
NS	—	Temporary string storage for centering and name-flash
R(X,Y)	—	Rating of name X on quality Y
S	—	Screen location counter in teaser, counter in save subroutine
Score(X)	—	The weighted score for person X
SBJS,OBJ\$,PSS	—	Subject, object, and possessive form of TSS (e.g., he, him, his for boy)
TS	—	Used to label titles
TIS,T2S,T3S	—	Words used in cover screen
TN(X)\$	—	Target names
UNS	—	User name
US\$	—	User sex (boy/girl)
W,X,Y,Z	—	Miscellaneous counters
WS	—	Title in wait subroutine
XS	—	INKEY\$ marker

120	.....	175
340	.....	95
415	.....	156
540	.....	183
735	.....	23
800	.....	228
985	.....	197
1095	.....	249
1155	.....	162
END	.....	209

The listing:

```

1  *=====
2  *
3  *      COMPUTER CUPID
4  *      VERSION  2.2
5  *
6  *      BY T. GRAY
7  *
8  *=====
9  *
10 *
15 CLEAR 3000
20 GOSUB100 'INITIALIZE
25 GOSUB200 'COVER SCREEN
30 GOSUB300 'INPUT PERSONAL DATA
35 GOSUB400 'INPUT NAMES,
   QUALITIES
40 GOSUB450 'INPUT QUALITIES
45 GOSUB500 'SORT, RANK, COMPARE
50 GOSUB600 'REPORT

```

```

55 GOSUB700 'DISPLAY
60 GOSUB900 'DO IT AGAIN?
65 END
70 '
100 'INITIALIZE
105 DIM TN$(20) 'TARGET NAMES
110 DIM R(20,10) 'RATINGS
115 DIM IMP(10) 'IMPORTANCE
120 DIM CH$(10) 'CHARACTERISTICS
125 NQ=10 'NUMBER OF QUALITIES
130 BL=453 'BOTTOM LINE
135 X=0:Y=0:F=0:T$=""
140 L1=163:L2=178:L3=176:L4=L3+9
   4
145 RETURN
150 '
200 'COVER SCREEN
205 C=RND(8):IF C=4 THEN 205
210 GOSUB 710 'DRAW HEART
215 T1$="computer":T2$="cupid":T
   3$="BY T. GRAY"
220 PRINT@128+32+16-(LEN(T1$)/2)
   ,T1$;
225 PRINT@224+16-LEN(T2$)/2,T2$;
230 PRINT@320+16-LEN(T3$)/2,T3$;
235 GOSUB 1055
240 RETURN
241 '
300 'INPUT PERSONAL DATA
305 CLS
310 PRINT:PRINT"HI, WHAT'S YOUR

```



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```

NAME?"
315 INPUT UN$
320 PRINT"OKAY, ";UN$,"
325 PRINT"ENTER <G> IF YOU'RE A
GIRL"
330 PRINT"ENTER <B> IF YOU'RE A
BOY"
335 INPUT US$:IF LEFT$(US$,1)<>"
G" AND LEFT$(US$,1)<>"B"THENGOTO
325
340 GOSUB980:GOSUB1055
345 '
350 CLS:PRINT:PRINT"NOW IT'S TIM
E TO FIND OUT WHAT"
355 PRINT"YOU LOOK FOR IN A "TS$
"."
360 PRINT"YOU WILL HAVE TO RATE
EACH":PRINT"QUALITY I SHOW YOU":
PRINT"ON A SCALE FROM 1 TO 10.":
PRINT:PRINT"1 MEANS YOU DON'T MU
CH CARE":PRINT"IF THE "TS$" HAS
THAT QUALITY OR":PRINT"NOT. A <
10> MEANS IT IS REALLY IMPORTANT
TO YOU THAT THE "TS$
365 PRINT"HAS THAT QUALITY.":GOS
UB1055
370 CLS:PRINT:T$="YOUR IDEAL "+T
S$:F=1
375 GOSUB 925 ' DISPLAY QUALITIE
S
380 GOSUB1080:RETURN
385 IFF=1 THEN IMP(Y)=N:RETURN
390 IF F=2 THEN R(X,Y)=N:RETURN
395 RETURN
400 'INPUT NAMES, QUALITIES
405 CLS:PRINT
410 PRINT"NOW IT IS TIME TO ENTE
R THE":PRINT"NAMES OF SOME "TS$"
S YOU ARE":PRINT"INTERESTED IN."
415 PRINT:PRINT"RATE EACH "TS$:P
RINT" ON A SCALE OF 1 TO 10":PRI
NT"FOR EACH QUALITY.":PRINT"A <1
> MEANS THE "TS$" IS LOW"
420 PRINT"ON THAT QUALITY, WHILE
A":PRINT"<10> MEANS THE "TS$" H
AS A LOT":PRINT"OF THAT QUALITY.
BE HONEST,":PRINT"FAIR, AND OB
JECTIVE."
425 GOSUB 1055
430 CLS:PRINT"ENTER THE NAME OF
EACH "TS$:PRINT"YOU ARE INTEREST
ED IN.":PRINT"PRESS <ENTER> AFTE
R EACH NAME.":PRINT"PRESS <ENTER
> AGAIN WHEN YOU AREFINISHED.":X
=1
435 PRINT TS$" NUMBER "X
440 INPUT TN$(X)
445 IF TN$(X)=""ORTN$(X)=CHR$(13
) THEN NT=X-1:RETURNELSEX=X+1:GO

```

```

T0435
450 CLS:F=2:FORX = 1 TO NT:T$=TN
$(X)
455 GOSUB 925
460 NEXT X:F=0
465 RETURN
500 'SORT, RANK, COMPARE
505 CLS:PRINT:PRINT:PRINT"I'M CH
ECKING THESE "TS$"S OUT...."
510 FOR X=1TO NT
515 FOR Y=1 TO NQ
520 SCORE(X)=SCORE(X)+R(X,Y)*IMP
(Y)
525 SOUNDNRND(100),RND(5):SOUNDRN
D(100),RND(5)
530 NEXTY,X
535 'RANK
540 W=1
545 FOR C= 2 TO NT
550 IF SCORE(C)>SCORE(W) THEN W=
C
555 NEXT C
560 CHOICE$=TN$(W)
565 GOSUB1055
570 RETURN
600 'REPORT CHOICE
605 S=3:GOSUB1165:PRINT" ARE Y
OU READY FOR THIS?":GOSUB1055

```

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```

610 GOSUB1165:PRINT" THE WINNE
R...":GOSUB1055
615 GOSUB1165:PRINT" THE ONE W
HO COMES CLOSEST TO MEETIN
G YOUR ":PRINT" REQUIREMENTS
...":GOSUB1055
620 GOSUB1165:PRINT" THE ";TS$;
" OF YOUR DREAMS... ";:GOSUB 105
5
625 GOSUB1165:PRINT" IS....":G
OSUB1055
630 RETURN
700 RESTORE:GOSUB705:GOSUB735:RE
TURN
705 X$="":C=0
710 CLS(C)
715 READ X:READ Y:IF Y=255 THEN
RETURN
720 C=4:FLAG=32
725 SET(X,Y,C)
730 GOTO 715
735 K=L1:N$=UN$:GOSUB1225:PRINT@
L,N$:
740 PRINT@L3,"+";
745 K=L2:N$=CHOICE$:GOSUB1225:PR
INT@L,N$;:L2=L
750 PRINT@L4,"true";:PRINT@L4+64
,"love";

```

```

755 GOTO 805
760 DATA 1,9,1,10,1,11,1,12,2,7,
2,8,2,13,2,14,3,6,3,15,4,5,4,16
765 DATA 5,4,5,17,6,4,6,18,7,3,7
,18,8,3,8,19
770 DATA 9,2,9,20,10,2,10,20,11,
2,11,21,12,2,12,21,13,1,13,22,14
,1,14,23,15,1,15,23,16,1,16,24,1
7,1,17,24,18,1,18,25
775 DATA 19,1,19,25,20,1,20,26,2
1,1,21,26,22,1,22,27,23,2,23,27,
24,2,24,27,25,2,25,28,26,3,26,28
780 DATA 27,3,27,29,28,4,28,29,2
9,4,29,30,30,5,30,30,31,6,31,31
785 DATA 32,6,32,31,33,5,33,30,3
4,4,34,30,35,4,35,29,36,3,36,29,
37,3,37,28,38,2,38,28,39,2,39,27
,40,2,40,27,41,1,41,27
790 DATA 42,1,42,26,43,1,43,26,4
4,1,44,25,45,1,45,25,46,1,46,24,
47,1,47,24,48,1,48,23,49,1,49,23
,50,1,50,22
795 DATA 51,2,51,21,51,22,52,2,5
2,21,53,2,53,20,54,2,54,20,55,3,
55,19,56,3,56,18,57,4,57,18,58,4
,58,17,59,5,59,16,60,6,60,15,61,
7,61,8,61,13,61,14,62,9,62,10,62
,11,62,12
800 DATA 255,255
805 X$=INKEY$:PRINT@L2,CHOICE$;:
GOSUB1195
810 X$=INKEY$:PRINT@L2,CHOICE$;:
IF X$=""THEN 805 ELSE RETURN
815 RETURN
900 'DO IT AGAIN OR QUIT
905 CLS:PRINT:PRINT"WANT TO TRY
AGAIN?"
910 INPUT ANS$
915 IF LEFT$(ANS$,1)="Y"THEN RUN
ELSE RETURN
920 RETURN
925 'PRINT QUALITIES
930 CLS:PRINT"RATE "T$:PRINT"ON
EACH QUALITY:":PRINT
935 FOR Y=1 TO NQ
940 PRINTTAB(0)CH$(Y)TAB(27)"";
945 GOSUB960:GOSUB385
950 NEXT Y
955 GOSUB1080:RETURN
960 'INPUT RATING, 0 TO 10
965 INPUT N
970 IF N<1 OR N>10 OR N<>INT(N)T
HEN PRINT"ENTER A NUMBER FROM 1
TO 10":GOTO 965
975 RETURN
980 'SET UP STRINGS, CHARACTERIS
TICS
985 IF LEFT$(US$,1)="G" THENGOSU
B1025:RETURN

```

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```

990 SBJ$="SHE":OBJ$="HER":PS$="H
ER":TS$="GIRL"
995 CH$(1)="PRETTY FACE":CH$(2)=
"WELL-BUILT":CH$(3)="INTELLIGENT
":CH$(4)="SEXY/PASSIONATE"
1000 CH$(5)="THOUGHTFUL AND CONS
IDERATE":CH$(6)="WARM AND LOVING
"
1005 CH$(6)="SENSE OF HUMOUR":CH
$(7)="DELICATE AND FEMININE":CH$
(8)="THE RIGHT HEIGHT"
1010 CH$(9)="RICH":CH$(10)="ATHL
ETIC/LIKES SPORTS"
1015 RETURN
1020 '
1025 SBJ$="HE":OBJ$="HIM":PS$="H
IS":TS$="GUY"
1030 CH$(1)="HANDSOME":CH$(2)="M
USCULAR":CH$(3)="INTELLIGENT"
1035 CH$(4)="SEXY AND PASSIONATE
":CH$(5)="THOUGHTFUL AND CONSIDE
RATE":CH$(6)="HAS A CAR"
1040 CH$(7)="TOUGH AND MACHO":CH
$(8)="THE RIGHT HEIGHT"
1045 CH$(9)="SENSE OF HUMOUR":CH
$(10)="WELL-GROOMED"
1050 RETURN
1055 'WAIT FOR USER

```

```

1060 W$="PRESS ANY KEY TO GO ON"
1065 PRINT@BL,W$;
1070 EXEC44539
1075 RETURN
1080 'CHECK FOR TOO MANY TENS
1085 SUM=0
1090 FOR P=1 TO NQ
1095 IFF=1THENSUM=SUM+IMP(P)ELSE
IFF=2THENSUM=SUM+R(X,P)
1100 NEXT P
1105 IF SUM>(NQ-1)*10 THEN GOSUB
1110ELSE IF SUM <15 THEN GOSUB 1
130 ELSE RETURN:RETURN
1110 CLS:SOUND10,5:SOUND1,10:PRI
NT:PRINT"COME OFF IT!"
1115 PRINT:PRINT"NO "TS$" IS THA
T PERFECT!"
1120 PRINT:PRINT"BE A LITTLE MOR
E realistic THE NEXT TIME Y
OU PLAY!":GOSUB1055:IF SUM=100AN
D TS$="GIRL"THENGOSUB1150:GOSUB1
055
1125 RUN
1130 CLS:SOUND 100,5:SOUND 200,5
1135 PRINT:PRINT"YOU'RE SURE NOT
FUSSY!":PRINT:PRINT"JUST SO THE
"TS$" IS ALIVE":PRINT"AND MOVIN
G, RIGHT?"
1140 GOSUB 1055:RUN
1145 'SUBROUTINE FOR PERFECT 10
1150 FORC=0TO8:CLS(C):FORW=1TO50
:NEXTW,C
1155 CLS:PRINT@32*3,"IF THE WOMA
N really IS ":PRINT@32*5," **
*** A perfect 10 ***** ":PRIN
T:PRINT:PRINT" THEN CALL MR. F
ROST!"
1160 'SCREEN ADVANCE FOR TEASER
1165 CLS
1170 FOR X=1 TO S
1175 : PRINT
1180 NEXT
1185 S=S+1
1190 RETURN
1195 'FLASH NAME
1200 FOR X=1 TO LEN(CHOICE$)
1205 : MID$(CHOICE$,X,1)= CHR$(A
SC(MID$(CHOICE$,X,1))+FLAG)
1210 NEXT
1215 FLAG=- (FLAG)
1220 RETURN
1225 'CENTRE NAMES
1230 L=INT(K+(12-LEN(N$))/2)
1235 RETURN
1240 FOR S = 1 TO 2
1245 MOTORON
1250 FORX=1TO8000:NEXT
1255 CSAVE "CUPID"
1260 NEXT S

```

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Use Imagination And Creativity With Role Playing Games

By George Firedrake and Karl Albrecht

Farewell Art, Hello Karl

Our pages in THE RAINBOW are too few for all we want to do, so we reluctantly drop the development of *Taipan: A Game in Context*. Art Canfil has finished writing the CoCo version of the book and is now working on Apple and Commodore paraphrases. We'll let you know when the CoCo book is published.

As you may know, George Firedrake is also known as Bob Albrecht. He and Karl Albrecht have played together for all of Karl's life. When Karl was three, they decided

"A character is any imaginary person or other creature created according to the rules of a game system . . . We encourage you to design your own team and send them into the labyrinth."

Bob would do the easy stuff and Karl would handle more difficult things. This relationship has worked especially well in the world of computers and fantasy role playing games. Karl is now 16 years old — Bob is somewhat older. No one knows how old George is.

We just received a letter from Rick Loomis, the originator of play-by-mail games. He tells us many of you have sent for *Heroic Fantasy* rules. The more players, the more fun we will have sharing our experiences on these pages!

Into the Labyrinth

We have signed up for *Heroic Fantasy* and sent our first team of Adventurers into the labyrinth. Here they are:

Name	Sex	Code	Kindred	Class*	Potion**	Str	Con	Cost
Ai Khong	M	H	Hobbit	F	H	5	15	5
Frona	F	H	Hobbit	F	H	5	15	5
Mariko	F	H	Hobbit	M	H	4	15	7
Steffi	F	H	Hobbit	M	H	4	15	7
Sheri	F	P	Human	F	H	15	30	9
Zamora	M	P	Human	M	H	10	30	11
Tindil	M	E	Elf	F	H	25	25	15
Leiko	F	E	Elf	M	H	20	25	18
Jonjari	M	D	Dwarf	F	H	30	40	23
TOTALS						118	210	100

*CLASS: F = Fighter, M = Magic-User

**Each character can carry one magic potion into the labyrinth:

H = Healing, S = Strength. We decided to send a healing potion with every character — we want to keep them alive as long as possible!

We'll play two turns a month. We hope to have at least one turn to report to you next time.

Design Your Own Team

We encourage you to design your own team and send them into the labyrinth. Begin by getting the rules for *Heroic Fantasy*. Send \$1 to Flying Buffalo, Inc., Dept. GMA, P.O. Box 1467, Scottsdale, AZ 85252-1467. Be sure to tell them you want the rules for *Heroic Fantasy* — they have several other play-by-mail games.

Last time, we set up a database containing the character type information and showed you two programs to use the information: Scan Character Types and Compute Cost Ratios. This time, we begin developing a simple worksheet program, and challenge *you* to complete it. We'll show you our program (or programs) next time.

Our first worksheet program is simple. With this program, you can design a team having up to 13 characters.

All information is on the screen all the time. When you type *RUN*, this is what you first see:

CH	CODE	CLASS	STR	CON	COST
1			0	0	0
2			0	0	0
3			0	0	0
4			0	0	0
5			0	0	0
6			0	0	0
7			0	0	0
8			0	0	0
9			0	0	0
10			0	0	0
11			0	0	0
12			0	0	0
13			0	0	0
TOTALS:			0	0	0
CHARACTER #? ■					

Yes, we are feeling the pinch of a 16-line screen! Since we want to keep all information about our characters on the screen, we limit the number of characters to 13. We'll use the bottom line of the screen to get information and rewrite the screen anytime incoming information might cause scrolling.

Well, let's start with character #1. We type the number '1' and press ENTER. The screen remains the same except the bottom line which now asks:

CODE? ■ ← You see this on the bottom line of the screen.

The CoCo will accept any valid *KINDRED* code with a single keypress (use *INKEY\$* to get it). Valid codes are:

CODE	KINDRED
F	Fairy
G	Gremlin
L	Leprechaun
H	Hobbit
K	Goblin
P	Human
E	Elf
D	Dwarf
O	Ogre
T	Troll
X	Giant

Ever-patient CoCo will wait until you press a valid code key. Let's type 'P' for human. The screen now looks like this.

CH	CODE	CLASS	STR	CON	COST
1	P		0	0	0
2			0	0	0
.			0	0	0
.			0	0	0
.			0	0	0
13			0	0	0
TOTALS:			0	0	0
CHARACTER #? ■					

← This line changes.

← This line changes.

On the bottom line, the CoCo is now asking for the class of the character.

Valid answers are 'F' for fighter or 'M' for magic-user. Let's make our human a magic-user. We press the 'M' key and see:

CH	CODE	CLASS	STR	CON	COST
1	P	M	10	30	11
2			0	0	0
3			0	0	0
4			0	0	0
5			0	0	0
6			0	0	0
7			0	0	0
8			0	0	0
9			0	0	0
10			0	0	0
11			0	0	0
12			0	0	0
13			0	0	0
TOTALS:			10	30	11
CHARACTER #? ■					

← Our first character!

Our team now has one member, a human magic-user. We have spent a total of 11 points. Let's add character #2, who is an elf fighter.

Type '2' and press ENTER.

Press the 'E' key.

Press the 'F' key.

Now the screen looks like this.

CH	CODE	CLASS	STR	CON	COST
1	P	M	10	30	11
2	E	F	25	25	15
3			0	0	0
4			0	0	0
5			0	0	0
6			0	0	0
7			0	0	0
8			0	0	0
9			0	0	0
10			0	0	0
11			0	0	0
12			0	0	0
13			0	0	0
TOTALS:			35	55	26
CHARACTER #? ■					

And so on until we have the team we want with a total cost not to exceed 100.

- 1) How can you change a character? For example, can you now change character #1 to a human fighter or a hobbit magic-user?
- 2) How can you remove a character? Look again at the database from last time. What do you see in Line 32180?
- 3) How do you get the numbers on the screen to line up as shown above?

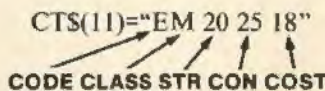
In the next time or two or three, we will show more than one way to write this program. Our first program will use the following subroutine to set up a string array to hold character type information.

```

15000 REM**CHAR TYPE ARRAY SUBR
15005 REM**CODE$CLASS$STR$CON$COST
15010 CT$(1) = "FF 1 1 1"
15020 CT$(2) = "FM 1 1 2"
15030 CT$(3) = "GF 3 4 3"
15040 CT$(4) = "LM 3 4 4"
15050 CT$(5) = "HF 5 15 5"
15060 CT$(6) = "HM 4 15 7"
15070 CT$(7) = "KF 7 20 6"
15080 CT$(8) = "PF 15 30 9"
15090 CT$(9) = "PM 10 30 11"
15100 CT$(10) = "EF 25 25 15"
15110 CT$(11) = "EM 20 25 18"
15120 CT$(12) = "DF 30 40 23"
15130 CT$(13) = "DM 30 40 36"
15140 CT$(14) = "OF 35 40 29"
15150 CT$(15) = "OM 35 40 46"
15160 CT$(16) = "TF 50 50 57"
15170 CT$(17) = "XF 60 60 72"
15180 CT$(18) = "ZZ 0 0 0"
15190 RETURN

```

The array CT\$ contains the information for the 17 character types plus CT\$(18), which marks the end of the array. For example, CT\$(11) is the information for an elf magic-user.



Each string in the array is 11 characters long and contains five items of information, positioned within the string as follows.

Position(s)	Item
1	Kindred Code
2	Class
4&5	STR
7&8	CON
10&11	COST

Positions 3, 6 and 9 are spaces included to make the string more readable by humans. We could have omitted these and packed the information as follows.

"EM202518"

Plunge right in and write the program. Later, think about other ways to set up the CT\$ array. How can you define the CT\$ array using the database from last time (DATA statements in lines 32010 through 32180)? For example, the information for CT\$(11) is in Line 32110.



Hint: Use the STR\$ function.

Who is a Character?

A character is any imaginary person or other creature created according to the rules of a game system. The characters in *Heroic Fantasy* are quite simple. The characters in *Dungeons & Dragons* or *RuneQuest* are much more detailed and complex. Characters in *Adventurer's Handbook* are simplified versions of characters found in the very elegant *RuneQuest* system.

In past issues, you met Aloysious and Rokana. Here they are again, accompanied by two friends, Dernfara and Joleen. We show partial character records for all four characters.

	Aloysious	Rokana	Dernfara	Joleen
Characteristics				
STR	10	9	13	13
CON	11	9	13	11
SIZ	10	9	8	7
INT	12	17	13	13
POW	10	18	4	8
DEX	12	9	17	17
CHA	9	10	6	13
Skills				
Climb	55	65	70	70
First Aid	50	60	50	45
Hide	55	60	75	80
Jump	45	55	60	60
Listen	50	60	50	45
Move Quietly	25	30	45	50
Spot Hidden	30	40	30	25
Swim	20	30	35	35
Throw	45	55	60	60

In many activities, a character has less than a 100 percent chance of success, sometimes *much* less. The numbers across from Skills such as Climb, First Aid and Hide are success percentages. Let's take Jump as an example.

Yes, we know almost anyone can jump. In this case, Aloysious has a 45 percent chance to jump:

- 1) Across a ditch about four meters wide, or
- 2) up, up, and over something one meter high, or
- 3) down from a place four meters high without falling and possibly getting hurt.

If he fails, he falls into the ditch (we hope it is shallow), trips over the something and falls on his face, or lands in a heap while jumping down. He might get hurt doing this and take a few hit points.

In typical game play, success or failure is determined by making a percentile roll using 10-sided dice, giving a random number from 0 to 99. OK, Aloysious, jump that ditch!

Success: Roll 45 or less.

Failure: Roll 46 or more.

A roll of zero is special. It is called a fumble. The GM will prescribe a suitable disaster.

Aloysious is meandering down a path through the forest. He comes to a somewhat deep and fast-moving stream about eight meters wide. There is a large rock showing in the middle of the stream. Aloysious doesn't feel like trying to swim across, so he tries to jump to the rock. He figures he can cross the stream in two jumps.

Roll the dice: zero. Oops! That's a fumble. Aloysious' foot hits the rock and slips off. He bangs his knee, scrapes

his arm, bounces his chin off the rock, and plunges into the cold, rushing water.

The GameMaster solemnly intones "1D6 hit points." We roll 1D6 and get three. His clothing absorbs one point, so we mark off two hit points on his character sheet.

You will find information about GameMaster's Dice in the April, June and August 1983, "GameMaster's Apprentice" articles, including programs to simulate dice rolls on the CoCo.

Rokana, Dernfara and Joleen have higher Jump percentages than does Aloysious. Let's see what happens when the four of them go to the spring festival in Triford.

Early on a spring day, the festival begins — food, drink, music, dancing, contests of skill and luck abound. Our characters arrived at dawn and have already spent two wondrous hours savoring the festival's delights. Now, with some misgivings, they approach the Mud Ditch.

The Mud Ditch is four meters wide and one meter deep. It is filled with gooey mud. In the town of Triford and surrounding villages, it is a matter of honor for youngsters to try the Mud Ditch at festival time.

Joleen, always the most daring, goes first. She tenses, runs toward the ditch, springs, soars, and . . . we make a percentile roll: 57. Joleen's success percentage is 60. She made it!

Reluctantly, Aloysious lines up, urged on by his friends. "Come on, Aloysious, you can do it!" Aloysious sprints toward the ditch and, with a mighty grunt, heaves himself into the air. We roll 38. Alas, Aloysious takes a mud bath.

Now it's your turn. Do Rokana and Dernfara leap successfully across the mud ditch, or does one or the other suffer the fate of Aloysious? You roll the dice or use the CoCo to find out.

	Success	Failure
Rokana	55 or less	56 or more
Dernfara	60 or less	61 or more

Want to Play Our Game?

Do any of you want us to run a small play-by-mail game? In this game, you would run one character like Aloysious or Rokana. You take your character to a festival. Today they are called "Renaissance Faires," but in the world of Aloysious and Rokana they were contemporary fairs.

No previous experience is needed to play our play-by-mail game. Your only costs will be a copy of *Adventurer's Handbook* and some self-addressed, stamped envelopes. If you want to play, send a SASE to DragonFun, P.O. Box 310, Menlo Park, CA 94026. (Our games are rated G, intended as an enjoyable family experience. We encourage non-violence and cooperation.)

ROLE PLAYING GAMES

Millions of people play fantasy role playing games. A role playing game is a game in which one or more players create and play characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), referee, or dungeon master (DM). Most people who play role playing games use a formal rule system. Some of the best known are shown below.

Champions. Hero Games, 92A 21st Avenue, San Mateo, CA 94402.

Dungeons & Dragons (D&D). TSR, P.O. Box 756, Lake Geneva, WI 53147.

RuneQuest (RQ). Avalon Hill, 4517 Harford Road, Baltimore, MD 21214.

Star Trek. FASA, P.O. Box 6930, Chicago, IL 60680.

Tunnels & Trolls (T&T). Blade, P.O. Box 1467, Scottsdale, AZ 85252.

Beginners beware! The rule books are formidable. If you are a beginner, we suggest you start with one of the following books, both from Reston Publishing Company, 1480 Sunset Hills Road, Reston, VA 22090.

Adventurer's Handbook: A Guide to Role Playing Games by Bob Albrecht & Greg Stafford.

Through Dungeons Deep by Robert Plamondon.

In "GameMaster's Apprentice," we include how-to-play information for all beginners.

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Submitting Material To The Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary, explaining how the program works. We're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will send you some more comprehensive guidelines.

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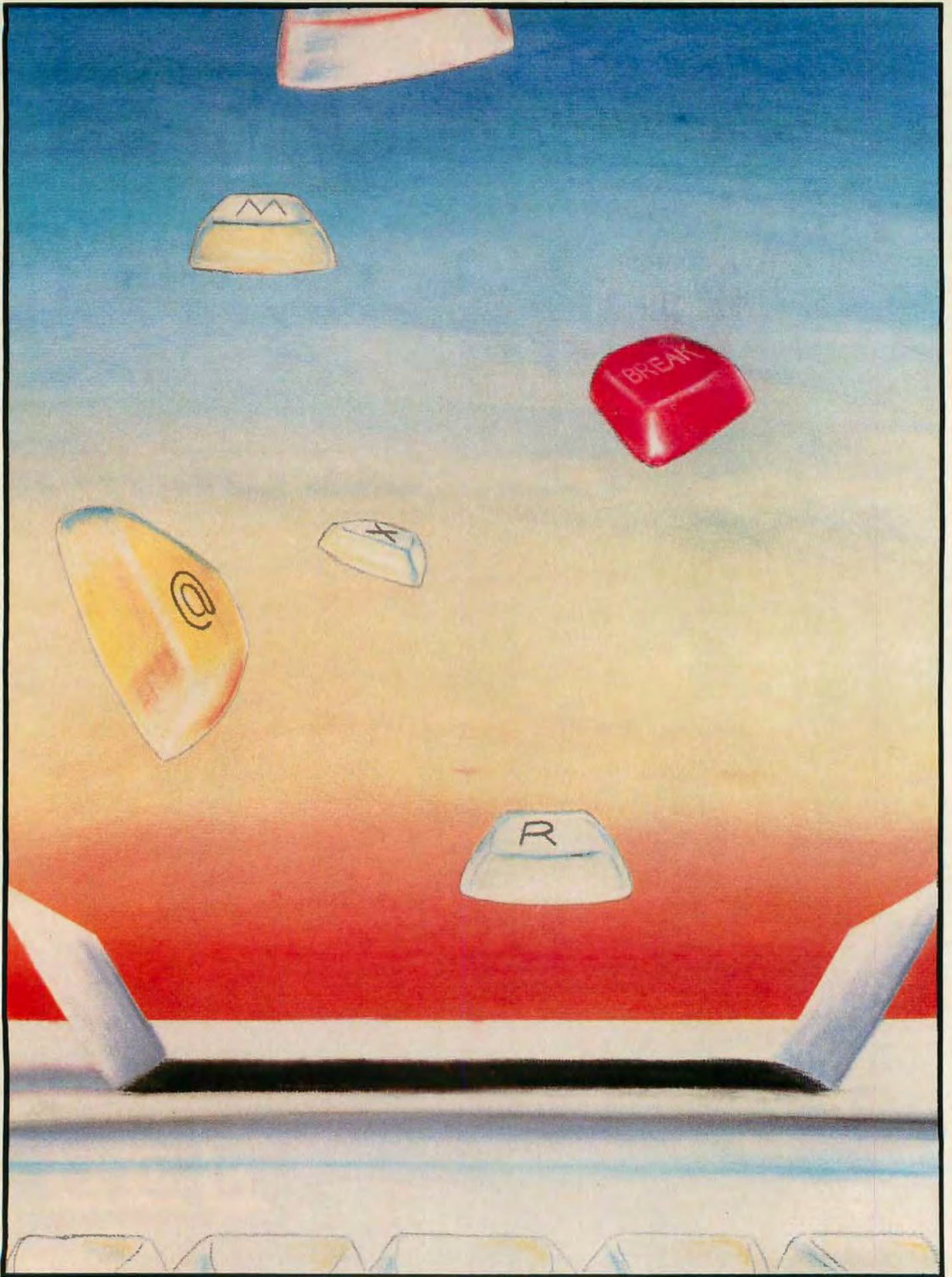


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Enhance Your Keyboard Input With Buffer Stuffer

By Richard W. Rutter

This program consists of a position independent machine language routine designed to greatly enhance your Color Computer's keyboard input capability. Its features include:

- 1) The ability to mask (disable) up to 10 keys.
- 2) The ability to unmask any key that had been previously masked.
- 3) The ability to increase or decrease the size of the input text buffer.
- 4) A resettable right tab key.
- 5) A resettable left tab key.
- 6) A repeat key to allow rapid duplication of any printable keypress, and the ability to either increase or decrease the speed of this repeat function.
- 7) An exchange function that lets you change characters anywhere within the input buffer instead of having to retype the line.
- 8) The ability to edit BASIC text strings using any or all of the above options.
- 9) The ability to apply any or all of the above options to Extended Color BASIC's line statement *EDIT* function.
- 10) The ability to enable or disable the entire program, as needed, by entering the command *EXEC*.

In essence, *Buffer Stuffer* provides the capability to both input and edit command lines and program statements and text strings according to user modifiable specifications.

(Richard Rutter works for a design and development company which specializes in computer-controlled flexible manufacturing systems.)

The program will require 1,536 bytes of storage. It may be offset loaded into either an unused graphics page or behind the string pool. There are two ways to create the program: First, process the Assembly Language Source Code with a dependable assembler, or second, use the Object Code Generator to poke the instructions into RAM and have a complete block of memory saved on either cassette or disk.

If you have a 16K computer, you may need to *PCLEAR 3* to provide room for the Object Code Generator. Also, you should exclude the comments in the Source Code to assure that it will fit within a 16K computer. A detailed description of how these programs function will be provided later.

Remember that the assembler generated version will always need a loading offset value, but the OCG version may not necessarily require one. Here are two loading examples: *CLOADM "BUF.BIN",1536* for Extended Color BASIC or *LOADM "BUF.BIN",3541* for Disk Extended Color BASIC.

After you have loaded it into your computer, enter the command *EXEC*. The program is now "patched" into your computer's line input routine. To verify this, press the down-arrow key. This key is the control key. When you press it, the cursor will flash yellow, reminding you you're in the control mode. Whenever in this mode, you will have nine keyboard command options available. You may abort the control mode by again pressing the control key. Let's look at each of the nine control mode options.

If not already in the control mode, press the control key to activate it. Now press

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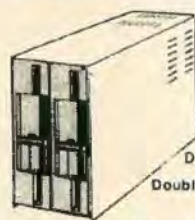
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right-arrow key. You have just sent a right tab. The value of the right tab has been initially set to five blank spaces.

To reset the right tab, press the control key and then press 'R'. You will see the prompt RTAB:. Enter the desired numerical value. Note that only three-digit key presses will be accepted; anything beyond that will be ignored. Non-digit key presses will not be displayed.

If you key in the wrong value or change your mind for whatever reason, press BREAK and the routine will abort without affecting any current values. Take note that there is no backspace function. Use the BREAK option to start over if you should make a mistake. Press ENTER to return the current value. Note that an entry less than one will cause an automatic abort, and all values will remain unchanged. An entry in excess of 250 will be adjusted equal to 250. To verify all of this, experiment with both setting and sending the right tab.

The left tab is the opposite of the right tab. To send one, press control, and then press the left-arrow. The left tab erases a predetermined number of

characters. To reset the left tab value, press control and then press 'L'. You will see the prompt LTAB:. Enter the desired value in precisely the same manner as you would set the right tab.

You may change the buffer size by pressing control and then pressing 'B'. The prompt BUF: will appear. Enter the desired buffer size, one to 250. The buffer size determines how many characters may be entered into the current line. It is difficult to overstate the usefulness of this option.

Now let's try masking a key. Press control, then press 'M'. You see the prompt MASK:. Press whatever key you wish to mask. To verify that the key is masked, try pressing it; any key that is masked will be completely ignored. The main purpose of the mask option is to prevent the loss of data from an accidental key press. You will almost certainly want to mask the BREAK and CLEAR keys. Also, the "line erase" SHIFT-left arrow and ENTER keys are prime candidates for masking.

It is fitting that an unmask option be available. Press the control key, and then press 'U' and you will see the prompt UNMASK:. Press whatever key you wish to unmask. To verify that

it is unmasked, press it. You normally would not press keys such as BREAK, ENTER, and CLEAR to test for mask status, for obvious reasons. Also, note that two keys are not completely maskable. If you mask the control key, it will still allow access to one control option, the unmask function. If you mask the 'U' key, it will still respond to an unmask request.

Another feature is the repeat key option. To try it out, press any printable key and press SHIFT-@. The current character will begin to duplicate itself and will continue to do so until you press a key to stop it, or either the beginning or end of the buffer is reached. You may also use the repeat key to repeat delete (left-arrow, SHIFT @).

It is a good idea to use the repeat key to stop and start the repeat process so you will be able to interact with it more swiftly. Practice using the repeat key to familiarize yourself with it.

The speed of the repeat process may be increased or decreased. Press control, then press 'S'. You see the prompt SPEED:. Enter the desired value from one to 250. A setting of one will give you the fastest speed, while a setting

star

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