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The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month’s RAINBOW ON TAPE, ready to LOAD and RUN. For full details, check our RAINBOW ON TAPE ad on Page 89.

NEXT MONTH: As autumn ushers in its picturesque brilliance, THE RAINBOW blends into the season with its Graphics issue. You'll see the smoothness and speed of animated graphics with Digital Aquarium, a fascinating representation of "life in a fish bowl," and "CoCo Gallery" will present its usual vivid display. For hardware enthusiasts, October marks the debut of a new RainbowTech column by Dennis Kitaz. For practical users, longtime contributor Richard White continues his spreadsheet tutorial in "Accessible Applications." There'll be games to test your wits, down-to-earth programs for serious use, and a complete update on "CoCo Clubs." Also, a nationwide directory of CoCo Bulletin Board Systems.

Experience October's multicolored RAINBOW! We've got more information for your Color Computer than any other source.
No Obligations Required

Editor:
F.C. Caswell complained about programs that don't work on disk systems. He specifically pointed out Michael Repasy's program "Run For Your Life" [April 1985, Page 18]. He said, "If Mike wants me to use (or sometime, buy) his programs, he should write them for disk users and include a tape modification." I have a disk system, also, but I must try to see Mike's side, too.

Maybe Mike doesn't have a disk system. He can't very well write programs for a disk system if he doesn't have one, can he?

Secondly, programmers who send programs to a magazine do it as a favor to the readers, not a responsibility. He had a good program, so he shared it with all of us. He's not obligated to make it satisfy everyone.

If you have any further comments, write me at Route 3, Box 120-A, 29630.

Chris Cope
Central, SC

Using CoCo to Close the Gender Gap

Editor:
I have been a devoted fan of yours since purchasing my first CoCo. I have since done my own 64K upgrade (with chips ordered from one of your ads). I have taught my 4-year-old daughter where the letters are on the keyboard (using Early Games ordered from one of your ads).

I also am now the computer teacher in our school since I learned enough on the CoCo to take over the job.

Just wanted you to know that there is at least one woman who uses CoCo and THE RAINBOW constantly. And I don't have a recipe or a checkbook program!

Sandra Roosa
Stone Ridge, NY

The Powers of CoCo

Editor:
I am writing to tell you how much I enjoy your magazine. I am a computer repair technician and I work on 32-bit super minicomputers; I feel the power of the CoCo is just as good as those larger machines. The graphics and basic processing properties of the CoCo are very easy to understand, which makes the programming of this machine a breeze as compared to the larger system.

A big part of the understanding of the CoCo's power was due in large part to your magazine. The programs and projects are well-documented and the reviews section really gives me an idea of how different programs can be used for my various needs.

Again, thanks for the great magazine and keep up the good work you have been doing.

Donald F. Saunders, Jr.
East Brunswick, NJ

Editor:
Your January "Beginners Issue," with its multitude of short programs and continuing "One-Liner Contest," is a hunt-and-peck typist's paradise!

Two requests for your readers: 1) Is there anyone out there with a program to keep track of all these magazines? 2) How about a CoCo users group in the York-Hanover area? Write me at 509 Delone Ave., 17344.

I've looked at other magazines, but I cannot find anything "over" THE RAINBOW!

Douglas B. Klunh
McSherrystown, PA

'Round and 'Round We Go with RND

Editor:
I can see poor Daniel Pardue of Gretna, La., taking your advice in the July 1985 [Page 8] issue concerning the RND function. It seems he was told that RND(1) returns a number between zero and one and that simply changing RND(0) to RND(1) would solve his problem. Wrong! Picture his frustration. RND(1) will always return a value of one. The lines he specified containing the RND function, N=INT(1945*RND(0)+1) and X=INT(10*RND(0)) will work without modification because RND(0), not RND(1), returns values between zero and one. Anyone wishing a detailed explanation can send me a SASE; my address is P.O. Box 385, 29556.

Also, to everyone with valuable disks containing I/O errors: You may have noticed that the Disk BASIC BACKUP command will not copy a problem disk onto a good disk. Any salvaging must be done file by file, which is very time-consuming. I have written a program called Mirror Image which will back up any disk, even those with I/O errors, onto a good disk. With this program, parts of programs and data files can be salvaged that would have been previously lost because of I/O errors.

To receive your free copy of this program, send me one blank, formatted diskette (Disk BASIC compatible) and $2 to cover the return postage.

If anyone has heard of a reasonably priced ($15-$20 range) PMODE 4 screen print program for the Apple Imagewriter, please let me know!

I also have collected quite a stockpile of old RAINBOWS and a few other magazines. These magazines contain megabytes of useful CoCo information (BREAK disable, printer baud POKEs, faster disk drive operation, POKEs for long life in video games, etc.). If there is something in particular you need to know how to do, I'd love to help you! Just send me the problem and a SASE (or call me at home 8-10 p.m. Eastern time Monday-Friday at 803-354-7073) and I will try to help out.

And, of course, to the staff of THE RAINBOW: You produce the best and, in my book, only CoCo magazine around! Keep up the good work!

Joey Staton
Kingstree, SC
Good News/Bad News

Editor:
I enjoy RAINBOW ON TAPE very much. I have some good news and some bad news. The good news is that my mom is letting me subscribe to RAINBOW ON TAPE! The bad news is I have to pay $20 of the subscription. So as soon as I earn enough money, you'll get my order. Thanks again.

Tim Paulhus
Utica, MI

Speaking in ECB

Editor:
When I added a disk drive to my Color Computer system, I encountered the same problem reported by David B. Lamon in "Letters to Rainbow" [Page 7] in the June 1985 issue. My son has Cookie Monster's Letter Crunch (Radio Shack Cat. No. 26-2526), which is an educational game designed to run on a cassette-based 16K Extended Color BASIC system. The program will not run unless the disk controller is removed.

After studying memory maps and ROM listings, I have come up with the following method for reverting from Disk Extended Color BASIC to Extended Color BASIC:

1) Copy ROM to RAM (requires 64K) and switch to all-ROM mode.
2) POKE &H134,0;POKE &H139,0
3) POKE &H000,0
4) EXEC &H002

Step 1) Causes BASIC to be executed from RAM where it can be modified. If one has J&M's JDOS, merely use the RAM command.

Step 2) Nullifies the Disk BASIC token tables. This step is not required to run Cookie Monster's Letter Crunch, but is required if one wants to be able to get back to Disk Extended Color BASIC without turning off the computer. If the Disk BASIC token tables are not nullified, Extended Color BASIC reserved words, such as PEEK and POKE, cannot be tokenized properly.

Step 3) Causes the Extended Color BASIC initialization routine, when executed, to fail the test for the presence of the disk ROM and, therefore, bypass Disk BASIC initialization.

Step 4) Invokes the Extended Color BASIC initialization routine, setting the required memory map. The Extended Color BASIC start-up message appears when Step 4 is performed.

In order to make it easy for a child to revert from Disk Extended Color BASIC to Extended Color BASIC, I would suggest incorporating the four steps into a program which can be loaded and run from disk, as follows:

<table>
<thead>
<tr>
<th>Memory Address</th>
<th>ASCII Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000 - 003F</td>
<td></td>
</tr>
<tr>
<td>0040 - 00FF</td>
<td></td>
</tr>
</tbody>
</table>

If one does not have JDOS, a more complicated procedure would have to be substituted for Line 10:

10 TO return to Disk Extended Color BASIC without turning off the computer, enter the following:

1) POKE &HFFDE,0
2) POKE &H?1,:EXEC &H?02?

Step 1 returns the computer to the ROM/RAM mode and Step 2 performs a "cold start." Note that this procedure is good for any application which requires the memory map and function of Extended Color BASIC.

David A. Lynde
Arlington, MA

HINTS AND TIPS

Editor:
The program Disk Merge in your February 1985 issue [Page 175] is excellent. The additions on Page 8 of your May 1985 issue make it even better, but if you wish to select programs from several disks then it is necessary to keep running the program and selecting the drives.

The following lines allow using the BREAK key without the drives running. Further, they allow the choice of using multiple disks and remind you which drive you have selected as the source drive.

229 BS=INKEY$:IF BS="" THEN 220
221 IF BS<CHR$(13) THEN 220
560 'ANOTHER DISK?'
570 GOTO 700
700 PRINT@359,"END OF THIS DISK"
710 PRINT@422,"PRESS ANY KEY"
720 EXEC44539:CLS
730 PRINT@67,"ANOTHER DISK? Y/N"
740 BS=INKEY$:IF BS="" THEN 740
750 IF BS="Y" THEN 760
760 IF BS="N" THEN 600
770 GOTO 740
780 CLS:PRINT@132,"INSERT NEXT DISK";PRINT@164,"IN DRIVE ";$596 GOTO 210
800 CLS:END

Now the program allows you to very easily make a special disk from your file of disk programs.

R. (Dick) Thwing, Sr.
Columbus, NC

Of Printouts and Praise

Editor:
I thought I'd write to pass on some information. To get a nice printout of your BASIC listing, use your word processor and the global change function. Change all the colons to a carriage return and five spaces. The result is a great looking listing. You can use all the functions of the word processor such as pagination, headers, etc. Of course, the program must be saved in ASCII format before loading into the word processor.

Also, the new CoCo 2 slim-line drives from Radio Shack are capable of 40 tracks and six ms step rates (by modifying Disk BASIC) without any I/O errors. They also appear to be capable of double-sided operation with the addition of another read/write head, and using an optical sensor for the head stop eliminates the "head banger" problem and keeps the head in alignment.

These drives also are much quieter than the older drives; they seem to read the disk faster, possibly with only one pass, and the rotation speed is better controlled. The disk RPM never increases more than .2 RPM, even after hours of intensive use. I can't wait to get Drive 1, which just plugs in. Radio Shack has come out with a winner!

Mark D. Griffith
Fort Myers, FL

Choose Your Color

Editor:
The Gemini screen dump program in the May 1985 RAINBOW [Page 18] was interesting but it can be easily improved. As it stands, it will only correctly copy a picture in PMODE 4 with a light background. With a few changes, you can make it copy either a PMODE 3 or 4 picture with any color background.

The changes needed are to add lines 5 and 6 and change lines 10 and 1000-1030:

5 CLS:INPUT "PMODE 3 OR 4:"
6 INPUT "BACKGROUND COLOR NUMBER 0-8:B"
10 PMODE 1:1:SCREEN1,1
1000 T=0:P=POINT(X,Y):IFP<>B THEN T=T+2
1010 P=POINT(X,Y+1):IFP<>B THEN T=T+4
1020 P=POINT(X+1,Y):IFP<>B THEN T=T+4
1030 P=POINT(X+1,Y+1):IFP<>B THEN T=T+4

By incorporating these changes, you are asked which PMODE you wish to use and the background color. The one drawback is that you can still only use two colors. Any color except the background color can be printed, but it will only be black on the paper.

Robert Toscani
Philadelphia, PA

Guide has Excellent Information

Editor:
The 1985 Radio Shack Semiconductor Reference Guide has a very good section on the chip used in the S/SC. Pages 109 to 116 have an incredible amount of information not found in the S/SC manual, such as allophone dictionaries and linguistic principles.

Reed Darsey
Mobile, AL

Any Key, Same Program!

Editor:
I'd like to thank the readers for sending in helpful hints for the CoCo. Now I have a little hint to help them. Instead of typing in this long line: (line number) BS=INKEY$:IF BS="" THEN (back to same line), try this in place of it: (line number) EXEC 41172.

It will have the same results. Just press
my key and ta-daa! You are still in the same program.

Mark Clements Woodbridge, VA

Editor's Note: Similarly, Mark, try EXEC44535. See this month's "Downloads" (Page 236) for more information on this.

Editor:

As a brand new CoCo user, I was immediately referred to RAINBOW by family and friends. My first issue was January 1985, and your cover is extremely applicable to our house! We solved part of the problem by connecting "Alex" up to a small black-and-white console. It is much easier on the eyes while I am trying to learn programming, and frees the color TV for the kids.

While I am crazy about THE RAINBOW, and spend hours pouring over ads and articles, I do have a request. Please remember there are lots of us out here who are new to the CoCo and to computers in general! I feel lucky if I understand one word in 10. How about a dictionary of terminology? Or at least remind each author to define abbreviations upon first usage in each article? It would help a lot of us catch on more quickly. (Thank you to Wayne Day for doing just that! I finally know what SysOps and SIGs are!)

Another thank you to the Albrechts. My first copy of Dragon Smoke arrived, and the penned-in comments let me know they not only read my letter, but understood, sympathized and want to help.

I would also like to commend our local Radio Shack manager, Greg. I have driven him crazy with questions and made every mistake possible. He has never yet lost his sense of humor — or his patience.

Thank you Radio Shack and thank you RAINBOW. Even in my frustration I'm having a great time!

Vicki Daubner Concord, CA

KUDOS

Editor:

Please let me congratulate you on RAINBOW's fourth anniversary. I have been a subscriber to your magazine only a short while, but having seen several of the other computer magazines, believe me you are "head and shoulders" above them all. I really look forward to receiving each issue, and, while I go over every page of it many times, I particularly enjoy the One-Liners. My computing is strictly a hobby and I spend many enjoyable hours at the keyboard.

Jim Oakley, Nashville, TN

Ubiquitous Users

Editor:

I vigorously support the theme of Jim Reed's editorial (April 1985, Page 16). Sure, many CoCo buyers are hackers and/or hobbyists at first. But (at the risk of offending many) most of us eventually grow up and tire of playing games, then the CoCo shines as an appliance. We have two, one for home and the other for the office.

I know little about programming and have no interest except as required to get the machine to produce the results I want or need. (Ed Eiler's rundown of stuff to fix my Telewriter-64 is great.) FLEX, OS-9 and memory maps are no more interesting than the elastomeric properties of a pneumatic tire to a truck driver. To me, a computer is like a chainsaw to a woodsman.

Tandy has sold the CoCo as a game machine and much of the third party marketplace approaches the machine from the hacker/hobbyist viewpoint. So people don't see it as a "real" computer. I just brought my second CoCo home — my company finally entered the computer age and put HP-150s in our offices! They spent more for the software for each office than my entire system cost. The HP is a fine machine and software like Lotus 1-2-3 is the "right stuff," but few will really use 640K of RAM for ordinary business applications. What a shame we didn't buy CoCos!

And last, to software vendors: I don't even consider copy-protected material. We vigorously protect your copyright interests, but have no interest in playing dumb games in order to have your program on a working disk (which, of course, crashes from time to time).

William Sill Tunkhannock, PA

Made Our Day

Editor:

I would like to compliment you and everybody involved with the publication of
to ask for information on light pens. I have seen advertisements in your magazine for them, so I decided to be creative and try to build my own before I purchased one. I have a fair idea of how I would do it, but there is one missing piece: the location(s) in memory where I can find the coordinates for the television's scan line. Can you help me?

Also, I noticed a few people wrote in the June 1985 issue about a PMODE 4 screen dump for Radio Shack (DMP) printers. I have written one and will gladly share it with anyone interested. For a copy, send a SASE and cassette or disk (formatted) to me at 144 Westminster Square, 53402.

Matthew Thomas
Racine, WI

Editor's Note: See “Why Not Build A Light Pen” on Page 90 of the April 1983 issue.

Building the Family Tree

Editor: I am one of thousands of breeders who has bought a computer specifically for the purpose of tracing pedigrees. What is needed, however, is a program designed to print out a basic pedigree chart, including the animal’s name in the places designated. Because many breeders line breed, the same animal can be repeated several times in a pedigree of any length.

Do you know of anyone who puts out a program for tracing pedigrees, or of someone who can modify a program I have made for a Model III to work on a CoCo? Write to me at 216 Orleans Street, Canada E1A 1W9.

Debbie Wilson
Dieppe, New Brunswick

Information Please

Editor: Does anyone out there know of a complete statistical analysis program (oriented to sociology decision) for a 64K cassette-based Dragon (or CoCo; I have DECODE from CompuServe, U.K.)? I am a professor in a college. Please write to me.

Julian Colina
Costa del Sol, 16, 28033 Madrid Espana (Spain)

A Little Light Construction

Editor: I am an avid CoCo hobbyist who reads THE RAINBOW every month. I am writing
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Here at THE RAINBOW, we have been part of a large number of “firsts” in the Color Computer marketplace, but this month I would like to announce what may well be one of the most significant “firsts” of all.

Beginning with the October issue, THE RAINBOW will fulfill subscriptions to Under Color, the CoCo magazine which, since last year, has been published by Dennis Kitsz and edited by Debra A. Marshall.

Why is this a first? It is simply because, for the first time, readers of a Color Computer magazine which is ceasing publication will get full value received for their money paid. In this case, all Under Color readers with one-year subscriptions will receive the last three months of their term through THE RAINBOW. (Under Color subscriptions, like thoroughbreds, all were “born” on the same day. When you subscribed to Under Color, you were sent a whole set of back issues.) Those who subscribed to Under Color for two years will receive a cash refund for the additional year. Those of you who already subscribe to THE RAINBOW and who subscribed to Under Color as well will receive an additional three months tacked onto the end of your subscription to THE RAINBOW.

Contrast this, if you will, to several other Color Computer magazines which have gone out of business. One simply stopped publishing; the other “fulfilled” with a magazine which runs one monthly article on “TRS-80 Computers.”

This, I happen to know, was one of the things which concerned Dennis Kitsz most of all in making a decision to cease publication of Under Color. It is a mark of Dennis’ concern for people that they get fair value received for their good money paid to him for Under Color.

Dennis’ other concern was that those many persons who subscribed to Under Color to read his articles would still be able to do so. To that end, Dennis joins our staff at THE RAINBOW and we will be adding his column to these pages on a monthly basis. Debra Marshall, who has a wealth of experience in Color Computer editing, will edit Dennis’ columns — as she has for several years — and will also be involved with some additional assignments from time to time.

This arrangement is particularly satisfying to me, since we’ve been trying to attract Dennis to these pages for quite some time. At the same time, I am very pleased that a top-notch editor such as Debra will have an association with us, too.

Most important, however, is my feeling — and yours, too, I believe, whether you are directly involved or not — of appreciation to Dennis Kitsz for his personal concern in this entire project. It would have been easy for Dennis to “walk away” from it all; it would have most likely been more financially rewarding for him to “sell” his mailing list to a non-related magazine; or it would have been convenient to “string things along” for a while.

What prevented Dennis from doing any of these things is his personal integrity, regard for people and feeling for the CoCo Community in general. That certainly deserves plaudits from us all. I am proud that we can be a part of this, but I am even prouder that our CoCo Community has as a citizen someone like Dennis Kitsz.
The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. Telewriter gives you 51 columns by 24 lines with true lower case characters. So a Telewriter screen looks like a printed page, with a good chunk of screen text than you'd get with Apple II, Atari, T1, 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.

**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 x 24 and 85 x 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 x 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, Terminet, etc.).
- **Embedded control codes** give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dots, 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 multiline 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-reverse 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.

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Apple II is a trademark of Apple Computer, Inc.; Atari is a trademark of Atari, Inc., TRS-80 is a trademark of Tandy Corp. MX-80 is a trademark of Epson America, Inc.
The Model 101 is a serial to parallel interface intended for use with a COCO and any Centronics compatible parallel input printer. The 101 has 6 switch selectable baud rates (300-9600). It comes with a “UL” listed power supply that can be unplugged from the interface if your printer supplies power (Most do). The 101 is only 4” x 2” x 1” and comes with all cables and connectors for your computer and printer.

MODEL 102 SWITCHER 35.95
The Model 102 has 3 switch positions that allow you to switch your computer’s serial output between 3 different devices (modems, printers or another computer). The 102 has color coded lights that indicate the switch position. These lights also act as power indicators to let you know your computer is on. Supplied with the 102 are color coded labels that can be applied to your accessories. The 102 has a heavy gauge anodized aluminum cabinet with non-slip rubber feet.

MODEL 103 COMBO $55.95 73.50
With the turn of a knob the model 103 switches your computer’s RS232C serial port to any one of 3 outputs — 2 serial and 1 parallel. The serial ports may be used for modems, serial printers or even another computer. The parallel port can be used with any Centronics compatible printer. The 103 has the best features from the 101 and 102: color coded position indicator lights, 6 switch selectable baud rates, heavy anodized aluminum cabinet, “UL” listed power supply and many more.

The Model 101, 102 and 103 will work with any level COCO basic, any memory size 4K-64K and are covered by a 180 day warranty.

We manufacture these products. Dealer inquiries are invited.

Cassette Volume Settings

Although Tandy recommends a volume setting of ‘5’ for their CTR-80 and CCR-81 recorders, we’ve found that a volume setting of ‘3’ is actually more reliable. (The CCR-82 has a special preset level feature, but you might want to switch it out and set the volume to ‘3’ as well.)

If you don’t have a Radio Shack recorder, here’s a quick way to set the volume control. Type AUDIO ON: MOTOR ON and ENTER, and play a regular audio cassette on your recorder. Adjust the recorder volume so the sound comes through the TV set’s speaker without distortion. (If you find this setting doesn’t work well, try turning the volume down.)

— Lonnie Falk
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Please hire the mentally retarded. They are sincere, hard working and appreciative. Thanks! Phyllis.
To be, or not to be, that is the question.

Jim Reed, 1985

- Who's kidding whom, Jim. Those are Bill Shakespeare's words, not yours.

Shucks, you got me. Perhaps the two most compelling reasons that Shakespeare is so often quoted are that 1) he did have a way with words, but also 2) somebody is bound to call your hand if you try to pass off his words, such as these from Hamlet, as your own.

- Methinks there is CoCo relevancy in this somewhere.

Yes. One of the thorniest questions we deal with here at THE RAINBOW and her sister publications goes something like this: "How much do I have to alter the program (or subroutine) I based mine on in order to call it my own?" Usually, the answer is "a lot more than you have." Indeed, a better question might be, "How much do I have to put into this program in order to earn a share of the credit?" There's no black and white, but rather a wide gray area to such questions. You can usually feel pretty confident once your concern shifts to whether someone else will credit your work or call it their own. Just remember the golden rule.

- You mean it's simply a matter of conscience?

Not entirely. You might find yourself in court if someone feels you've encroached on his rights.

- But, how can you be sure when someone submits something to THE RAINBOW that the work is original?

Well, we don't do a line by line comparison with every bit of code that's ever been written. Rather, we require an author to sign a contract that stipulates, in part: "Author warrants that the program described herein is his own original work or that he has title to the work. Author agrees that he shall have sole responsibility, at author's expense, for any claims relating to the program or its components, in whole or in part, by others." We like to think our contracts are signed only after due deliberation.

- Yes, I believe one would think twice before signing that. Obviously, just typing in a program from a listing in THE RAINBOW doesn't make it your own.

Maybe it's not so obvious. You'd be surprised at how many people seem to think that once they've typed in a listing, it is theirs. Not so; it is still protected by the copyright and is for the single end use of purchasers of the RAINBOW only. If you sell a copy, or even give it away, you are violating the copyright and breaking the law.

- Now, that brings us a related matter. My CoCo club has a subscription to RAINBOW ON TAPE. So, can I use it in good conscience?

Use it, yes. Copy it, or portions from it, no. While we encourage clubs to subscribe, in order that members can examine the club's copies, to decide whether to type in a program or purchase a copy of their own, we do not condone members making copies of our product any more than any of our advertisers would approve of their products being reproduced without permission.

- What if I download a RAINBOW program from a bulletin board system. Is it mine, then?

Of course not! The copyright still applies. Almost daily, we get letters saying, "I'm starting up a BBS. Is it OK for me to put RAINBOW programs on my download section?" While we are flattered, we politely, but firmly decline. Ours is a copyrighted, commercial product. I'm reminded of the appliance salesman on TV who proclaims, "I'd like to give them away, but my wife won't let me." Not only do we need to pay the rent here at THE RAINBOW, but we have a responsibility to our authors to preserve the integrity of their copyright. RAINBOW ON TAPE - like the magazine - is for the individual use of the purchaser only. With the sole exception of CompuServe, which markets RAINBOW programs through a license from us, no BBS or network should have any RAINBOW programs, of any vintage, available for downloading. We would appreciate information about any abuse of our copyright.

- In summary, then, while the temptation to copy published software is great and the opportunity is ever present, we must learn to respect the property rights of others.

Someone before me said it best. In the properly attributed words of Thomas Babington Macaulay, "The measure of a man's real character is what he would do if he knew he would never be found out."

- Any final comments?

Well, if everyone subscribed to RAINBOW and its adjuctive RAINBOW ON TAPE, the problem would be solved, wouldn't it? You can quote me on that.

— Jim Reed

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THE RAINBOW September 1985
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Become A Math Whiz!
(Robo’s Depending On It)
By Leonard Hyre

An educational program designed to keep a youngster’s interest, Robomath allows basic math skills to be learned. By giving the child an exciting and challenging goal (the rescue of “Robo”), the correct answers take on a more important meaning in the student’s mind. I have tried to take advantage of the color and sound power of the CoCo to add a more arcade-like presence to the action.

The scenario for Robomath is simple. Robo, the friendly robot, is stranded on a strange and desolate planet. Naturally, we all want to aid in his rescue; there is a catch though. The rescue ship must send down fuel for Robo to use to blast off!

The user must provide the correct coordinates in order for the fuel to reach its destination. These are provided by answering the math questions when they are given. A correct answer adds to Robo’s fuel supply; an incorrect one results in air being added to the tank. If the air valve reaches the top, the mission is aborted and all fuel is lost. However, a successful mission results in the arrival of a rescue ship and Robo’s blasting off to safety.

User options for addition, subtraction, multiplication and division are given for better tailoring to the individual child’s level of mathematical progress.

Program Structure
Robomath has some programming features which you may find of interest in your own programming needs. Following is a breakdown of the general flow of the program along with some of the programming methods.

Lines 80, 1020-1390: This section includes a title screen and parental instructions. I have always been a sucker for an entertaining title screen, so I usually put some time and effort into the opener. Using two of CoCo’s commands for the main structure, STRING$ and PRINT$, we build the title “Robo” and scroll it into position. These two powerful commands are taken for granted by CoCo owners, while in truth, users of much more expensive machines have nothing to match them!

Leonard Hyre is the author of Federal Hill Software’s Handicapper series and a number of articles for RAINBOW. He also published several articles in RAINBOW’s sister publication SOFT SECTOR, for Sanyo computers, and is the author of Sanyopoly, a new Sanyo game from Michigan Software.)
After display of the title, the user is offered an opportunity to receive on-screen instructions. If selected, lines 1310-1390 are used to explain the scenario. If not, the program executes a RETURN command to Line 90. Line 90 is then used to call two more subroutines.

Lines 740-1000: Utilizing ECB's DRAW command, we set up a series of strings to give Robomath the necessary letters and numerics for Hi-Res applications. These strings have been gleaned from my collection of RAINBOW magazines, modified and picked over dozens of times for my own use.

Lines 590-720: Now to the business of drawing the main screen in preparation for play. I like to see a screen ready for action the first time it is shown, so the SCREEN 1,0 command is saved till just prior to a RETURN for action statement. You might want to examine this screen as it is being drawn at various stages. You can do this by adding a temporary line such as:

625 SCREEN 1,0
626 GOTO 625

This stops the graphics creation at Line 620 for your examination. When done, just DEL 625-626 and go on. This is a handy way of examining any BASIC program you may wish to learn graphics techniques from.

A Final Word

I believe Robomath will be a valuable software addition to those users looking for educational tools for the family or school.

If you are a reluctant typist or don't have RAINBOW ON TAPE, I will be glad to provide a copy on cassette. Just send $4.50 with a request for the program to me at P.O. Box 403, Cambridge, MD 21613.

The listing: ROBOMATH

10 "***********************
20 ' ** ROBOMATH *
30 ' COPYRIGHT 1985 *
40 ' ' LEONARD HYRE *
50 ' ' CAMBRIDGE MD *
60 ' '********************
70 'CLS:F$=185;FW=185;TM=0;TN=0
80 GOSUB 1920
90 GOSUB 7490;GOSUB590
100 REM
105 IF MA=4 THEN 271
110 FD=RND(9);SD=RND(9);IF MA=2 THEN SD=RND(FD)
120 FD$=STR$(FD);SD$=STR$(SD)
130 B$=NU$(VAL(FD$))
140 DRAW"BM88,50;C3;S4;XB$;"
150 FOR X=1TO300:NEXT

160 IF MA=1 THEN DRAW"BM113,50;C3;BR6U12BD6BL6R12"ELSE IF MA=2 THEN DRAW"BM113,50;C3;BU6R12"ELSE IF MA=3 THEN DRAW"BM113,50;C3;E12BG6BH6F12"
162 IF MA=1 THEN RA=FD+SD ELSE IF MA=2 THEN RA=FD-SD ELSE IF MA=3 THEN RA=FD*SD
170 C$=NU$(VAL(Al$))
180 DRAW"BM138,50;C3;S4;XC$;"
190 DRAW"BM113,62;C4;U2R6D4L3D3B
D2D2
200 A1$=INKEY$;IFA1$="THEN 290"
210 D$=NU$(VAL(A1$));DRAW"BM96,90;C3;X$;"
212 IF RA<10 THEN A3=VAL(A1$);GOTO 270
220 A2$=INKEY$;IFA2$="THEN 220"
230 IF A2$=CHR$(13) THEN 250
240 E$=NU$(VAL(A2$));DRAW"BM116,90;C3;XE$;"
250 A3$=A1$+A2$;A3=VAL(A3$)
270 IF A3=RA THEN 290 ELSE 350
271 FD=RND(9);SD=RND(9);IF SD<10 THEN 271
272 FD$=STR$(FD);SD$=STR$(SD):C1
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This graphics program does more for you than just hi-res graphic editing. It will generate lettering in hi-res graphics that can be different sizes, skinny, bold, textured, drop shadowed, raised shadowed or tall. It will also interface with the Telewriter-64 word processor for printing hi-res displays with your letters.

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700 SCREEN 1, 0
710 GOTO 100
720 RETURN

730 'LEARN THE ALPHABET
740 XA$ = "BM+l, 0U4E2R1F2D4BL3BU2R
2BD2BR3"
750 XB$ = "BM+2, 0U6BL1R3F1D1G1L1R1
F1D1G1L3BR7"
760 XE$ = "BM+5, 0L4U6R4BD3BL2L1BD3
BR6"
770 XF$ = "BM+l, 0U6R4BD3BL2L1BD3BR
6"
780 XH$ = "BM+l, 0U6BR4D6BL3BU3R3BR
4BD3"
790 XI$ = "BM+5, 0L4R2D6L2R4BR3 11
8,0,0 XL$ = "BM+l, -6D6R4BR3 11
81,0 X0$ = "BM+5, 0U4H1L2G1D4F1R2BR
4"
82,0 XR$ = "BM+l, 0Ul2R7D6L7R2F6 11
83,0 XS$ = "BM+l, -6D5FlR2ElU5BD6BR3
11
84,0 XT$ = "BM+3, 0U6L3R6BR2BD6 11
85,0 XU$ = "BM+l, -6D5FlR2E1U5BD6BR3
11
86,0 XW$ = "BM+l, -6D6R1E2U1D1F2R1U6
6BR3"
87,0 XY$ = "BM+l, -6D1F2D3U3E2U1BD6B
R2"
88,0 BL$ = "BM+l, 0BR7"
89,0 'LEARN THE NUMBERS
900 NU$ (1) = "BM+4, OR4BL2U1G2"
910 NU$ (2) = "BM+l, 0BU1U02R8D5L8D7
R8"
920 NU$ (3) = "BM+l, 0BU2D2R8U6L4BR
U6LD2"
930 NU$ (4) = "BM+4, 0BU4U8BD8R8BL3B
U8D12"
940 NU$ (5) = "BM+2, 0BU2D2R8U6L6R
6"
950 NU$ (6) = "BM+3, 0R8U5L8BD5U12"
960 NU$ (7) = "BM+4, 0BU1RD8D4G8"
970 NU$ (8) = "BM+2, 0BU1RD6L6BD6D
L8"
980 NU$ (9) = "BM+2, 0BU2D2R8U1L8D6
R8"
990 NU$ (0) = "BM+l, 0BU1R8D1L8D6
R8"
1000 RETURN

1010 'SET UP TITLE SCREEN
1020 CLS: PR=226: PX=32: SS=l, 0, 0
1030 X$ = CHR$(159): Y$ = CHR$(128)
1040 Xl$ = STRING$(6, X$): Yl$ = STRING$(4, Y$)
1050 BS$ = "Y1S+XS+YS+XS+Y1S+XS+
YS+S+Y1S+S+YS+S+Y1S+S+
YS+S+X1S;"
1060 FOR TI=1 TO 7
1070 PRINT@PR,X1$+YS+X1$+YS+X1$+
YS+S+X1S;
1080 PRINT@PR+PX, BS$: PRINT@PR+2
*PX, BG$: PRINT@PR+3*PX, X1$+YS+S+X1S;
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<th>Price</th>
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</thead>
<tbody>
<tr>
<td>101-1</td>
<td>Single Sided 40 KB</td>
<td>120.00</td>
</tr>
<tr>
<td>101-2</td>
<td>Dual Sided 40 KB</td>
<td>165.00</td>
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<tr>
<td>105-1</td>
<td>Single Sided 40 KB</td>
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<td>105-3</td>
<td>Single Sided 40 KB</td>
<td>125.00</td>
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<td>105-4</td>
<td>Dual Sided 40 KB</td>
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<th>Description</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>55A</td>
<td>Single Sided 40 KB</td>
<td>20.00</td>
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<tr>
<td>55B</td>
<td>Single Sided 40 KB</td>
<td>20.00</td>
</tr>
<tr>
<td>55B</td>
<td>Dual Sided 40 KB</td>
<td>215.00</td>
</tr>
<tr>
<td>55F</td>
<td>Dual Sided 80 KB</td>
<td>215.00</td>
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<tr>
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<tbody>
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<td>Controller, Instruction Booklets, Diskettes</td>
<td>365.00</td>
</tr>
<tr>
<td>Memory Upgrade Kit</td>
<td>125.00</td>
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<tr>
<td>Dual DISK Switch</td>
<td>30.00</td>
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</table>

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<table>
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<tr>
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<th>Price</th>
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<tr>
<td>Volkmodem 300 Baud</td>
<td>99.95</td>
</tr>
<tr>
<td>Signatron Mark X Auto Dial</td>
<td>164.95</td>
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<tr>
<td>Mark XII 1200/2400 Baud Autodial</td>
<td>264.95</td>
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ADDITION: PRINT
2> SUBTRACTION: PRINT
3> MULTIPLICATION: PRINT
4> DIVIDE: PRINT
5> instructions

123 PRINTSTRING$(96,175);
124 PRINT "ENTER 1, 2, 3, 4 OR 5"
125 A$=INKEY$: IF A$="1111" THEN 125
126 MA=VAL(A$) : IF MA=<0 OR MA>5 THEN SOUND1,4: GOTO 125
127 IF MA=5 THEN 132
128 PRINT "one minute please "
129 SOUND 1,0,0,1: SOUND 15,0,1:SOUND 125,1
130 RETURN
131 HOW TO PLAY
132 CLS: PRINTSTRING$(32,149);: PRINT@46,"ROBO"
133 PRINTSTRING$(32,149);: PRINT "ROBO THE FRIENDLY CO
134 CO ROBOT HAS BEEN STRANDED BY ACCIDENT ON A STRANGE PLANET. You
135 MISSION IS TO RESCUE HIM!"
136 PRINT "BUT--be careful--WRONG ANSWERS FILL UP THE AIR TANK
137 AND IF IT GETS FULL ALL FUEL IS LOST!"
138 PRINT "<enter key>"
139 A$=INKEY$: IF A$="" THEN 139
140 GOTO 1,0
141 SCREEN,0,,0;CLS$: FOR X=1 TO 3 :PLAY"V31T7002CE03CE04CE05CE":NE XTX
142 PRINT@1,0,4,"into"+CHR$(128)+"hyperspace";:PMODE 4,1:PCLS$0
143 FOR ST=1 TO03:O=RND(255):D=RND(180):PSET(O,D):NEXT:LINE(18,0,18)
144,PSET:(6,178),PSET:LINE(-85,184),PSET:LINE(-60,178),PSET:LINE(1-60,178,175)
145,NE(-128,180),PSET:LINE(140,180),PSET:LINE(160,179),PSET
146 LINE(185,182),PSET:LINE(205,174),PSET:LINE(226,185),PSET
147 :LINE(255,176),PSET:PAINT(2,189)
148 FOR XG=1 TO 3:FOR SG=1 TO 3:LINE(XG,0,165)-(XG,14,0),PSET
149:LINE(XG,165)-(XG,14,0) ,PRESET:NEXT SG:NEXT XG
150 XX=1,0
151 FORMV=1 TO 8:CIRCLE(XX,4,0),12
152,CIRCLE(XX,4,0),12,,0,.25
153,FORT=1 TO3:FOR SG=1 TO 3:CIRCLE(XX,4,0),12,.25:XX=XX+15:
154 CIRCLE(XX,4,0),12,.25
155 FORMV=1 TO 8:CIRCLE(XX,4,0),12,.25:XX=XX+15:
156 NEXT MV:CIRCLE(XX,4,0),12,1,25:PLAY"V31T25505GCGC":LINE(130,165)
157:(120,149),PSET:LINE(130,165):LINE(120,149),PRESET:NEXT SG:NEXT XXG
158 SUBW THE MATH PROBLEMS SHOWN FOR EACHONE CORRECT ROBO'S SH

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FILL THE FUEL TANK AND SAVE ROBO."
136 PRINT "BUT--be careful--WRONG ANSWERS FILL UP THE AIR TANK
137 AND IF IT GETS FULL ALL FUEL IS LOST!"
138 PRINT "<enter key>";
139 A$=INKEY$: IF A$="" THEN 139
140 GOTO 1,0
141 SCREEN,0,,0;CLS$: FOR X=1 TO 3 :PLAY"V31T7002CE03CE04CE05CE":NE XTX
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143 FOR ST=1 TO03:O=RND(255):D=RND(180):PSET(O,D):NEXT:LINE(18,0,18)
144,PSET:(6,178),PSET:LINE(-85,184),PSET:LINE(-60,178),PSET:LINE(1-60,178,175)
145,NE(-128,180),PSET:LINE(140,180),PSET:LINE(160,179),PSET
146 LINE(185,182),PSET:LINE(205,174),PSET:LINE(226,185),PSET
147 :LINE(255,176),PSET:PAINT(2,189)
148 FOR XG=1 TO 3:FOR SG=1 TO 3:LINE(XG,0,165)-(XG,14,0),PSET
149:LINE(XG,165)-(XG,14,0) ,PRESET:NEXT SG:NEXT XG
150 XX=1,0
151 FORMV=1 TO 8:CIRCLE(XX,4,0),12
152,CIRCLE(XX,4,0),12,,0,.25
153,FORT=1 TO3:FOR SG=1 TO 3:CIRCLE(XX,4,0),12,.25:XX=XX+15:
154,CIRCLE(XX,4,0),12,.25
155 FORMV=1 TO 8:CIRCLE(XX,4,0),12,.25:XX=XX+15:
156 NEXT MV:CIRCLE(XX,4,0),12,1,25:PLAY"V31T25505GCGC":LINE(130,165)
157:(120,149),PSET:LINE(130,165):LINE(120,149),PRESET:NEXT SG:NEXT XXG
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The Difference Between Programming and Successful Programming.
blank entries are self-explanatory. Number four on the menu, “Answer Questions,” allows for both objective and subjective testing. Up to four lines can be automatically printed under the question, thereby eliminating the time-consuming typing task normally required of teachers compiling tests.

Matching tests have always been popular with teachers and students. By matching statements in one column with information in another column, the students can use comparison of choices and the process of elimination. For the teacher it is a quick grading type of test, which is important when there are up to 200 papers to be corrected for the next day. CoCo Testmaker permits the teacher to enter, for example, states in one column and capitals in the other. Shuffling the information is done by lines 600-695. Different patterns of jumbling this information can be accomplished by editing this section of the program.

CoCo Testmaker is designed to be very “teacher friendly.” The goal was to cut down on the time it took to write and type up test papers. With the advent of plain paper copy machines as the way tests are mass printed, it was only natural that the CoCo would replace the typewriter/mimeograph machine connection. Automatic numbering, columning, shuffling and the printing of lines for students to write on have cut the time of this task in half.

As mentioned earlier, CoCo Testmaker can be used as a home study aid as well. Teaching the youngest students how to take these types of written tests will give them a definite advantage throughout their entire school years. Reviewing studied homework via a homemade test should help any student, no matter what the grade level. Taking written tests is just like everything else in life — practice makes perfect!

This program was written for 16K, but can be expanded in several areas if the user has a larger memory machine. By altering lines 420-425, additional lines can be printed to allow for longer essay answers. As indicated in Line 546, only 10 matching entries can be made. If more are desired, additions would have to be made to the 600-622 series, and to the 650-695 series. It should be noted that due to the placement of the columns on the page, there are limits to the number of characters in each column. There can be a maximum of 27 characters in Column A and 45 in Column B.

On a non-programming topic, the authors offer a test-scoring technique suggestion. Take an extra copy of the test to be graded and cut out the incorrect answers on the objective questions. By laying this cut-out test sheet on the test to be graded, only the wrong answers have to be marked for scoring. This quick method of scoring has a number of modifications available, and cuts down the time it takes the teacher to read the subjective answers and total up the final grade.

```
THE RAINBOW  September 1985
```

```
LISTING:

TESTMAKER

1 REM ---------------------COCO TESTER ------------------------
2 REM ---------------------A TEST MAKING PROGRAM
3 REM /// AM BY W. BALDASSARO & L.C. SHERMAN
4 REM /// COPYRIGHT 1985
6 REM /// 5 CLS
7 REM /// 6 CLEAR 200
8 REM /// 9 GOTO25
9 REM /// 10 CLS INPUT "DATE OF TEST";O
11 REM /// NAME------------------------":PR INT#-2,""
12 REM /// 13 PRINT#-2,""
13 REM /// 14 PRINT#-2,""
15 REM /// 16 PRINT#-2,""
17 REM /// 18 PRINT#-2,""
19 REM /// 20 PRINT#-2,""
21 REM /// 22 PRINT#-2,""
22 REM /// 23 CLS : GOTO 40
25 REM "YOUR COMPUTER IS NOW YOUR TEACHER'S AID AND WILL ASSIST YOU IN MAKING UP A TEST. MAKE SURE THE PAPER IN YOUR PRINTER IS SET TO THE TOP OF THE PAGE.
26 REM "PRESS ANY KEY TO BRING UP THE MENU OF TYPES OF QUESTIONS OFFERED."ZZZ$
27 REM " INPUT ZZZ$
28 REM 40 PRINT "WHICH WOULD YOU PREFER"
29 REM 50 INPUT " 1 PRINT HEADING ON PAPER"
30 REM 2 MULTIPLE CHOICE"
31 REM 3 FILL IN THE BLANK"
32 REM 4 ANSWER QUESTIONS"
33 REM 5 TRUE FALSE TEST"
34 REM 6 MATCHING TEST ";N 70 IF N <1 OR N >6 THEN50
35 REM 80 ON N GOSUB 9,200,300,400,500,90,530
36 REM 32
37 REM 32
38 REM 32
39 REM 32
40 REM 32
41 REM 32
42 REM 32
43 REM 32
44 REM 32
45 REM 32
46 REM 32
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88 REM 32
89 REM 32
90 REM 32
91 REM 32
92 REM 32
93 REM 32
94 REM 32
95 REM 32
96 REM 32
97 REM 32
98 REM 32
99 REM 32
100 REM 32
```
PRINT\#-2,"CIRCLE TRUE IF THE STATEMENT IS TRUE--CIRCLE FALSE IF THE STATEMENT IS FALSE":PRINT 
\#-2,""
CLS
J=0
PRINT "TRUE OR FALSE QUESTION"
PRINT "AFTER TWO LINES RETURN TO ARROW (^)"
INPUT II;A$;
B$="TRUE OR FALSE"
Q$=II
J1=1
J=J1+J
PRINT\#-2,J;B$;Q$;A$;PRINT\#-2 
110 INPUT\"";A$
120 BS="TRUE OR FALSE "
151 QS="" 
156 J1=1
157 J=J1+J
160 PRINT\#-2,J;B$;Q$;A$;PRINT\#-2 
166 GOTO 100
180 END
200 PRINT\#-2,"CIRCLE THE BEST AN D MOST CORRECT ANSWER FOR EACH S TATEMENT "
201 J=0
202 CLS
204 PRINT "TYPE STATEMENT OR QUE STION WHEN FINISHED SELECTI ONS WILL APPEAR A-B-C-D"
UNIT \#10,0,0
111 PRINT\"" 
220 INPUT "A";A$;INPUT "B";B$;INPUT "C";C$;INPUT "D";D$ 
225 INPUT "DO YOU NEED E, Y/N ":EE$ 
230 IF EE$="Y" THEN 250 ELSE 240 
240 PRINT\#-2,TAB(10)C2$+A$;PRINT\#-2,TAB(10)C3$+B$;PRINT\#-2, 
TAB(10)C4$+C$;PRINT\#-2,TAB(10)C5$+D$ 
245 GOTO 200
250 INPUT \"E\";E$
**NEW DUAL MODE EPSON**

The new Epson LX-80 offers printing flexibility in two modes: one mode allows you to print in a quick (100 cpm) dot matrix mode for programming and graphics, and the Other Letter Quality mode (16 cpm) produces precise (240 dots per inch), beautiful type for correspondence, reports, and similar purposes. The LX-80 offers 160 different type-style combinations, including Pica, Elite, Enlarged, Emphasized, Condensed, Subscripted, and Superscripted, and type-styles and type-styles can be selected quickly from the top control panel or from program control. Comes standard in friction feed; tractor option is also available.

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**LX-P: LX-80 package $317 ($7 shpg)**

**ET-1 tractor option for LX-80. $29.50.**

**SF-1 Single-sheet feeder for the LX-80. $145 ($7 shpg)**

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**EPSON RX-80/F/T+**

RXF package includes Epson RX-80/F/T+ printer, Epson serial interface, a serial Color Computer to Epson cable, and free Printer Tutorial. $377 ($7 shpg)

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All monitors require video controller. Reverse video free with monitor order.

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54-2 for COCO 2. Kit requires one solder point, no trace cuts. $48.45 ($2 shpg)

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SS-1 protects your data and equipment against power surges and transients. $16.25 ($2 shpg)

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New Controller from J&M: Has switch that allows either JDOOS or RS DOOS to be the disk operating system; eliminates software compatibility problems, while preserving the advantages of J&M's gold contacts and data separator. Also added to the DC-2 is a parallel port, which means a serial interface is no longer needed to make a parallel printer (like the Epson) work.

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New TS-1X Monitor Stand: Designer-beautiful stand with clear corner posts, easy side access to ROM port, reset and on/off buttons. $39.50 ($3 shpg)

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SPEED RACER

The checkered flag drops as your pulse rises in this lively new arcade game. The road twists to the horizon on the 3-D panorama that sets the stage for the most exciting race the CoCo has ever seen! Vie for time as you speed through the curves at incredible speeds. Step through the gears to stay ahead of the pack, but step lively since some will stop at nothing to see the end of the race, or the end of you! Four challenging raceways, complete with obstacles and colorful 3-D scenery, put your skills to the test in this Pole Position™ type game.

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You clutch the tank controls, searching for any sign of the enemy. Suddenly a blip appears on radar! Frantically, you move your tank into position. At last you spot the elusive enemy tank! Facing it, you race to lock sights and fire before he does!

Enter the ultimate battle-zone in this exciting 3-D tank combat game. Strategy, speed, and your tank's cannon are your only hope as you wind through a three-dimensional course inhabited by impenetrable barriers and enemy tanks. Dazzling graphics and lifelike sound take you a step beyond the ordinary in this fast, machine-language arcade game. Enter the next dimension, ROMMEL's troops are waiting for you!

32K Color Computer Required. $29.95
255 PRINT#-2, TAB(10) C2$+A$: PRINT 
#-2, TAB(10) C3$+B$: PRINT#-2, TAB(10) 
C4$+C$: PRINT#-2, TAB(10) C5$+D$: 
PRINT#-2, TAB(10) C6$+E$: 
260 GOTO 205 
300 PRINT#-2, "FILL IN THE BLANKS 
OF EACH STATEMENTS.": PRINT#-2, 
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At $79.95, the HJL-57 is reasonably priced, but you can find other CoCo keyboards for a few dollars less. So, before you buy, we suggest that you compare.

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Keeping The Communication Lines Open

This informative program demonstrates some of the manual signs and gestures used in sign language.

By Bill Bernico

Computers have already come to mean a lot to the handicapped. They are frequently being used by people who have no other way to communicate with the rest of the world. Computers and computer programs have made their lives easier and have helped them to reach out to us. Now we can reach out to some of them by familiarizing ourselves with sign language, the form of communication used by the deaf.

Sign language is made up of different configurations of the hands to spell out letters, words and phrases. The overall process of sign language involves much more than is presented here, but this program may spark your interest enough to continue on and learn more.

Rainbow Hand Sign simply spells out the word “rainbow” one letter at a time using sign language. Each letter is made up of DRAW, LINE and CIRCLE commands, and is presented in graphics.

(Bill Bernico is a self-taught computerist who enjoys programming, golf, TV and music. He has played with a '60s rock band for 18 years.)
form. Memory permitting, a person could do the entire deaf alphabet and a fairly good-sized collection of words and phrases using this technique.

Upon running the program, the opening page will inform you that you can delay the length of time each picture is on the screen by simply changing the delay values in those lines that contain the phrase FOR X=1 TO 750:NEXT X.

There are more complicated ways of customizing the speed option here, but I wanted to keep it as simple as possible. *Rainbow Hand Sign* was actually trimmed down from a program I wrote called *Hand Sign*. It presented the entire sign language alphabet and the user could call up any letter and see it displayed simply by pressing the appropriate key. Due to the length of the original *Hand Sign*, it will not be included with this article. However, it will be added to this month's RAINBOW ON TAPE following the *Rainbow Hand Sign* program listing.

(For anyone having questions concerning this program, you can write to Mr. Bernico at 708 Michigan Avenue, Sheboygan, WI 53081. Please include a SASE.)

---

### The listing: RAISIGN

```
10 'SPELL OUT "RAINBOW" IN SIGN LANGUAGE
20 'BY BILL BERNICO
30 'SHEBOYGAN, WI 53081
40 'CLS:PRINT@12,11rainbow11
50 PRINT@4,0,'IN SIGN-LANGUAGE
60 PRINT@164,'TO VIEW LONGER OR SHORTER, CHANGE TIME DELAY
70 PRINT@485,'HIT ANY KEY TO BEGIN IN';
80 EXEC44539
90 EXEC44539
100 CLEAR500
110 MODE4,1:CLS5:SCREEN1,1:COL08,1
120 A$="BD1D6U4NR5U2ER3FD6"
130 B$="ND7R4FDGNL4FD2GNL4"
140 I$="R4L2D7L2R4"
150 N$="D7U6F5DU7D7"
160 O$="BD5FR3EUL3G"
170 R$="ND7R4FDGNL4FD3"
180 W$="D6E3F3U6"
190 PCLS ' **** R ****
200 DRAW"BM162,118S4HLHLHERE2G2L GL3M123,94U2DL2HL2HL2HL2HLHULU7E 2H2U3EUEUEUE2ER4FRHL11BM148,96HL HLHLH2LBM2,95HLHLHULUHULUHULU HUNR3U3HLHLH5GLGL9HLHL2NRR7HUL L2L2H2LFRF2FR2U3EUERF5E2D6U6H2R2E RNH7ER2ER7FR2FR2FR2BM116,90R13ER EUEUBL7BGUD2FBL9U3U3
```

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### The RAINBOW September 1985
Cassette Motor Control

If you want to switch external devices on and off under computer control, the cassette remote control (the smaller gray plug on the cassette cable) is a good way to do it. It’s best to use the CoCo’s relay to key another relay whose contacts can handle the load you intend to switch.

In many cases (such as telephone pulse dialing) the MOTOR ON and OFF commands work too slowly. You can use POKE 65313, 4 to switch the motor on and POKE 65313, 52 to switch it off.

October 1985 THE RAINBOW 41
VIP Integrated Library™

VIP Desktop Magic!

Finally, you can have the power and integration of Lotus Symphony®, 1-2-3™ or Open Access™ for the larger micros on your Color Computer! The convenience of instant changes to a new application and effortless transfer of files is at the tip of your finger.

With VIP Desktop, the six applications of VIP Library are integrated into one program, on one disk. You have instant access to word processing, with a spelling checker always in attendance, data management with mail merge, spreadsheet financial analysis, telecommunications and disk maintenance. Just move the hand to point to the volume, and the new application is there. And VIP Integrated Library has been made to work well with one disk drive, or all four, so be ready to push your Color Computer to the limits!

Stand-Alone Power

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- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pausr, print, single-sheet pause, and print commands.
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"ONE OF THE BEST" JULY 1984 "RAINBOW"

This high speed MACHINE LANGUAGE program fills all your information management needs, be they for your business or home. And it does so better than any other database program for the Color Computer, featuring machine code, lowercase screens and mail-merge capabilities, Inventory, accounts, mailing lists, family histories, you name it, VIP Database™ will keep track of all your data, and it will merge VIP Writer™ files.

The VIP Database™ features selectable lowercase displays for maximum utility. It will handle many records as it does on your disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Each file can be searched for specific entries, using multiple search criteria. With database form merge you may also combine files, sort and print mailing lists, print "boiler plate" documents, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Unlimited print format and report generation with the ability to embed control codes for use with all printers.

32K DISK $59.95
64K Required for math package & mail merge

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RATED BEST IN JANUARY 1984 "RAINBOW"

For your important communication needs you've got to go beyond software that only lets you chat. You need a smart terminal so that you can send and receive programs, messages, even other VIP Library files. VIP Terminal™ has "more features than communications software for CP/M, IBM, and CP/M 86 computers." Herb Friedman, Radio Electronics, February 1984.

FEATURES: Choice of 8 bi-res lowercase displays * Memory-Sense with BANK SWITCHING for full use of workspace * Selectively print data at baud rates from 110 to 9600 * Full 128 character ASCII keyboard * Automatic graphic mode * Word mode (word wrap) for unbroken words * Send and receive Library files, Machine Language & BASIC programs. Duplex: Hall/Full/Echo, Word length: 7 or 8, Parity: Odd/Even or None, Stop Bits: 1-9 * Local linefeeds to screen * Save and load ASCII files, Machine Code & BASIC programs * Lowercase masking * 10 Keystroke Multiplier (MACRO) buffers to perform repetitive pre-entry log-on tasks and send short messages * Programmable prompt or delay for send next line * Selectable character trapping * Send up to ten short messages (KMS), each up to 255 characters long, automatically, to save money when calling long distance. Recommended baud rates are 110 and 300.

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(Tape works in 16K but without hi-res displays)

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The Daily Schedule Pictograph: A Time For Every Purpose

By Steve Blyn
Rainbow Contributing Editor

This month's program presents a "pictograph" which illustrates children's daily schedules. A pictograph is one of the types of graphs usually studied in elementary school. The other types of graphs are the bar, line and circle.

Pictographs are fun because they use one or more pictures to depict amounts. In our example, a clock represents one hour in the child's daily schedule. We have divided the child's typical school day into four categories: school time, bedtime, time for television and time for play.

We chose only four activities to keep the graph large and simple for instructional purposes. There are, of course, other activities such as homework, mealtimes and chores. You may alter the program to suit your purposes.

The topic of daily schedules was selected because of its importance to the children. Using their own activities focuses interest on the task at hand. Children are likely to partake in the learning whenever new topics can be related to their own experiences.

Pictograph begins by asking the child to input the amount of integer hours consumed by school, bed and watching TV. The program then adds up these three amounts and subtracts this amount from 24. This is done on the screen. The child can see how much free time is left for play activities. Children may enjoy checking the computer's calculations. This can also be done for reinforcement of arithmetic skills.

An appreciation for time budgets can be gained by using Pictograph. Many children, for example, watch an excessive amount of TV. By bringing this out in the program, they can see they have little time left for play. Children who get an improper amount of sleep can also see similar results from this program.

It is interesting that many children will be more likely to answer these questions more truthfully to a computer than to a parent or teacher. Computers are obviously inanimate objects and are probably viewed by children to be non-judgemental. It is often easier, therefore, to confess one's transgressions to a machine than to a person.

If used with a class or a group, children can compare and discuss their pictographs. Averages of the various amounts of time that children spend on TV and play can be interesting. A child can then compare his habits with those of other classmates.

It should be stressed that different people naturally require different amounts of sleep. Only unusually high or low amounts should be noted and discussed privately with the child.

Lines 120-190 ask for the amount of hours spent on school, sleep and television. The program checks for reasonable answers. Sometimes ridiculous answers are input into a program merely for mischief. It is always a good idea to program safeguards against this. The program checks on lines 130, 160 and 190 for answers within acceptable limits. Answers outside of these limits will not be accepted. You may, of course, change these limits if you disagree with any of them.

Lines 200-260 add up these three amounts on the screen and subtract them from 24. This shows the amount of hours left for play. This was done by the computer to prevent any mistakes. The total must obviously be 24. Younger children will have to be taught that there really are only 24 hours in each day.

(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.)
Lines 300-580 draw the pictograph. Lines 620-720 place the shapes of the letters needed into strings. Each activity will show the first letter of the activity followed by the proper number of clocks. A picture of a clock represents one hour of activity time. Children can see that the activities with the greater number of clocks drawn are those on which they spend the most time.

It is often said a picture is worth a thousand words. Pictographs present an interesting way of representing data from which youngsters can learn. The pictograph is probably the easiest type of graph to explain. At the level used in this program, it is merely a counting exercise.

The next step in learning pictographs is to have each symbol represent more than one of an item. For example, each picture of a person could represent 100,000 people in a population pictograph.

If you desire such follow-up activity, more sophisticated pictographs can often be found in many newspaper articles for further study.

The listing:
```
PICGRAPH
10 CLEAR 5000
20 REM"PICTOGRAPH"
30 REM"STEVE BLYN, COMPUTER ISLAND, NY, 1985"
40 REM SC=SCHOOL BD=BEDTIME TV=TV TIME PL=PLAYTIME
50 FF$=STRINGS(32, 255) :REM COLOR ED LINE
60 DIM V(2, 2, 2, 0) :REM DIMENSION OF THE CLOCK PICTURE ARRAY
70 GOSUB 620 :REM READ THE LETTERS NEEDED
80 CLS
90 PRINT" MY DAILY SCHEDULE"
100 PRINT$;
110 PRINT@64," "
120 PRINT@64,"HOW MANY HOURS IN SCHOOL"; :INPUT SC
130 IF SC<2 OR SC>10 THEN 110
140 PRINT@128," "
150 PRINT@128,"HOW MANY HOURS FOR BED"; :INPUT BD
160 IF BD<5 OR BD>12 THEN 140
170 PRINT@192," "
180 PRINT@192,"HOW MANY HOURS FOR TV"; :INPUT TV
190 IF TV<1 OR TV>9 THEN 170
200 TL=SC+BD+TV : 'TOTAL
210 PL=24-TL : 'PLAY TIME
220 PRINT@224, FF$;
230 PRINT@256," "
240 PRINT@288," 24 "
250 PRINT@320,FF$;
260 PRINT@385,"THAT LEAVES";PL;
270 PRINT@449,"PRESS ENTER TO SEE YOUR GRAPH.";
280 EN$=INKEY$ 290 IF EN$=CHR$(13) THEN 300 ELS
This helpful program really 'makes the grade' and could very well be the teacher's pet.

Teaching an evening class is a lot of fun and quite a learning experience, but when the end of the quarter comes, ugh! I hate averaging grades! It's boring and takes a lot of time.

I decided to combine my favorite hobby with teaching and came up with Teacher's Aid. Now, I save time and actually enjoy averaging grades. (Well, CoCo enjoys it.)

Teacher's Aid is designed to do as much of the manual labor as possible. It has several features any teacher could appreciate. Among these are:

- Calculates grade average (weighted or straight average, and drop lowest grade)
- Determines letter grade
- Maintains a file of up to 35 students
- Cursor control when entering data
- User prompts

For those of you who wish to follow this program, I have included REMarks throughout. Table I contains a list of the main variables used.

Program Operation

Teacher's Aid will run unchanged on a 32K Color Computer with Extended BASIC and is configured for a tape-based system. To use it, simply CLRD the program and type RUN.

(Garry Shelton is an accountant for the pension and profit-sharing department of a large retail organization. He also teaches accounting at a local community college. His future goal is to start his own accounting and data processing business.)
The first screen to appear will be the title, followed by the menu. This menu offers seven options from which to choose. These are:

1) Start New Class
2) Enter Data
3) Perform Calculations
4) Display Data
5) Print Data
6) Save File
7) Quit

To select an option, type the number and press ENTER. Each option will be discussed in general order of use.

There is no routine for the “Print Data” option because I do not have a printer. I have left a block of line numbers, 5000 to 5999, open so you can add your own print routine.

Start New Class

This option is used when beginning a new class. It does not have to be used before entering student data, but it must be used before calculations are made. To begin, you will be asked to enter the following:

- Class name
- Course number
- Section number
- Beginning class date
- Ending class date
- Number of class days

Each item must be limited to the number of characters specified. If you exceed the allowed number, then you will be prompted to reenter the item. After each item has been entered, you will be asked whether or not it is correct, then respond with ‘Y’ or ‘N.’

Teacher’s Aid determines the letter grade based on a student’s average. You supply your own grade scale for each grade of A, B, C, D or F. For each grade, you are directed to enter the upper value for that letter, then the lower value. You are then given the opportunity to correct an error.

When supplying the grade ranges, you must not let them overlap. For example, if the range for ‘B’ is 92 for the upper value and 88 for the low value, then C’s upper range would be 87, not 88.

Following the entry for ‘F,’ Teacher’s Aid will switch directly to the “Enter Data” option and be ready to accept data.

Enter Data

If this routine is entered directly from the “Start New Class” option, the screen will be formatted and ready to accept data. If this option is entered from the menu, you will be asked whether or not you wish to use a previous file; answer with ‘Y’ or ‘N.’ Given a ‘Y’ response, the program will direct you to enter the filename (limit to eight characters). Prepare the tape recorder and press ENTER when ready to load the file. Note: When adding records to a previously started file, the file must be loaded first.

An ‘N’ response or completion of file loading will cause the screen to be formatted for data input with the last record on file being displayed. This format will look like Figure 1. Each record will consist of 14 fields, 11 of which you may enter. The fields are:

- Name
- Social Security number
- Grades (up to eight)
- Number of days absent
- Grade average
- Letter grade
- Percent absent

The fields’ grade average, letter grade and percent absent are supplied by the “Perform Calculations” option.

When the screen is first formatted and as each new record appears, the cursor (a red block) appears on field one, “Name.” To enter the student’s name, press ‘Y’ to gain access to the field, type in the name then press ENTER. The backspace key may be used to backspace before ENTER is pressed. The cursor automatically moves to the next field, which in this case is “Social Security number.” Follow the same procedure to enter this.

Now, assume that so far you have not given any tests but wish to enter an amount for number of days absent. Use the down-arrow key to skip past the grades and get to the correct field. After this field has been entered, the next record will appear.

When entering grades, fill up the fields beginning with grade one and go in order. You may leave blanks only at the end of the grades. Also, all grades must be entered as integers, i.e., 95, not 94.8 (see Figure 1).

To move back and forth between records, use the left- and right-arrow keys. You can also use the slash key (/) search command. Teacher’s Aid gives the choice of searching by name or Social Security number. Prompts will appear instructing you what to do.

Deleting a record is just as easy as entering one. To do so, blank out both the name and Social Security number. This can be accomplished by typing ‘@’ and ENTER for each field. Teacher’s Aid will delete the record(s) upon exit from the “Enter Data” option. To exit this option, simply press the CLEAR key. There will be a short pause as the file is being scanned for possible deletions.

If the computer seems to hang up while you are entering data, it is because CoCo is rearranging its strings in memory. You just have to sit back and wait a moment.

### Table 1

<table>
<thead>
<tr>
<th>List of Variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>R$X,Y$</td>
</tr>
<tr>
<td>HR$X$</td>
</tr>
<tr>
<td>G$X$</td>
</tr>
<tr>
<td>F1$X$</td>
</tr>
<tr>
<td>F2$X$</td>
</tr>
<tr>
<td>F3$X$</td>
</tr>
<tr>
<td>TEST</td>
</tr>
<tr>
<td>WT</td>
</tr>
<tr>
<td>TW</td>
</tr>
<tr>
<td>TN</td>
</tr>
<tr>
<td>GRADE$X$</td>
</tr>
<tr>
<td>GT</td>
</tr>
<tr>
<td>AVG</td>
</tr>
<tr>
<td>DO</td>
</tr>
<tr>
<td>ND</td>
</tr>
<tr>
<td>ET</td>
</tr>
<tr>
<td>E5$</td>
</tr>
<tr>
<td>ENS</td>
</tr>
<tr>
<td>CH</td>
</tr>
<tr>
<td>PF</td>
</tr>
<tr>
<td>P</td>
</tr>
</tbody>
</table>

### Table 2

#### Field Details

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>Student record</td>
</tr>
<tr>
<td>Y</td>
<td>Field number</td>
</tr>
<tr>
<td>N</td>
<td>Number of tests</td>
</tr>
<tr>
<td>T</td>
<td>Test number</td>
</tr>
<tr>
<td>G</td>
<td>Grade</td>
</tr>
<tr>
<td>D</td>
<td>Days absent</td>
</tr>
<tr>
<td>A</td>
<td>Average grade</td>
</tr>
</tbody>
</table>

### Notes

- When adding records, use the down-arrow key to skip past the grades and get to the correct field.
- Deleting a record is easy once you know how. Use the slash key (/) search command.
- If the computer seems to hang up, wait a moment and try again.
Perform Calculations

This option is the reason I wrote Teacher’s Aid — to calculate grades. It will calculate the grade average, the letter grade and percent of absence. Several prompts are used which will determine how the grades will be averaged. These are:

1) Drop lowest grade? — If you wish to drop the lowest grade before calculation of the average, then answer ‘Y.’
2) Exclude one test? — If you answered ‘Y’ to dropping a grade, then you are given the choice of excluding a grade from being dropped. For example, I do drop the lowest grade, but I never allow the final exam to be dropped. Answer this with ‘Y’ or ‘N.’
3) Which test number? — If you choose to exclude a test, then enter the number of that test.
4) Will one test have a different weight? — Sometimes my final will count more or less than a regular test grade, so I have allowed for a different weight to be used.
5) Enter the weight as a decimal — When answering ‘Y’ to question #4, you must input the weight. Answer with a number greater than zero and less than one.
6) Which test number? — Simply enter the test number of the one with the different weight.
7) How many tests? — Answer this with the total number of tests you gave regardless of whether or not one will be dropped.

After you have gone through these questions, Teacher’s Aid will take over. You can sit back and relax because the calculations may take several minutes depending upon the number of students and options chosen. When finished, you will be alerted by a buzz and the menu will appear.

Display Data

This option displays the data you have supplied. Actually, you could use the “Enter Data” option to get student information, but this one puts more records on the screen at one time. The program gives several options which are:

1) Record dump
2) Display grades
3) Display absences
4) Quit
Option one will display the entire record of each student. Option two will display name, Social Security number, grade average and letter grade. Option three will display name, Social Security number, number of days absent and percent absent for students who have been absent. Option four returns the program to the menu.

Save File

Using this option is much like loading a file. You will be prompted to enter the filename, then press ENTER when the recorder is ready. After the file has been saved, the menu will appear.

Quit

This option allows you to end program execution. I designed a safety feature to prevent inadvertent ending of Teacher’s Aid. You will be asked if you are sure you wish to quit — answer with ‘Y’ or ‘N.’ An ‘N’ will return you to the menu.

Teacher’s Aid was written primarily for use in a college classroom setting, but the concepts would apply in a variety of classroom situations. Anyone needing help making changes or using this program may write me at 521 Annex Avenue, Kannapolis, NC 28081 (please include a SASE).
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```
2139 '***PLACE FIELD INTO RECORD
2140 POKE1023+P,32:GOSUB2810:IFP
2141 =103THENR$(M,1)=I$ELSEIFP=167THENR$(M,1)=I$ELSEIFP=408THENR$(M,1)
2142 =I$CALCULATE NEXT FIELD***
2143 CURSOR POSITION
2144 IFP=1~3 OR P=167 THENP=P+64 ELSEIFP=455 THENP=P+32
2145 GOTO2200
2146 '***MOVE CURSOR DOWN***
2147 IFP=1~3 THENP=P+64 ELSEIFP=455 THENP=P+32
2148 GOTO2220
2149 '***MOVE CURSOR UP***
2150 IFP=4~8 THENM=M+1 ELSEIFP=231 OR P=167 THENM=M-1 ELSEM=M+1
2151 GOTO2220
2152 '***SEARCH BY NAME OR SSN***
2153 GOSUB2770:PRINT@","NAME OR
2154 ssN?":GOSUB2800:GOSUB2770:IFE$="" THENF=1:PRINT@","ENTER THE NA
2155 ME":INPUT$ELSEIFE$="S" THENF=2:PRINT@","ENTER THE SSN":INPUT$ELSE2240
2156 FORX=1TON:IFR$(X,F)=N$ THENM=X;X=N;F=0
2157 NEXT:IFF<>0THENGOSUB2770:PRINT@"RECORD NOT FOUND":FORX=1T
2158 01000:NEXT
2159 GOTO2220
2160 '***CALCULATE NEXT FIELD***
2161 CURSOR POSITION
2162 IFP=1~3 OR P=167 THENP=P+64 ELSEIFP=455 THENP=P+32
2163 GOTO2220
2164 '***MOVE CURSOR DOWN***
2165 IFP=1~3 THENP=P+64 ELSEIFP=455 THENP=P+32
2166 GOTO2220
2167 '***MOVE CURSOR UP***
2168 IFP=4~8 THENM=M+1 ELSEIFP=231 OR P=167 THENM=M-1 ELSEM=M+1
2169 GOTO2220
2170 '***SEARCH BY NAME OR SSN***
2171 GOSUB2770:PRINT@","NAME OR
2172 ssN?":GOSUB2800:GOSUB2770:IFE$="" THENF=1:PRINT@","ENTER THE NA
2173 ME":INPUT$ELSEIFE$="S" THENF=2:PRINT@","ENTER THE SSN":INPUT$ELSE2240
2174 FORX=1TON:IFR$(X,F)=N$ THENM=X;X=N;F=0
2175 NEXT:IFF<>0THENGOSUB2770:PRINT@"RECORD NOT FOUND":FORX=1T
2176 01000:NEXT
2177 GOTO2220
2178 THE TIME MACHINE!
Stop wasting time on that cassette or single-drive system. You can afford Polygon's disk systems featuring Teac 1/2 height, 40 track drives that are fast, quiet, and use less power.

With complete systems you get J&M Systems' controller with gold-edge connectors, the latest circuitry and reliable design. For 100% compatibility. The controller is supplied with RSDOS assuring easy, trouble-free operation with all commercial software.

---

<table>
<thead>
<tr>
<th>Drive(s) w/ Case/Pwr Supply</th>
<th>No. of Drives</th>
<th>Systems w/ Controller/DOS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One</td>
<td>Two</td>
</tr>
<tr>
<td>Teac Sgl Sided</td>
<td>$159</td>
<td>$229</td>
</tr>
<tr>
<td>Teac Dbl Sided</td>
<td>$279</td>
<td>$339</td>
</tr>
</tbody>
</table>

Drive(s) are pre-tested and ready to plug in and use. Options available are ADOS in ROM, JFD-CP controller w/printer port, HDS dual ROM controller. Horizontal case, etc. call for details.

---

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9/85

THE RAINBOW 51
P+X,CHR$(191) ;:PRINT@P+X,CHR$(32) ;:GOTO2815 ELSE=E=ASC(E$) ;:IFE=13THEN283ELSEIFE=8THENIFX=0THEN8215ELSE=X-1: I$=LEFT$(I$, (LEN(I$)-1)) PRINT@P +X," ";:GOTO2815 2820 I$=I$+E$:PRINT@P+X,E$:X=X+ 1:GOTO2821 2830 IFP=103THENP=2ELSEIFP=167T HENE=9ELSEIFP=408THENENE=3ELSE=4 2840 PRINT$P,STRING$(E,32);:PRINT T@P,$;:RETURN 2899 "***DELETE RECORDS*** 2900 FORX=1TON:IFRS$(X,1)="" AND R$(X,2)="" THENY=X:N ELSENEXTX :GOTO1000 2910 NEXTX:FORX=Y TO N-1:FORZ=1T08:GRADE(Z)=0:NEXTX:ET=2,0,0 2999 "***PERFORM AVERAGE*** 3000 CLS:F1$="$:F2$="":F3"":F3$="": IF""DO YOU WISH TO DROP THE LOWEST GRADE? (Y/N)";EN$:IFLEFT$(EN$,1)="N"THEN3030ELSEIFLEFT$(EN$,1)<="Y"THEN3000 3010 F1$="":PRINT""WILL ON E GRADE BE EXCLUDED? Y/N";EN$:IF LEFT$(EN$,1)="N"THENTEST=0:GOTO3 030 ELSEIFLEFT$(EN$,1)<="Y"THEN3000 3020 INPUT""WHICH TEST NUMBER";TEST:IFTEST<1 OR TEST>8 THENGOSUB3350,0:GOTO3020 3030 PRINT""WILL ONE TEST HAVE A DIFFERENT WEIGHT? Y/N";EN$:IF LEFT$(EN$,1)="N"THENTEST=0:GOTO3 030 ELSEIFLEFT$(EN$,1)<="Y"THEN3020 3040 PRINT""ENTER THE WEIGHT AS A DECIMAL";IFWT<0 OR WT>1 THENPRINT""MUST BE FROM ZERO TO ONE"":GOTO3040 3050 INPUT""WHICH TEST NUMBER";TW:IFWT<1 OR TW>8 THENGOSUB3350:GO TO3030 3060 PRINT""HHow MANY CALCULATIONS ARE THERE";TN:IFTN<1 OR TN>8 THENGOSUB3350:GOTO3060 3070 CLS:PRINT""PLEASE WAIT--CALCULATING GRADES"":GOTO3070 3080 "***PLACE GRADES INTO STORAGE*** 3090 "***DROP LOWEST GRADE*** 3100 FORZ=1TON:F3$="":TT=TN:FOR X=1TO8:GRADE(X)=0:NEXTX:ET=2,0,0 3110 FORX=1TON:IFRS$(X,2)="":IFF1$<="Y" THEN3130,0 3120 IFTEST=X THEN3130 3130 FORX=TN TO1 STEP-1:IFX=Y THEN ENY=Y-1 3140 IFY=TEST THENY=Y-1 3150 IF VAL(R$(Z,X+2))>=VAL(R$(Z, Y+2)) THENF2$="Y" 3160 IF VAL(R$(Z,X+2))<VAL(R$(Z, Y+2)) AND VAL(R$(Z,X+2))<ET THEN ET=VAL(R$(Z,X+2)) 3170 NEXTX:IFF2$="Y"THEN3230 ELSEIF3$="Y";GOTO3190 3180 GRADE(X)=VAL(R$(Z,X+2)) 3190 NEXTX 3200 IFTEST=X THEN3200 ELSEIFF1$="Y"THEN3230 ELSEIF3$="Y";GOTO3190 3210 IFTEST=X THEN3210 ELSEIFF1$="Y"THEN3230 ELSEIF3$="Y";GOTO3190 3220 TT=TT-1 3230 IFWT<0 THENTT=TT-1 3240 AVG=INT(((GT-GRADE(TW))/TT )*(1-WT)) + (GRADE(TW)*WT+.5) :ENS=STR$(AVG):R$(Z,12)=MIDS(E$ N$,2,3) 3249 "***DETERMINE LETTER GRADE* 3250 FORX=1TO100 STEP2:IFAVG<=-G(X ) AND AVG<=G(X+1) THENONX GOSUB3350,0,0,33,0,0,3310,0,3310,0,3320,0,3320,0,3330,0,3330,0,3340,0,X=10 3260 NEXTX 3269 "***CALCULATE % OF ABSENCE* 3270 DO=VAL(R$(Z,11)) :ND=VAL(MIDS(H R$,5,0,3)):DO=(DO/ND)*100:ENS$: STR$(DO):R$(Z,14)=MIDS(E$,2,4) 3280 PRINT@224, STRING$(31," "): P RINT@227,"PLEASE WAIT--STILL WOR KING" 3290 NEXTX:SCOUNT10,10,GOTO1000 3299 "***GRADE SUBROUTINES*** 3300 R$(Z,13)="A":RETURN 3310 R$(Z,13)="B":RETURN 3320 R$(Z,13)="C":RETURN 3330 R$(Z,13)="D":RETURN 3340 R$(Z,13)="F":RETURN 3349 "***ERROR MESSAGE*** 3350 PRINT""TEST NUMBERS RANGE FROM 1 TO 8":RETURN 3998 "***DISPLAY DATA OPTION*** 3999 "***DISPLAY MENU*** 4000 CLS:PRINT@162,"DISPLAY DATA ":PRINT:PRINTTAB(3) "1) RECORD DU 4010 MP":PRINTTAB(3) "2) DISPLAY GRADE S":PRINTTAB(3) "3) DISPLAY ABSENCE ENC":PRINTTAB(3) "4) QUIT":PRINT 4020 INPUT""ENTER YOUR CHOICE";CH :IFCH<1 OR CH>4 THEN4000ELSEIFCH =4 THEN100 4030 IFCH=1 THENPF=2 ELSEPF=4 4039 "***DISPLAY CLASS NAME***
4040 GOSUB 4200
4048 ***SET UP LOOP***
4049 ***GO TO DISPLAY SUBS.***
4050 FOR X = 1 TO N: ON CH GOSUB 4100: NEXT: GOTO 4050
4055 NEXT X: IF < > 0 THEN GOSUB 4210:
4058 ***DISPLAY SUBROUTINES***
4059 ***RECORD DUMP***
4129 ***DISPLAY GRADES***
4199 ***DISPLAY CLASS NAME***
4200 CLS: P = 0: PRINT @ 3, MID$(HR$, 1, 25): IF CH = 1 THEN PRINT @ 41, \"NAME \": \"TAB (25) \"GRADE \": PRINT @ 67, \"SSN \": \"TAB (13) \"AVG \": \"TAB (18) \"DYS OUT \%\": P RINT @ 195, \"TEST GRADES\" 4205 PRINT STRINGS$(32, \"") \; RETURN 4209 ***WAIT***
4210 INPUT \"PRESS <ENTER> TO CONTINUE\": EN$: RETURN 5000 CLS: PRINT \"PRINT ROUTINE NOT AVAILABLE\": FOR X = 1 TO N: NEXT: GOTO 5100
5999 ***SAVE FILE OPTION***
6000 CLS: INPUT \"ENTER THE FILE NAME\": FS: PRINT \"INPUT \"GET RECORDER READY-PRESS <ENTER>\": EN$: MOTORON: OPEN"", #-1, FS: PRINT \#-1, HR$: FOR X = 1 TO N: NEXT: FOR Y = 1 TO 14: PRINT \#-1, R$: (X, Y): NEXT: X: MOTOROFF 6010 CLOSE: GOTO 1000
7000 CLS: INPUT \"ARE YOU SURE? Y/N \": EN$: IF LEFT$(EN$, 1) = \"N\" THEN 7900 ELSE IF LEFT$(EN$, 1) = \"Y\" THEN 7900: NEXT: GOTO 4040
7010 PRINT \"PRINT \"************PROGRAM END************\": END

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September 1985 THE RAINBOW 53
How To Be An Educated Stargazer In 12 Easy Lessons

Starfinder familiarizes you with information on selected constellations, and draws them on CoCo's screen, as well.

By Eugene Vasconi

Have you ever stood outside under the night sky staring into the heavens while trying to remember what your science teacher said about finding constellations? Then you get frustrated because you can't even find the “Big Dipper.”

Starfinder is designed to accurately display 12 of the more picturesque constellations in the night sky. In addition, the data option provides information on each constellation, including alternate names, selected member stars and comments on the mythological figures ancients used to describe them. “Scorpius,” for example, was depicted as a scorpion and both claws and tail are labeled. Finally, a LINE command is available to connect each star and make the figure more apparent.

Selecting number 13 on the menu, Dippers, displays the Big and Little Dippers on the star field for use in visualizing their relative positions. Press ‘D’ and the computer will show you how the two are related by distance and angle.

In assembling star coordinates, I have maintained as great an accuracy with member stars as is possible given the graphics area available. Size is the only variable and one constellation versus another might not be an accurate comparison. “Pegasus,” for example, displayed much clearer as a tight figure than spread out. However, when using Starfinder to help you locate actual constellations, you will find it quite realistic.

Actual constellations are not necessarily made up of the brightest stars. I have included an intensity option which allows you to choose a more realistic display of somewhat dim member stars or one that would make them stand out. Selecting this option at the beginning will cause all stars displayed to be in that mode.

A large part of the program is made up of Hi-Res labels and it is worth mentioning the technique. I have elaborated on a system Mike

(Eugene Vasconi is a free-lance television producer/director who is also active in aviation as a commercial helicopter pilot. His computer interests center in the areas of graphics, music and education. He has been a CoCoer for nearly four years.)
Hall used in his Trailin' Tail program (RAINBOW, August 1983) which displays Hi-Res words by detecting their ASCII equivalent. (I heartily recommend this way if you find a program needs a lot of wording on the graphics screen.) In Starfinder this system consists of lines 3, 110, 111, 113-149, plus individual draw coordinates and GOSUBs for the particular label.

Starfinder is not a game but a learning tool for both students and those of us who have forgotten our planetarium visits. I think a few sessions with the program will make our star-gazing much more enjoyable.

A final comment for those who might be curious about the connect sequence: I discovered that while DATA statements were fine for the display of the stars alone, this was unsatisfactory for connecting them with lines since each constellation has its own peculiar design. The easiest solution was to create a central universal line routine that could be joined in progress at various positions according to how many stars were involved, then, by assigning the variables array designations, the lines would draw properly. Loops were set up to take care of as many lines as possible (lines 49-57).

(For any questions regarding Starfinder, you may contact Mr. Vasconi at 8301 N. Council, Apt. 1204, Oklahoma City, OK 73132, phone 405-722-1978.)
23 FOR CC=W TO Z: CIRCLE(ST(CC), SR(CC)), SS: PLAY"L54T1804;1;8;1;8;1;8;1;8": NEXTCC
24 DRAW"BM10,190;S4;C1": N$="M FOR MENU OR D FOR DATA": GOSUB110
25 RT$=INKEY$: IF RT$="M" THEN 15 E LSE26
26 IF RT$="D" THEN42 ELSE25
27 'VARIABLES
28 W=1: Z=12: CD=1: RETURN
29 W=13: Z=26: CD=2: RETURN
30 W=27: Z=33: CD=3: RETURN
31 W=34: Z=49: CD=4: RETURN
32 W=50: Z=63: CD=5: RETURN
33 W=64: Z=78: CD=6: RETURN
34 W=79: Z=94: CD=7: RETURN
35 W=95: Z=110: CD=8: RETURN
36 W=111: Z=118: CD=9: RETURN
37 W=119: Z=131: CD=10: RETURN
38 W=132: Z=146: CD=11: RETURN
39 W=147: Z=151: CD=12: RETURN
40 W=152: Z=165: CD=13: RETURN
41 ' ** DATA SELECTOR **
42 PLAY"LI007804AB-02B-B01C #D": D RAW"BM1,0,19,0;S4;Cl": N$="M FOR ME NU OR D FOR DATA": GOSUB110
43 PLAY"L6T4,002;1;8;1;8;1;8": NEXTCC
44 DRAW"BM10,190;S4;C1": N$="M FOR MENU L TO CONNECT": GOSUB110
45 RT$=INKEY$: IF RT$="M" THEN 15 E LSE46
46 IF RT$="L" THEN47ELSE45
47 ' **CONNECTION SEQUENCE**
48 LINE(ST(M), SR(M))-(ST(N), SR(N)) PSET: LINE-(ST(P), SR(P)), PSET
50 LINE(ST(Q), SR(Q))-(ST(R), SR(R)) PSET: LINE-(ST(S), SR(S)), PSET
51 IF SK=3 THEN56
52 LINE(ST(T), SR(T))-(ST(U), SR(U)), PSET
53 IF SK=1 THEN 57
54 LINE(ST(V), SR(V))-(ST(W), SR(W)) PSET
55 IF SK=2 THEN57
56 FOR LP=GG TO HH: PLAY"L25504B-B C": LINE(ST(LP), SR(LP))-(ST(LP+1), SR(LP+1)), PSET: NEXTLP
57 FOR LP=G TO H: PLAY"L25504B-BC": LINE(ST(LP), SR(LP))-(ST(LP+1), SR(LP+1)), PSET: NEXTLP
58 DRAW"BM10, 190; S4; C1": N$="M FOR MENU L TO CONNECT": GOSUB110: DRAW"BM10, 190; C1": N$="M FOR MENU": GOSUB110
59 A$=INKEY$: IF A$="M" THEN 15 E LSE 59
60 ' **STAR DATA**
61 DRAW"BM105,30; S16; C1": N$="TAURUS": GOSUB110: DRAW"BM199,45; S4": N$="THE BULL": GOSUB110
62 DRAW"BM43,96; S4": N$="ALDEBARAN": GOSUB110: DRAW"BM14,35; S4": N$="HORNS": GOSUB110: DRAW"BM176,1": 4P; S4; C1": N$="LEGS": GOSUB110
63 RETURN
64 DRAW"BM15,28; S16; C1": N$="ORION": GOSUB110: DRAW"BM135,10; S4": N$="THE HUNTER": GOSUB110
65 DRAW"BM159,138; S4": N$="RIGEL": GOSUB110: DRAW"BM19,66,52": N$="ARM": GOSUB110
66 DRAW"BM32,199; S4": N$="BELT": GOSUB110: DRAW"BM66,52": N$="ARM": GOSUB110
67 RETURN
68 DRAW"BM125,20; S8; C1": N$="URSA MINOR": GOSUB110: DRAW"BM176,32; S4": N$="LITTLE BEAR": GOSUB110: DRAW"BM158,42": N$="LITTLE DIPPER": GOSUB110
69 DRAW"BM51,52; S4; C1": N$="POLARIS": GOSUB110: DRAW"BM188,117": N$="HEADE": GOSUB110: DRAW"BM46,10; S4": N$="TAIL": GOSUB110
70 RETURN
71 DRAW"BM19,135; S8; C1": N$="URSA MAJOR": GOSUB110: DRAW"BM27,150; S4": N$="THE TWINS": GOSUB110
72 DRAW"BM6,43; S4": N$="POLUX": GOSUB110: DRAW"BM135,16": N$="CASTOR": GOSUB110
73 RETURN
74 DRAW"BM11,20; S8; C1": N$="CANUS": GOSUB110: DRAW"BM11,35": N$="MAJOR": GOSUB110
75 DRAW"BM12,47; S4": N$="GREAT DO": GOSUB110: DRAW"BM149,43; S4": N$="SIRIUS": GOSUB110: DRAW"BM197,66": N$="MIRZAM": GOSUB110
76 RETURN
77 DRAW"BM11,30; S16; C1": N$="LEO": GOSUB110: DRAW"BM84,18; S8": N$="THE LION": GOSUB110
78 DRAW"BM157,88; S4; C1": N$="ALGIER": GOSUB110: DRAW"BM177,140": N$="REGulus": GOSUB110
79 DRAW"BM294,55": N$="HEAD": GOSUB110: DRAW"BM14,115": N$="TAIL": GOSUB110
80 RETURN
81 DRAW"BM9,20; S8; C1": N$="URSA MAJOR": GOSUB110
82 DRAW"BM10,30; S4": N$="GREAT BE
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A fascinating aspect of computer graphics is the ability to present a three-dimensional figure on the screen and then cause it to rotate about the pitch (X), yaw (Y) and roll (Z) axis of the figure. Such a presentation is possible with a relatively modest home computer if one is willing to accept some reduction in the speed and smoothness of motion and complexity of the figure. To demonstrate the possibility, let us first derive an algorithm to describe the task and the overall "plan of attack."

Assume the body is located in a coordinate system formed by three lines 'X', 'Y' and 'Z' passing through a point zero (origin), each line perpendicular to the other two (Figure 1).

The 'X' axis is horizontal with the plus values to the right of the origin and the negative values to the left of the origin. The 'Y' axis is vertical with the plus values upward and the minus values downward from the origin. The 'Z' axis is at right angles to the other two and, in relation to the computer screen, would project directly forward for plus values and behind the screen for minus values. The body is placed in this coordinate system such that the center of gravity of the body is located at the origin of the system.

The initial location of the body is established in the coordinate system by assigning the 'X', 'Y' and 'Z' coordinates of each corner of the body. First, let us look at a two-dimensional plane figure for simplicity. Consider a square located in the X,Y plane with its center located at the origin of the X,Y axis. (Since the square is a symmetrical figure, the center of the figure is also its center of gravity.) The location of the corners of the square are (X1Y1), (X2Y2), (X3Y3) and (X4Y4).

Assuming that X1Y1 is the upper right corner, progressing clockwise the signs of the corner coordinates are (X1Y1), (X2−Y2), (−X3−Y3) and (−X4Y4). Now if the square is rotated counter-clockwise about the origin through an angle of Φ degrees, the new coordinates of the corners will be (X'1Y'1), (X'2−Y'2), (−X'3−Y'3) and (−X'4Y'4). Using the equation of rotation (from our high school analytical geometry course) the new coordinates for each corner can be calculated from the initial coordinates as follows:

\[
X' = X \cos \Phi + Y \sin \Phi \\
Y' = -X \sin \Phi + Y \cos \Phi
\]

(It is necessary to observe the signs of the coordinates as we substitute them in the equations above.)

Now if we draw lines connecting the new corner coordinates, we will have drawn the square in its new position, rotated Φ degrees from its initial position.

(Charles Dold is a registered professional engineer. He recently retired from Martin Marietta Orlando Aerospace where he was responsible for systems integration of military high speed data equipment which provided computer control for automatic testing and circuit routing. He has a bachelor's degree from Purdue University.)
So much for the two-dimensional (X,Y plane) figure. Now we will add the 'Z' axis. Take the plane containing the coordinates of the original square and slide it forward along the 'Z' axis to a point 'Z'. The new coordinates of the corners are (X₁, Y₁, Z₁), (X₂, Y₂, Z₂), (-X₃, Y₃, Z₃) and (-X₄, Y₄, Z₄). Slide the plane in the opposite direction from the origin along the 'Z' axis to a point -Z.

Starting with the upper right corner and numbering clockwise, the corners in this plane are numbers 5, 6, 7 and 8. The coordinates of the corners lying in the plane are (X₅, Y₅, -Z₅), (X₆, -Y₆, -Z₆), (-X₇, Y₇, Z₇) and (-X₈, Y₈, Z₈). If we connect all eight corners we have drawn a cube (Figure 2).

Since the 'Z' coordinate of a corner is measured along the 'Z' axis to a line perpendicular to the 'Z' axis and passing through the corner, rotation of the corner about the 'Z' axis does not change the 'Z' coordinate of the corner. Therefore, the new coordinates of the corner after rotation about the 'Z' axis through the angle Φ degrees is:

\[ X' = X \cos \Phi + Y \sin \Phi \]
\[ Y' = -X \sin \Phi + Y \cos \Phi \]
\[ Z' = Z \]

Rotation about the 'X' axis does not change the 'X' coordinates, therefore:

\[ Z'' = Z' \cos \Theta + Y' \sin \Theta \]
\[ Y'' = -Z' \sin \Theta + Y' \cos \Theta \]
\[ X'' = X' \]

Rotation about the 'Y' axis does not change the 'Y' coordinates, therefore:

\[ Z''' = Z'' \cos \Psi + X'' \sin \Psi \]
\[ X''' = -Z'' \sin \Psi + X'' \cos \Psi \]
\[ Y''' = Y'' \]

New corner coordinates resulting from rotation about more than one axis are obtained, as shown, by solving the equations for rotation about each axis, in turn using the coordinates resulting from each previous set of calculations for substitution into the next following set of equations.

Figure 3 is a flow chart showing this sequence of operations in graphical form. Notice that after the three sets of equations of rotation have been solved, we are only interested in the
The initial coordinates of the corners of the cube were taken with the origin of the coordinate system at the center of gravity (in the case of the cube, also the geometric center). This was done to simplify the equations of rotation.

The origin of the screen map of the Tandy Color Computer is the upper left-hand corner of the screen. If we were to plot the coordinates without correction, the cube would be plotted with its center located at the upper left corner of the computer screen. It is necessary to move the center of the cube to the right and down to center it on the screen. This is done with equations of translation (analytical geometry again):

\[
X = X + h \\
Y = -Y + k
\]

In the case of the TRS-80C, \( h = 128 \) and \( k = 96 \) (for a 256-by-192 graphics screen).

The TRS-80C graphics screen locations in the 'Y' direction are inverted. That is, the numbers increase in positive values as they go down the screen. In order to prevent the figure from being plotted in the inverted position the second equation is written as shown to compensate for the inversion.

Now we are able to plot the object at any angular attitude we desire. The next step is to make it rotate about one or more axes. Referring to the flow chart (Figure 3), we see that we input a fixed angle of rotation \( \Theta \) about the 'Z' axis. Instead, we can input a variable angle 'S' which is made to vary between zero and 'M' degrees. To do this we use a FOR / NEXT loop, for example:

```
10 FOR S = 0 TO M STEP 1
20 \text{The equations of rotation about the 'Z' axis}
30 \text{X' = X cos} \phi + Y \sin \phi
40 \text{Y' = -X \sin} \phi + Y \cos \phi
50 NEXT "S
```

The STEP 1 is added so the angular increments can be chosen. If we repeat for all eight corners of the cube, we will have calculated the new coordinates of all corners of the cube after rotation about the 'Z' axis in increments of 'I' degrees.
In like manner, we can calculate the coordinates of the corners after rotation of 2I, 3I, 4I, etc., until S = M. By substituting the equations of rotation about the 'X' or 'Y' axis in the FOR/NEXT loop, we can calculate the coordinates of the corners of the cube after rotation, in increments, about the 'X' or 'Y' axis. By having the computer plot the lines connecting each set of coordinates for each set of calculations, the cube will appear to rotate about its center.

As I mentioned in the beginning, there are some limitations to the quality of the presentation. The greatest is speed, the rate at which a new plot can follow the last one. When we consider that there are 64 calculations and 12 LINE statements to plot the cube in a single position it is easy to see why it takes so long.

A faster method that can be used for simple shapes with few corners (such as the cube) is to store the results from each set of calculations in a different array. After all calculations are complete and the results stored in arrays, the data can be retrieved from each array in turn and the figure defined by these data plotted. This eliminates the time for calculations from the sequence of plotting. The drawback of this method is that a great amount of memory is required.

A third method which conserves memory for complex shapes (but is somewhat slower than the previous method) is to output the results of each set of calculations to tape and then, after all calculations are complete for all increments of rotation and recorded on tape, recall the data from tape one set at a time and plot the figures one following the other.

Now we have a plan of attack; let's look at the three programs for accomplishing it. We have some necessary inputs and options which are common to all three programs. These are prompted by lines 30 through 110. (Note: The line numbers refer to Listing 1. The statements are the same in Listings 2 and 3, but may have slightly different locations in the program.)

First, we must tell the computer how far to rotate the figure and in what increments or steps. Next, we are asked if we want a stroboscopic presentation. This means do we want to clear the screen after each plot (Line 620) or do we want to preserve all of the plots to get an effect similar to a stroboscopic camera picture? Then we have a choice of whether we want rotation held at a fixed angle about any of the three axes and, if so, at what fixed angle.

If a fixed angle other than zero degrees is selected for rotation about a particular axis, the incremented angle 'R' is saved (lines 190, 310, 430) and the fixed angle is substituted (lines 200, 320, 440). After the calculations for the axis are completed the angle 'R' is restored (lines 280, 400, 520). If we don't want any rotation about a particular axis we can specify rotation at zero degrees for that axis. If a fixed angle of zero degrees is selected for rotation about an axis, the coordinates for that axis are unchanged, therefore, the calculations for that axis are skipped (lines 180, 300, 420).

Lines 150 and 160 contain the initial location of the corner coordinates of the cubic solid. After a set of calculations is completed the data is plotted on the screen in the GRAPHIC1 program, stored in an array in the GRAPHIC2 program or stored on cassette tape in the GRAPHIC3 program and 'S' is incremented for the next set of calculations. This will continue until S = M, the limit of rotation.

In the GRAPHIC1 program (Listing 1) the FOR/NEXT loop (lines 130-760) includes the PLOT routine (lines 590-760), therefore the object is plotted after each set of calculations.

In the GRAPHIC2 program (Listing 2) the FOR/NEXT loop (lines 130-570) does not include the plot routine (lines 600-760). Instead, the results of each set of calculations are put in an array in which the variables are labeled X(S + A) and Y(S + A) (Line 550). Thus for each value of 'S' a new array is established.

After arrays are filled for all values of 'S' the data is read out, one array at a time, in the FOR/NEXT loop (lines 580-770) which includes the plot routine. An array is read and the data plotted for each array in turn.

The GRAPHIC3 program (Listing 3) is similar to the GRAPHIC2 program, except the results of each set of calculations are recorded on cassette tape instead of stored in an array. To accomplish this, the cassette recorder is prepared to record (lines 130-140) before the FOR/NEXT loop is executed.

After completing a set of calculations, the line of communication to the tape recorder is opened (Line 610) and the results of the calculations recorded on tape, after which the line of communication is closed (Line 650). Following this the angle is incremented to the next 'S,' the cycle repeated until S = M and the data for all positions of the object are recorded.

We are now prompted to rewind the recorder and prepare to play back (lines 670-680). A new FOR/NEXT loop is established (lines 690-950) which, for each angle 'Z,' will open the communication line (Line 710), play back the data (lines 720-750) and plot the figure defined by that data (lines 770-930). After plotting the figure the communication line will be closed (Line 940) and the loop incremented to the next 'Z.' This will continue until Z = M and all the data from the tape is read and plotted.

At this point we are ready to run the program. Let us answer the prompts with the following inputs:

<table>
<thead>
<tr>
<th>Limit of rotation</th>
<th>Rotation increments</th>
<th>Strobe presentation</th>
<th>Fixed rotation about ‘Z’ axis</th>
<th>Angle</th>
<th>Fixed rotation about ‘X’ axis</th>
<th>Angle</th>
<th>Fixed rotation about ‘Y’ axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>360 degrees</td>
<td>10 degrees</td>
<td>No</td>
<td>Yes</td>
<td>20 degrees</td>
<td>Yes</td>
<td>30 degrees</td>
<td>No</td>
</tr>
</tbody>
</table>

This is all that is required for the GRAPHIC1 and GRAPHIC2 programs. For the GRAPHIC3 program you will be asked to set up the recorder with a blank tape to record and later, you will be asked to rewind and press Play.

It is immediately evident that both GRAPHIC1 and GRAPHIC2 programs are much faster than the GRAPHIC3 program. The approximate run times with the inputs specified are as shown in Table 1.

<table>
<thead>
<tr>
<th>Program</th>
<th>Time (min:sec)</th>
<th>Calculate</th>
<th>Plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRAPHIC1</td>
<td>2:15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRAPHIC2</td>
<td>2:00</td>
<td>:15</td>
<td></td>
</tr>
<tr>
<td>GRAPHIC3</td>
<td>6:15</td>
<td>4:00</td>
<td></td>
</tr>
</tbody>
</table>

GRAPHIC1 and GRAPHIC2 require the same overall run time, however, since the plot routine is separated from the calculations in GRAPHIC2, the plot time is by far the shortest.

One reason that GRAPHIC1 and GRAPHIC2 run time is less than GRAPHIC3 is because of the use of the statement POKED 65495,0 to double the CPU rate. To demonstrate, try watching the flicker rate of the cursor as you POKED 65495,0 and ENTER. To get back to normal POKED 65494,0 and ENTER. You will notice that we return the CPU rate to normal at the end of the program.
If you should break and not complete the program, it will be necessary to POKE the rate back to normal. This is especially important if you plan to CSAVE, CLOAD or input/output data to tape since these functions cannot be done at the high rate of the CPU. For this reason this scheme cannot be used in the GRAPHIC3 program.

The programs can be modified to present other solids by substituting the coordinates of the corners of any solid for those of the cube as long as the conventions described at the beginning of this article are followed. If the number of corners is more or less than eight, it will be necessary to change all of the FOR/NEXT loops beginning with FOR A = 1 TO 8 to FOR A = 1 TO (X) where 'X' is the number of corners in the new solid.

(Charles Dold may be reached at 1701 N. Indian River Drive, New Smyrna Beach, FL 32069 for any questions concerning these programs. Please include a SASE.)

Listing 1: GRAPHIC1

10 "GRAPHIC1" BY C.DOLD 1985
20 CLS:POKE65495,0
30 INPUT "LIMIT OF ROTATION IN DEGREES";M
40 INPUT "ROTATION INCREMENTS IN DEGREES";I
50 INPUT "IS STROBE PRESENTATION DESIRED (Y)ES-(N)O";N$ 
60 INPUT "FIXED ROTATION ABOUT THE Z AXIS (Y)ES-(N)O";B$
70 IF B$="Y" THEN INPUT "ANGLE IN DEGREES";B 
80 INPUT "FIXED ROTATION ABOUT THE X AXIS (Y)ES-(N)O";C$
90 IF C$="Y" THEN INPUT "ANGLE IN DEGREES";C 
100 INPUT "FIXED ROTATION ABOUT THE Y AXIS (Y)ES-(N)O";D$
110 IF D$="Y" THEN INPUT "ANGLE IN DEGREES";D 
120 DIMX(8):DIMY(8):DIMZ(8) 
130 FOR S=0 TO M STEP 1:R=S/57.29577951 
140 FOR A=1 TO 8 
150 X(A)=50:Y(A)=50:Z(A)=50 
160 X(1)=50:Y(1)=50:Z(1)=50 
170 IF B$="Y" THEN 210 
180 IF B=0 THEN 290 
190 E=R 
200 IF B>0 THEN R=R/57.29577951
210 FOR A=1 TO 8 
220 'CALCULATE NEW COORDINATES IN THE X,Y PLANE 
230 X=X(A)*COS(R)+Y(A)*SIN(R) 
240 Y=-X(A)*SIN(R)+Y(A)*COS(R) 
250 Z(A)=X:Y(A)=Y 
260 NEXT A 
270 IF B$="N" THEN 290 
280 R=E 
290 IF C$="N" THEN 330 
300 IF C=0 THEN 410 
310 E=R 
320 IF C>0 THEN R=R/57.29577951 
330 FOR A=1 TO 8 
340 'CALCULATE NEW COORDINATES IN THE Z,Y PLANE 
350 Z=Z(A)*COS(R)+Y(A)*SIN(R) 
360 Y=-Z(A)*SIN(R)+Y(A)*COS(R) 
370 Y(A)=Y:Z(A)=Z 
380 NEXT A 
390 IF C$="N" THEN 410 
400 R=E 
410 IF D$="N" THEN 450 
420 IF D=0 THEN 530 
430 E=R 
440 IF D>0 THEN R=R/57.29577951 
450 FOR A=1 TO 8 
460 'CALCULATE NEW COORDINATES IN THE Z,X PLANE 
470 Z=Z(A)*COS(R)+X(A)*SIN(R) 
480 X=-Z(A)*SIN(R)+X(A)*COS(R) 
490 Z(A)=Z:X(A)=X 
500 NEXT A 
510 IF D$="N" THEN 530 
520 R=E 
530 FOR A=1 TO 8 
540 'TRANSLATION OF AXIS TO CENTER OF SCREEN 
550 X(A)=X(A)+128 
560 Y(A)=96-Y(A) 
570 NEXT A 
580 'PLOT ROUTINE 
590 PMODE 4,1 
600 IF R=0 THEN 620 ELSE 610 
610 IF N$="Y" THEN 630 
620 PCLS 
630 SCREEN 1,0.
640 LINE (X(1),Y(1))-(X(2),Y(2)),PSET
650 LINE -(X(3),Y(3)),PSET
660 LINE -(X(4),Y(4)),PSET
670 LINE -(X(1),Y(1)),PSET
680 LINE -(X(5),Y(5)),PSET
690 LINE -(X(6),Y(6)),PSET
700 LINE -(X(7),Y(7)),PSET
710 LINE -(X(8),Y(8)),PSET
720 LINE -(X(5),Y(5)),PSET
730 LINE (X(6),Y(6))-(X(2),Y(2)),PSET
740 LINE (X(3),Y(3))-(X(7),Y(7)),PSET
750 LINE (X(4),Y(4))-(X(8),Y(8)),PSET
760 NEXT S
770 POKE 65494,0
780 GOTO 780

Listing 2: GRAPHIC2

10 ' "GRAPHIC2" BY C. DOLD 1985
20 CLS: POKE 65495,0
30 INPUT"LIMIT OF ROTATION IN DEGREES";M
40 INPUT"ROTATION INCREMENTS IN DEGREES";I
50 INPUT"IS STROBE PRESENTATION DESIRED (Y)ES-(N)O";N$"$1
60 INPUT"FIXED ROTATION ABOUT THE Z AXIS (Y)ES-(N)O";BS$0
70 IF BS$="Y" THEN INPUT"ANGLE IN DEGREES";B
80 INPUT"FIXED ROTATION ABOUT THE X AXIS (Y)ES-(N)O";CS$1
90 IF CS$="Y" THEN INPUT"ANGLE IN DEGREES";C
100 INPUT"FIXED ROTATION ABOUT THE Y AXIS (Y)ES-(N)O";DS$0
110 IF DS$="Y" THEN INPUT"ANGLE IN DEGREES";D
120 DIM X(400):DIM Y(400):DIM Z(400)
130 FOR S=0 TO M STEP I:R=S/57.2
140 "INITIAL COORDINATES FOR EACH CORNER OF THE SOLID"
150 X(1)=50:Y(1)=50:Z(1)=50:X(2)=50:Y(2)=50:Z(2)=50:X(3)=50:Y(3)=-50:Z(3)=50:X(4)=-50:Y(4)=50:

September 1985 THE RAINBOW 75
Z(4)=50
170 IF B$="N" THEN 210
180 IF B=0 THEN 290
190 E=R
200 IF B>0 THEN R=R/57.2957791
210 FOR A=1 TO 8
220 'CALCULATE NEW COORDINATES IN THE X,Y PLANE
230 X=X(A)*COS(R)+Y(A)*SIN(R)
240 Y=-X(A)*SIN(R)+Y(A)*COS(R)
250 X(A)=X:Y(A)=Y
260 NEXT A
270 IF B$="N" THEN 290
280 R=E
290 IF C$="N" THEN 330
300 IF C=0 THEN 410
310 E=R
320 IF C>0 THEN R=R/57.2957791
330 FOR A=1 TO 8
340 'CALCULATE NEW COORDINATES IN THE Z,Y PLANE
350 Z=Z(A)*COS(R)+Y(A)*SIN(R)
360 Y=-Z(A)*SIN(R)+Y(A)*COS(R)
370 Y(A)=Y:Z(A)=Z
380 NEXT A
390 IF C$="N" THEN 410
400 R=E
410 IF D$="N" THEN 450
420 IF D=0 THEN 530
430 E=R
440 IF D>0 THEN R=R/57.2957791
450 FOR A=1 TO 8
460 'CALCULATE NEW COORDINATES IN THE Z,X PLANE
470 Z=Z(A)*COS(R)+X(A)*SIN(R)
480 X=-Z(A)*SIN(R)+X(A)*COS(R)
490 Z(A)=Z:X(A)=X
500 NEXT A
510 IF D$="N" THEN 530
520 R=E
530 FOR A=1 TO 8
540 'TRANSLATION OF AXIS TO CENTER OF SCREEN. PUT IN ARRAYS
550 X(A)=X(A)+128:Y(A)=96-Y(A):X(S+A)=X(A):Y(S+A)=Y(A)
560 NEXT A
570 NEXT S
580 FOR Z=0 TO M STEP 1
590 ' PLOT ROUTINE
600 PMODE 4,1
610 IF Z=0 THEN 630 ELSE 620
620 IF N$="Y" THEN 640
630 PCLS
640 SCREEN 1,0
650 LINE (X(1+Z),Y(1+Z))-(X(2+Z),Y(2+Z)),PSET
660 LINE -(X(3+Z),Y(3+Z)),PSET
670 LINE -(X(4+Z),Y(4+Z)),PSET
680 LINE -(X(1+Z),Y(1+Z)),PSET
690 LINE -(X(5+Z),Y(5+Z)),PSET
700 LINE -(X(6+Z),Y(6+Z)),PSET
710 LINE -(X(7+Z),Y(7+Z)),PSET
720 LINE -(X(8+Z),Y(8+Z)),PSET
730 LINE -(X(5+Z),Y(5+Z)),PSET
740 LINE -(X(6+Z),Y(6+Z))-(X(2+Z),Y(2+Z)),PSET
750 LINE -(X(3+Z),Y(3+Z))-(X(7+Z),Y(7+Z)),PSET
760 LINE -(X(4+Z),Y(4+Z))-(X(8+Z),Y(8+Z)),PSET
770 NEXT Z
780 POKE 65494,0
790 GOTO 790

---

One-Liner Contest Winner...
This one-liner plays a song familiar to all Led Zeppelin fans, "Stairway To Heaven."

The listing:

```
1 PLAY"V31T404L3CEABECBO5C04EC0S
CO4F#D03A04FEC03A04L3CL3EC03AGAL
2A"
```

Dave Milson
Newark, DE

(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.)

Listing 3: GRAPHIC3

10 '"GRAPHIC3" BY C.DOLD 1985
20 CLS
30 INPUT"LIMIT OF ROTATION IN DEGREES";M
40 INPUT"ROTATION INCREMENTS IN DEGREES";I
50 INPUT"IS STROBE PRESENTATION DESIRED (Y)ES-(N)0";N$,
60 INPUT"FIXED ROTATION ABOUT THE Z AXIS (Y)ES-(N)0";BS
70 IF B$="Y" THEN INPUT"ANGLE IN DEGREES";B
80 INPUT "FIXED ROTATION ABOUT THE X AXI(S) YES-(N)NO"; C$ 90 IF C$="Y" THEN INPUT "ANGLE IN DEGREES"; C 100 INPUT "FIXED ROTATION ABOUT THE Y AXI(S) YES-(N)NO"; D$ 110 IF D$="Y" THEN INPUT "ANGLE IN DEGREES"; D 120 DIM X(8): DIM Y(8): DIM Z(8) 130 CLS: PRINT "POSITION TAPE - PRESS PLAY AND RECORD" 140 INPUT "PRESS <ENTER> WHEN READY"; R$ 150 FOR S=0 TO M STEP I: R=S/57.29577951 160 'INITIAL COORDINATES FOR EACH CORNER OF THE SOLID 170 X(1)=50: Y(1)=50: Z(1)=50: X(2)=50: Y(2)=50: Z(2)=50: X(3)=50: Y(3)=50: Z(3)=50: 180 X(4)=50: Y(4)=50: Z(4)=50 190 IF B$="N" THEN 230 200 IF B=0 THEN 310 210 E=R 220 IF B>0 THEN R=B/57.2957791 230 FOR A=1 TO 8 240 'CALCULATE NEW COORDINATES IN THE X,Y PLANE 250 X=X(A)*COS(R)+Y(A)*SIN(R) 260 Y=-X(A)*SIN(R)+Y(A)*COS(R) 270 X(A)=X: Y(A)=Y 280 NEXT A 290 IF B$="N" THEN 310 300 R=E 310 IF C$="N" THEN 350 320 IF C=0 THEN 430 330 E=R 340 IF C>0 THEN R=C/57.29577951 350 FOR A=1 TO 8 360 'CALCULATE NEW COORDINATES IN THE Z,Y PLANE 370 Z=Z(A)*COS(R)+Y(A)*SIN(R) 380 Y=-Z(A)*SIN(R)+Y(A)*COS(R) 390 Y(A)=Y: Z(A)=Z 400 NEXT A 410 IF C$="N" THEN 430 420 R=E 430 IF D$="N" THEN 470 440 IF D=0 THEN 550 450 E=R 460 IF D>0 THEN R=D/57.29577951 470 FOR A=1 TO 8 480 'CALCULATE NEW COORDINATES IN THE Z,X PLANE 490 Z=Z(A)*COS(R)+X(A)*SIN(R) 500 X=-Z(A)*SIN(R)+X(A)*COS(R) 510 Z(A)=Z: X(A)=X 520 NEXT A 530 IF D$="N" THEN 550 540 R=E 550 FOR A=1 TO 8 560 'TRANSLATION OF AXIS TO CENTER OF THE SCREEN 570 X(A)=X(A)+128 580 Y(A)=Y(A)+96 590 NEXT A 600 'STORE NEW COORDINATES ON TAPE 610 OPEN "O",#:1,"ARRAY" 620 FOR A=1 TO 8 630 PRINT#:1, X(A), Y(A) 640 NEXT A 650 CLOSE#1 660 NEXT S 670 PRINT "REWIND THE RECORDER AND PRESS PLAY" 680 INPUT "PRESS <ENTER> WHEN READY"; R$ 690 FOR Z=0 TO M STEP 1 700 'RECALL NEW COORDINATES FROM TAPE 710 OPEN "I",#:1,"ARRAY" 720 FOR A=1 TO 8 730 IF EOF(#) THEN 770 740 INPUT #1, X(A), Y(A) 750 NEXT A 760 'PLOT ROUTINE 770 PMODE 4, 1 780 IF Z=0 THEN 790 ELSE 790 IF N$="Y" THEN 810 790 IF N$="Y" THEN 810 800 PCLS 810 SCREEN 1, 0 820 LINE (X(1), Y(1))-(X(2), Y(2)), PSET 830 LINE -(X(3), Y(3)) , PSET 840 LINE -(X(4), Y(4)) , PSET 850 LINE -(X(5), Y(5)) , PSET 860 LINE -(X(6), Y(6)) , PSET 870 LINE -(X(7), Y(7)) , PSET 880 LINE -(X(8), Y(8)) , PSET 890 LINE -(X(5), Y(5)) , PSET 900 LINE -(X(6), Y(6))-(X(2), Y(2)), PSET 910 LINE -(X(7), Y(7))-(X(8), Y(8)) , PSET 920 LINE -(X(3), Y(3))-(X(7), Y(7)) , PSET 930 LINE -(X(4), Y(4))-(X(8), Y(8)) , PSET 940 CLOSE#1 950 NEXT Z 960 GOTO 960
**SUPER PRO KEYBOARD**

**WHY PAY MORE?**
The best is only $59.95*

- Original layout
- Fast, easy installation—no soldering
- Individually boxed with full instructions
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- Professional, low profile, finished appearance

* Computer produced after approximately October 1982 require an additional keyboard plug adapter. Please add $3.95.

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**QUALITY VIDEO MONITORS**

**SAKATA COLOR SC-100** $239.95

The SC-100 is a streamlined 13" composite monitor which produces sharp, brilliant colors. The cabinet is made of durable styrene and is available in an attractive off-white color. Includes audio with speaker and earphone jack. Highly recommend this color monitor because of its excellent performance and beautiful styling.

**TAXAN AMBER SCREEN** $119.95

A 12" amber screen composite monitor of the highest quality with exceptional reliability and performance. 18 MHz bandwidth, attractive off-white cabinet. We use this monitor in our offices. We carry other brands also. Call for additional information.

---

**UNIVERSAL VIDEO DRIVER**

- Works with Monochrome Monitors
- Works with Color Monitors
- Easy Installation—No Soldering

ENABLES YOUR COCO TO OPERATE WITH A VIDEO MONITOR INSTEAD OF A TELEVISION.

Carefully engineered to work with ALL Color Computer models, including the new COCO II.

- Great Price! ONLY $29.95

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**GREAT BARGAINS ON COCO DISC DRIVES!**

**COMPLETE SYSTEMS INCLUDE:**
- Hi-Quality 16-Inch Line Drives
- Attractive, Beige Dual Drive Cabinet/Power Supply
- Fill Panel for Single Drive Disc Systems
- Radio Shack or NEW TYPE I & II Disc Controller
- Offering Switch Selectable ROMs and Parallel Printer Port
- Cable and Operating Manual
- Full 90 Day Warranty

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Drive (SSDD) in Dual Cabinet w/Controller</td>
<td>$299.95</td>
</tr>
<tr>
<td>Two Drives (SSDD) in Dual Cabinet w/Controller</td>
<td>$384.95</td>
</tr>
<tr>
<td>Single Drive (DSDD) in Single Cabinet w/Controller</td>
<td>$359.95</td>
</tr>
<tr>
<td>Additional Drive</td>
<td>$129.95</td>
</tr>
<tr>
<td>Two Drives (DSDD) in Dual Cabinet w/Controller</td>
<td>$484.95</td>
</tr>
<tr>
<td>Dual Cabinet/Power Supply</td>
<td>$79.95</td>
</tr>
<tr>
<td>Disc Controller (Radio Shack or J &amp; M)</td>
<td>$39.95</td>
</tr>
<tr>
<td>Connecting Cable</td>
<td>$24.95</td>
</tr>
<tr>
<td>Radio Shack DOS ROM 1.0 or J/DOS w/Manual</td>
<td>$39.95</td>
</tr>
</tbody>
</table>

---

**SERIAL TO PARALLEL INTERFACE**

300 to 9600 baud. Complete with all cables and power supply.

- Only $49.95

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**PRINTERS**

NEW Star Gemini SC-10 model printer—

Only $249.95

120 cps w/true descenders, 2K buffer, proportional spacing. New model for 1985.

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**GREAT BARGAINS ON Cassette & Disc Supplies**

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We buy cassettes and discs in large quantities for our own use and can pass the savings on to you.

- C-10 Cassettes w/labels
  - $0.50 ea
  - 10 for $4.50

- Cassette storage box
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  - 10 for 2.00

**ROMs**

- Basic 1.2
  - $39.95

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**5½ DISCS**

High-quality, nationally advertised brand. Guaranteed Performance. We will replace any disc that fails during normal use. Discs are double density, reinforced hub with sleeve: $12.95 for 10 discs in an attractive storage box.

- Great Price!

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**DISC STORAGE**

Attractive, heavy-duty, smoked acrylic case. Holds and protects up to 75 5½" discs with six moveable, indexed dividers.

**SUPER BARGAIN — ONLY $9.95**

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**NEED MORE MEMORY?**

64K Memory Expansion Kit

All parts and complete instructions (For 'E' and 'F' boards and CoCo II).

NOW ONLY $14.95
ACCOUNTING SYSTEM

The Mark Data Products Accounting System is ideal for the small businessman needing a fast, efficient means to process income and expenses, prepare detailed reports and maintain most of the information required at tax time. The system is a family of programs which operate by means of a "menu" selection scheme. When the operator selects a task to perform, the computer loads a program designed to handle that task from the system disc. The system disc contains all of the programs required to create, update and maintain data files and prepare the necessary accounting reports including a transaction journal, A/P & I or income report, an interim or trial balance and a balance sheet.

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

ORDER ENTRY SYSTEM

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

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

EASY EDIT

Easy-Edit is a versatile, easy to use text editor which is particularly convenient for assembly language and BASIC programming. This editor offers powerful text handling capabilities, along with many special features including a built-in disc operating system, 32/64K memory sense, a 51 character by 24 line screen, auto key repeat, extensive error reporting, and complete compatibility with popular assemblers. Requires 32K and at least one disc drive.

Master disc and instructions are packaged in an attractive 3-ring binder. $34.95

SCREENDisable the menu "selection scheme. When the operator selects a task

TREKBOER

This exciting hi-res adventure begins aboard the starship Trekboer in the 21st century. Life on Earth is threatened by a deadly virus and your mission is to search the frontiers of space and return with a cure to save mankind from disaster.

TUT'S TOMB

Explore the ancient, mystical tomb of the great Pharaoh. Find the magical keys which lead you to unbelievable treasures as you outmaneuver the creatures that slither and swarm about you. Super fast arcade action—this one will knock your socks off.

SEASCARHEART

Get your shark repellent and scuba tanks ready! The graphics in this adventure are truly outstanding and the underwater scenes are unforgettable. You'll run into a pirate, a mermaid and some hungry sharks in this colorful and unique treasure hunt.

BLACK SANCTUM

Encounter the forces of black magic as you roam around an 18th century monastery. You'll see all the evil locations in this spooky adventure! You'll love searching for and destroying evil in this classic tale. A MUST for every adventure game fan!

FREE—Send for our NEW 24 page catalog!
Have your own personalized, computerized dictionary

Take Word Inventory with

vō kab’ yə ler’ ē

By Keith Osani

Vocabulary is a study program suitable for all ages. It will work on a 16K or 32K computer. (If you have 16K, you must type in PCLEAR 1 before loading.) Up to 50 words may be programmed, then you can be tested on your words.

You have the option of having the computer give the words or the definitions. If you are incorrect, the computer will either ask again or go on, as you wish. After testing, the computer will give your score. You may also review your definitions by quizzesing the computer.

The words may be saved on your disk for future study or to be added to later with the update function.

You may also print out your vocabulary words with the DMP-200 printer or other comparable printers. The printer control codes are shown as follows:

Printer Control Codes for the DMP-200

<table>
<thead>
<tr>
<th>Line Number</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1510</td>
<td>Selects data processing mode</td>
</tr>
<tr>
<td>1520</td>
<td>Starts elongation</td>
</tr>
<tr>
<td>1610</td>
<td>End elongation</td>
</tr>
<tr>
<td>1620</td>
<td>Carriage return</td>
</tr>
</tbody>
</table>

(Keith Osani is a ninth grader at Burr’s Lane Junior High School. He is a self-taught computer programmer.)
Give your COCO the gift of sight!
The Micro Works is happy to introduce the newest member of our Digisector™ family — the DS-69 Video Digitizer for your COCO. It has all the standard features of its big brothers but comes with a price tag that's right for you.

- **High Resolution** 256 by 256 spatial resolution.
- **Precision** 64 levels of grey scale.
- **SPEED!** ½ second for a full screen of video.
- **Compactness** Self contained in a plug in Rompack.
- **Ease of Use** Software on disk will get you up and running fast!

The DS-69 Digisector opens up a whole new world for you and your COCO. Your computer can be a security system, take portraits, analyze signatures, inspect assembly work . . . the DS-69 is your COCO's eyes. Use the DS-69 and a TV camera to get fast, precise conversion of video signals into digital data.

**Powerful C-SEE™ software.**
C-See is a menu-driven software package included with your DS-69. It provides high speed 5 level digitizing to the screen, high precision 16 level digitizing for superb hard copy printout, and simple software control of brightness and contrast. Or call our driver routines from your own Basic program for easy 64 level random access digitizing. Pictures taken by the DS-69 may be saved on disk by C-See and then edited by our optional MAGIGRAPH package for enhancements and special effects.

The DS-69 comes with a one year warranty. C-See supports both cassette and disk operation with the Multi-Pak adaptor and requires 64K. Cameras and other accessories are available from The Micro Works. Let your COCO see the World!

- DS-69 Digisector & C-See Software $149.95
- MAGIGRAPH Graphics Package on disk $39.95

Terms: Visa, Mastercard, Check or C.O.D.

Purveyors of Fine Video Digitizers Since 1977.

THE MICRO WORKS

Established 1977

P.O. Box 1110  Del Mar, CA 92014    (619) 942-2400
The listing: VOCABULARY

10 **VOCABULARY**
20 **BY KEITH OSANI**
30 **2/13/85*******
40 FOR Q=1TO10:R=RND(8):CLS R:NE XT Q
50 PLAY"T1501ED"
60 CLEAR4000
70 CLS:T=O;QQ=O
80 PRINT@1,0,"VOCABULARY":PRINT@4
90 PRINT@1,0,6,11 1) ADD WORDS
100 2) GET TESTED
110 3) DICTIONARY
120 4) SAVE WORDS
130 5) LOAD WORDS
140 6) UPDATE FILE
150 7) PRINT FILE"
L00 PRINT@362,"WHICH ":INPUT"ON E";A
110 SOUND 100,3
120 IF A<1 OR A>7 THEN PRINT@394,(1-7)"":FOR R=1TO100:NEXT R:GO
T070
130 ON A GOSUB 150,300,0,0,63,0,760,8
80,1040,1480
140 GOTO600
150 CLEAR:DIM A$(5,0):DIM B$(5,0)
160 F=1
170 FOR X= F TO 100
180 CLS
190 PRINT@ll,"add words"
200 PRINT"TYPE <XX> WHEN YOU ARE DONE"
210 IF X=51 THEN CLS:PRINT@230,"I AM FULL":FOR B=1TO100:Next B:
D=X-1:IF P$="UPDATE"THEN760 ELSE 70
220 PRINT"VOCABULARY WORD ":X
230 PRINT@192,"TYPE IN ":;LINE I NPUT"WORD::";A$(X)
240 IF A$(X)="XX" THEN 270
250 PRINT@256,"TYPE IN ":;LINE I NPUT"MEANING::";B$(X)
260 NEXT X
270 D=X-1:IF P$="UPDATE"THEN OO=
D:GOTO760
280 OO=D
290 GOTO700
300 DO=D:P=O:CLS:PRINT@8,"vocabulary test"
310 F=O:L=O
320 FOR X=1TO D:CLS
330 CLS:PRINT@8,"vocabulary test" 
340 PRINT"TYPE <XX> TO STOP TEST INS"
350 PRINT@128,"":PRINTA$(X):;LINE INPUT"=";S$
360 IF S="XX"THEN QQ=3:X=X-1:GO
TO530
370 IF S=B$(X) THEN 480
380 IF M=1 THEN P=P+1:GOTO330
390 FOR W=1TO100:NEXT W
400 CLS:PRINT@100,"WRONG!!!!!!!";
410 PRINT@197,"THE CORRECT ANSWER IS"
420 PRINT@230,B$(X)"!!!""
430 SCREEN,1
440 PLAY"OIT01L3ET5L1D"
450 FOR T=1TO2000:NEXT T
460 IF X=D THEN 530
470 NEXT X
480 FOR W=1TO100:NEXT W:CLS5:PR
INT@233,"CORRECT!!!!!";
490 SCREEN,1
500 F=F+1
510 FOR Y=1TO50:POKE 65344,1:K=R
ND(255):L=RND(5):SOUND K,L:POKE
65344,2:Z=RND(8):CLS Z:PRINT@233
,"CORRECT!!!!!!!"":NEXT Y
520 NEXT X
530 CLS5:PRINT@5,"vocabulary test ended";
540 SCREEN,1
550 IF QQ=3 THEN RR=D:D=X
560 D=D+P
570 PRINT@97, "YOU GOT "F" OUT OF "D:PRINT@129,"CORRECT!";
580 FOR Y=1TO2000:NEXT Y
590 D=D-P
600 D=RR
610 IF QQ=3 THEN D=D-1
620 GOTO700
630 CLS:PRINT@8,"dictionary mode"
640 D=DO
650 PRINT"TO STOP TYPE <XX>""
660 PRINT@224,"WHAT WOULD YOU LI KE "LINE INPUT"TO KNOW?";S$
670 IF S="XX"THEN 70
680 FOR X=1TO D
690 IF S=A$(X) THEN 730
700 IF S=B$(X) THEN PRINT@352,S
710 NEXT X
720 PRINT@352,"I DONT KNOW THAT "GOTO740
730 PRINT@352,S$:PRINT"="B$(X)
740 A$=INKEY$:IF A$=""THEN 740
NOW LABELIII IS AVAILABLE ON DISK!

LABEL64 - LABEL64 is a name and address file/print system that takes advantage of your 64K. You can develop and maintain a mailing list. Print lists or mailing labels in your choice of 1, 2, or 3 wide. Supports 3 or 4 line addresses with phone optional. You can sort by last name, first name, and/or zip code. You can work with up to 300 records in memory at a time. We include a second copy for back up at no additional charge. Take advantage of your 64K with LABEL64.

Cassette - 64K EXT Postpaid $24.95

FILE64 - FILE64 is a data management system designed to take advantage of a 64K machine. You can create and maintain records on anything you choose. Recipes, coupons, household records, financial records - you name it. You create records containing up to five fields you define. You can search, sort, modify, add, delete, save on tape, display on the screen and print on a printer. The program could cost you much more and we include a back up copy at no additional charge.

Cassette - 64K EXT Postpaid $24.95

SAVE $$ Take both our LABEL64 and FILE64 for only $40.00 Postpaid. Don't miss this special offer!

NOTE! If you already have our LABELIII or FILEIII program we will upgrade you to the 64K version for only $10.00. Upgrade both for only $15.00. It is not necessary to return your old programs. Simply send your invoice number with your request.

ALCATRAZ ADVENTURE - Our newest and we think most involved adventure. You have been unjustly imprisoned and sentenced to death. You must escape to prove your innocence. You will face many unique problems as you work on your goal. If you liked our BASHAN adventure you will love ALCATRAZ. Your adventure contains a large vocabulary and some unique features. This is a tough one recommended for advanced players.

32K EXT Postpaid Disk $20.95 Cassette $17.95

CUBE ADVENTURE - Cube is a non violent adventure for a minimum 16K EXT system. You must locate and enter the "CUBE" gathering treasures along the way. You will encounter some unique problems as you work on your goal. CUBE is an intermediate to hard adventure suitable for everyone.

16K EXT postpaid Disk $20.95 Cassette $17.95

GOOD NEWS FOR OUR FRIENDS FROM DOWN UNDER!
We are pleased to announce that our customers in Australia can now purchase our programs from our Australian distributor. This will avoid long shipping delays. Remit in Australian Dollars to COMPUTER HUT SOFTWARE 21 WILLIAMS ST. BOWEN QLD. 4805 Phone (077) 862220

GOOD NEWS FOR OUR FRIENDS FROM UP NORTH!
Now our friends from Canada can purchase our programs direct from our Canadian distributor. Remit in Canadian dollars to KELLY SOFTWARE DIST., LTD. P.O. Box 11932 EDMONTON. ALBERTA T5J 3L1 (403) 421-8003

NOW LABEL III IS AVAILABLE ON DISK!

LABELIII - (Reviewed in Nov 83 Rainbow) With LABELIII you can develop and maintain a mailing list. Print lists or mailing labels in your choice of 1, 2, or 3 wide. Supports 3 or 4 line addresses with phone optional. Sort by last name, first name or zip code.

16K EXT Postpaid Disk $21.95 Cassette $19.95

FILEIII - Data management system. With FILEIII you can create and maintain records on anything you choose. Recipes, coupons, household records, financial records - you name it. You create records containing up to five fields that you define. You can search, sort, add, delete, modify, display on the screen or send to a printer. The program is user friendly and user proof. Prompting is extensive. A comparable program could cost you much more. This one is a bargain!

16K EXT Postpaid Disk $21.95 Cassette $19.95

PROGRAM FILE - (rev Oct 83 Rainbow) Organize your programs. With PROGRAM FILE you create a file of your computer programs. You can search, sort, add, modify, delete, save to tape and display on the screen or send to a printer.

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The programs generated by the compiler can be run or compiled stand alone programs. A built-in linker/editor will automatically select one and only one copy of each subroutine that is required from the internal run-time library and insert them directly in the program. This eliminates the need for cumbersome, often wasteful separate “run-time” packages.

CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the Advanced Basic and Machine Language programmers, CBASIC will let you take control and manage every aspect of your program, even generate machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origination and even more changes. It can even generate machine code language generally designed within a program that exercises just like any other Basic program line.

FULL COMMAND SUPPORT & SPEED

CBASIC features over 100 Basic Commands and Features that fully support Disk, Tape, Printer and Screen I/O. It also supports all the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and with 99.9% syntax compatibility.

CBASIC IS FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well-experienced machine language programmer. We have had a report from a CBASIC user that claimed “a Basic program that used to take 3 hours to run now runs in 7 to 8 minutes.” Another user reported a program that took 1 to 1.5 hours to run in Basic, now runs in 5 to 6 minutes!!

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to create and edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program rerunthough, Complete, easy to use editing, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Assembling (merging), Tilling disk files and Displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequential lines between existing lines. You can set the printer baud rate and direct normal printer commands to the printer for hard copy. The built-in editor makes program corrections and changes as easy as “typing in a box.” If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it’s simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes the own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PAL “Word Pix” and the Double Density 90 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these displays, formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled program! If you want CBASIC to include the display driven in your program, all you have to do is use a single CBASIC command “HERE”. The run-time display driver that CBASIC includes in your program is not just a simple display, but a fully featured display package. With the Hi-Resolution display package you can mix text and graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you the kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6809 64K Synchronous Address Multiplexer (in the Color Computer). It will fully utilize the 64K of address space available in the Color Computer (64K installed) during program creation. Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it automatic selects one or more 32K of RAM space automatically for variables or even program storage to run-time. It will automatically switch the ROMs in and out needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of programs. Some of the other Basic compilers can work with 16K or about 200 lines. Even working with only 256 lines, CBASIC compiles programs with lightning fast speed. It will compile a 28K program to disk in less than 2 minutes That’s without a listing being generated. We’re heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the 0/1 devices (Disk, Tape, Screen & Printer), High-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Basic compilers don’t necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform /0 functions. Like INPUT, PRINT and so on. CBASIC doesn’t do this. All of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a “string pool” like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC’s string processing is so fast, it eliminates the time consuming “Garbage Collection” problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to have for each element. To Dimension an array of 40 strings, each containing 120 characters, you would DIM AX(40). But a string is not dimensioned. CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array AX, you would use AX(30). The only real change is in the DIM statement. For undeclared variables, CBASIC will automatically reserve space for 10-99 strings of characters. In other Color Basic compilers, you have to declare EVERY string variable used in the program in a DIM statement. And, to create an array of 40 strings each having 40 characters each, you would have to DIM AX(2000), and then to access string #30, you would have to multiply 30 x 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on one system will run on systems with different ROMS. CBASIC IS NOT compatible with JOSS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complete as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that just put one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual with a complete list of keywords and terms along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for simply by looking through the index and scanning the Section titles on the top of the page. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from Basic users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC’s features to what other compilers offer and you’ll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Do support /0 functions? You can’t write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large a program can you write? Can you compile a complex string like, MIDSTRING(DAS, "LENE", 3, 5)? Can you use two character variable names for string to numeric variables, like Basic? Does it support all the Hi-Res graphics statistics including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We’ve traded in a few of them. If you want a cheap compiler, we’l1 sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any other Color compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $100.00 plus $3.00 for shipping to the address below.

The address by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

CER-COMP

5566 Ricochet Ave.
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750 GOTO 630
760 CLS: PRINT@10", "save words"
770 IF PS="UPDATE" THEN PRINT "YOU MUST NAME THIS FILE ": FOR I=2 TO 2387: PRINTCHR$(PEEK(I)); : NEXT I
780 PRINT@96, "WHAT WOULD YOU LIKE TO": INPUT "CALL THIS FILE ";
790 IF LEN(S$)>8 THEN PRINT "8 LETTERS OR LESS PLEASE": FOR G=1 TO 1: NEXT G: GOT0 760
800 OPEN"O", #1, S$
810 FOR X=1 TO D:
820 PRINT #1, A$(X)
830 PRINT #1, B$(X)
840 NEXT X
850 CLOSE#1
860 P$=""
870 GOT0 7,0

880 CLS: PRINT@10,"load words"
890 PRINT@96,"WHAT IS THE NAME OF "
900 IF LEN(S$)>8 THEN PRINT "8 LETTERS OR LESS PLEASE": FOR P=1 TO 1:
910 NEXT P: P$=""
920 OPEN"I", #1, S$
930 CLEAR4000
940 CLEAR: DIM A$(50): DIM B$(50)
950 X=1
960 IF EOF(1)=-1 THEN 1000
970 INPUT #1, A$(X)
980 INPUT #1, B$(X)
990 X=X+1
1000 GOTO 950
1010 D=X-1
1020 END=0=D
1030 GOTO 70
1040 CLS: PRINT@10, "update file";
1050 PRINT@128, "WHICH FILE DO YOU WANT": PRINT@160, ";: LINE INPUT "TO UPDATE? "; S$
1060 IF LEN(S$)>8 THEN PRINT "8 LETTERS OR LESS PLEASE": FOR B=1 TO 1;
1070 NEXT B: GOTO 1040
1080 OPEN"T", #1, S$
1090 CLEAR4000
1100 DIM A$(50): DIM B$(50)
1110 X=1
1120 IF EOF(1)=-1 THEN 1110
1130 INPUT #1, A$(X)
1140 INPUT #1, B$(X)
1150 X=X+1
1160 GOTO 1110
1170 close#1
1180 PS="UPDATE"
1190 END=0=D
1200 GOTO 170

1210 PRINT@128,"WOULD YOU LIKE ME TO GIVE YOU THE WORD AND YOU GIVE THE DEFINITION OR THE DEFINITION AND YOU GIVE ME THE WORD"
1220 PRINT@128, "WOULD YOU LIKE ME TO GIVE YOU THE WORD AND YOU GIVE THE DEFINITION OR THE DEFINITION AND YOU GIVE ME THE WORD"
1230 IF A<1 OR A>2 THEN 1220
1240 GOSUB 1440
1250 IF A=1 THEN CLS: PRINT@8, "vocabulary test": RETURN
1260 CLS: F=0: P=0: L=1
1270 FOR X=1 TO D: CLS
1280 CLS: PRINT@8, "vocabulary test"
1290 PRINT"TYPE <XX> TO STOP TESTING"
1300 PRINT@128, B$(X); LINE INPUT "="; S$
1310 IF S$="XX" THEN QQ=3: X=X-1: GOTO 530
1320 IF S$=A$(X) THEN 1400
1330 IF M=1 THEN P=P+1: GOTO 1280
1340 CLS: PRINT@106, "WRONG!!!!!!"
1350 PRINT@197, "THE CORRECT ANSWER: 

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ER IS": PRINT@231, A$(X)"111"!
1360 SCREEN\,111:PLAY"01T10L3ET5L1
D"  
1370 FOR A=1TO1000:NEXT A  
1380 NEXT X  
1390 GOTO530  
1400 CLS:PRINT@233, "CORRECT!!!"  
\; :SCREEN,0  
1410 F=F+1:FOR Y=1TO1000:POKE65344  
,1:K=RND(255);Z=RND(5):SOUND K, L  
:POKE 65344, 2:Z=RND(8):CLS Z;PRI
NT@233,"CORRECT!!!!!":NEXT Y  
1420 NEXT X  
1430 GOTO530  
1440 CLS:PRINT@224, "WWould you like to l
ke me to 1>GIVE you T
he question again if you get i
t wrong 2>Just tell
you the right answer an
D go on testing."
1450 PRINT@384, "We":;INPUT"LL";M  
1460 IF M>2 OR M<1 THEN 1440  
1470 RETURN  
1480 CLS:PRINT@224, "print file"  
1490 I=(PEEK(65314)AND1)  
1500 IF I=1 THEN PRINT"TURN on y
our printer";O=9  
1510 PRINT#-2,CHR$(19)  
1520 PRINT#-2,CHR$(27);CHR$(14)  
1530 I=(PEEK(65314) AND 1)  
1540 IF I=0 AND O=9 THEN PRINT"T
Hanks!!"
1550 O=0  
1560 PRINT@128, "Which file would yo
u":LINE INPUT"Like to print o
ut?";R$  
1570 IF LEN(R$)>8 THEN PRINT"8 let
ters or less please":FOR P=1TO
1000:NEXT P:GOTO1480  
1580 R=LEN(R$):Z=21-R/2:PRINT#-2,
,TAB(Z)  
1590 PRINT@230, "printing....."  
1600 PRINT#-2,R$:PRINT#-2,TAB(16)
):PRINT#-2, "Vocabulary"  
1610 PRINT#-2,CHR$(27);CHR$(15)  
1620 FOR T=1TO 2:PRINT#-2,CHR$(1
3):NEXT T  
1630 OPEN"1", #1, R$  
1640 CLEAR40000  
1650 DIM A$(50):DIM B$(50)  
1660 X=1  
1670 IF EOF(1)=1 THEN 1730  
1680 INPUT#1, A$(X)  
1690 INPUT#1, B$(X)  
1700 PRINT#-2,X;A$(X)"="B$(X)  
1710 X=X+1  
1720 GOTO1670  
1730 CLOSE #1:X=0:GOTO60

---

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Music And A Terminal Program, Too?

By R. Wayne Day
Rainbow Contributing Editor

This summer has been an exciting one in the world of CoCo telecommunications. Tandy has released a new product that includes a "semi-smart" terminal program as an integral part of the product and a new revision of a popular terminal program has also been released.

In June, Tandy finally released the long-rumored Orchestra 90/CC program pack, a music synthesizer for the CoCo, and already it’s generating a lot of interest on CompuServe and on many BBSs across the country.

I'll leave the review of the musical capabilities of Orchestra 90 for someone more capable, but I would like to discuss the abilities of the on-board terminal program in Orchestra. In general, though, Orchestra 90 provides a method of generating music in stereo using your computer.

One of the advantages of Orchestra 90 is the ability to share (via bulletin boards and a special Orchestra SIG on CompuServe [Page PCS-15]) “source files,” the text-like data that is compiled by the program, to produce the actual sounds.

The programmers also included the ability to use the program as a terminal that’s capable of downloading and uploading the files to a BBS or CompuServe, using the normal RS-232 port on the CoCo at 300 Baud and utilizing what’s commonly known as the capture buffer protocol (also known as Control-R/Control-T or DC2/DC4). That protocol is simply a way of saying the BBS sends a Hex 12 just prior to sending the music data, following with a Hex 14 when the data has finished. Those control characters tell many terminal programs to open and close the buffer so the terminal “captures” the data into memory.

If you’ve followed my columns in the past, you’ll know I’m not overly fond of relying on a process that does not support some form of error-checking and error-correction when downloading or uploading important files. For my purposes, “important” is defined as something I’m not going to immediately discard after using once.

Additionally, the state of the telecommunications art in the CoCo world has progressed. A good portion of the folks who are using their Color Computers to telecommunicate are no longer relying on 300 Baud from the built-in RS-232 port, but are using the hardware in the RS-232 ROM pack and beginning to use 1200 Baud effectively, as well.

One other situation when using the built-in terminal program in Orchestra could cause some problems for the unwary. The files stored on disk or tape by Orchestra are not normal ASCII files. There are no carriage returns stored internally, plus the first characters of what should be a new line are modified. All of this adds up to the fact that more than one person has already attempted to upload an Orchestra music source file to the Color SIG in an improper format, plus the user who believes he can download music files with his “normal” terminal program, then use them in Orchestra has found it doesn’t work.

Enter OCNVRT.BIN (and OCNVRT.BAS), a program written by Mike Ward, an assistant SysOp of the Color SIG and the author of Mikeyterm. Mike has created a conversion utility that allows Orchestra 90/CC files to be uploaded and downloaded by a terminal program other than the one Orchestra contains. This allows the use of an error-checking protocol (XMODEM, CIS ‘B’ Protocol, DFT, etc.) as well as the use of 1200 Baud transmissions.

OCNVRT.BAS is a BASIC loader that creates the disk version of OCNVRT.BIN, and is presented at the end of this column. It has been released into the public domain by Mike, and you should feel free to share it with whomever has a use for it. It is also available for downloading from The Color SIG as well as the Orchestra 90 SIG on CompuServe.
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If you're among many readers of THE RAINBOW who file every issue, expecting someday to need a program or article contained within the magazine, past releases of RAINBOW ON TAPE are available — beginning with the April 1982 edition. (Please check this issue's Table of Contents for "Back Issue Information" to review previous magazine themes.)

Programs From Past Education Issues:

September 1984 — Clock, a program that teaches youngsters how to tell time; Mad Adder, a game of logical math; The ABC Game, a learning tool for preschoolers with a musical reward; Word Scrambler for Spelling Lists, an entertaining drill for assigned words; CoCo School Marm, Part I, a computer-controlled tape recorder for audio pronunciation and spelling. Also, two geography games, an investment interest display, a disk mailing list program and programs dealing with BASIC and PASCAL.

September 1983 — Random Lab Scheduler, a program to help teachers schedule students when they don't have enough lab stations; Ruler Reader, a program that reinforces measuring skills; The Write Idea, an aid in developing composition topics; Color Math Quiz, a math drill for preschool through junior high school students; Convert, an easy method for conversion to the metric system; Grade Averaging, a teacher's helper for grades; and Bibliography File, a storehouse of information on term papers, reports and lectures with easy access. Plus, a geometric graphics program, a hidden word game, valuable information on the 103 known elements, a music program for the high-tech piano player and a utility on machine language programming.

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Each edition of RAINBOW ON TAPE is a collection of ready-to-load-and-run programs from the corresponding month's issue of RAINBOW magazine. RAINBOW ON TAPE is not a "stand-alone" product, but is intended to be an adjunct and complement to the magazine. That is, even if you purchase RAINBOW ON TAPE, you will still need the magazine for loading and operating instructions. RAINBOW ON TAPE will not run on Dragon or MC-10 computers.

Look for the order card between pages 34 and 35 in this issue.

To order by phone, call: (502) 228-4492
compatible only with disk systems at this
time. A cassette version may be in the
works in the future.

By the way, lest anyone think I'm
taking unfair potshots at Bryan Eggers
and Software Affair, Ltd., the producers
of *Orchestra 90/CC*, rest assured that
I agree with Bryan's thinking — a
terminal program that would at least
allow the sharing of *Orchestra* files
would be better than no integral
downloading, as well as a very flexible
method of defining function keys and
user options. Like most of the newer
OS-9 terminal programs, it does require
the use of the RS-232 ROM pack. Look
for their ad in this month's *RAINBOW*.

**Word-Pak Compatible Terminal**

The newest version of *Mikeyterm* (Version 3.5) supports both the PBJ
*Word-Pak I* and *II* as well as the normal
Terminal Program at all. It came down
to a problem of space, since the entire
*Orchestra 90/CC* program is contained
on one 2764 EPROM (that's a 64K-
by-1 EPROM), which leaves very little
room left over.

They have produced one heck of a
program, and coupled with Mike's
*OCNVRT* utility, it has been one of
the more enjoyable programs I've used on
the CoCo in a long time.

**New XMODEM Terminal Programs**

Speaking of XMODEM, *COLOR
COM/E*, Disk Version 3.0, written by
Mark Davidsaver of Eigen Systems, has
added XMODEM support in this very
popular terminal program.

*COLORCOM/E*, if you weren't
aware, was one of the very first "smart
terminal" programs for the CoCo. The
current version, with its 51-by-24
graphics screen, flexible auto-log
capabilities and excellent user interface,
coupled with XMODEM support, puts
this program high up on the list of
recommended terminal programs.

It is available from Spectrum Projects
as well as other dealers, and upgrades
for current *COLORCOM/E* owners
should be available.

**New for OS-9**

OS-9 is not left out of the new breed
of CoCo communications utilities, with
the arrival of *OTERM*, by New World
Technologies of Dublin, Ohio.

Bernie Pluth, the author of *OTERM*,
has put together a program that
supports automatic and manual control
of a user-settable buffer (the buffer size
depends on how much available memory
you have when *OTERM* is loaded),
XMODEM support for uploading and
32-by-16 screen of the CoCo. An
upgrade to Version 2.5 (requiring the
RS-232 ROM pack for use at 300 or
1200 Baud), this version continues the
public domain heritage of the program,
and has been making its way through
the many BBSs that are distributing
the program through their download
sections.

*Mikeyterm* Version 3.5 is also available
on The Color SIG on CompuServe as
"MTER35.BIN" in the DL4 (Telecommu-
cinations) database.

**Hurricane Season and the CoCo**

A letter from Donald J. Kay of Key
West, Fla. ("Letters to Rainbow," July
1985, Page 6), pointed out that the
*WEFAX* program (RAINBOW, February
1985, Page 42) allows the CoCo to be
put to extremely good use by hooking
it up to a shortwave receiver to capture
weather maps from the various *WEFAX*
stations around the world.

Here are some of the various short-
wave frequencies where weather maps
normally can be received. The following
*WEFAX* stations normally transmit 24
hours daily, though actual reception on
a particular frequency may not be
consistent for your location all of that
time. The maps, though, are simulcast
— that is, the station will normally be
transmitting the same map on all of the
frequencies it uses at the same time.

Here have been several modifications
to the original *WEFAX* program to
support printers other than the Epson
(the original version), as well as
machine language versions of the
program which load almost instantly
(versus the 30 or so seconds the BASIC
versions take to get going). Versions are
currently available for the Gemini,
Okidata 92 and Radio Shack DMP-
110/DMP-120 series printers (this
version will not work with a DMP-105),
as well as the Epson with Graftrax.

Both the normal and fast-loading
versions are available from the author
of the original program: Marty Good-
man, 1633 Bayo Vista Avenue, San
Pablo, CA 94806, as well as being
available on many BBSs and The Color
SIG on CompuServe. For those who
are ordering any of the versions from
Marty, enclose a disk, prepaid return
mailer and $10 for handling.

**Letters**

In the last two months, I've been
reminded that *RAINBOW* truly is an
international magazine, thanks to notes
from Europe and South America.

From Buenos Aires, Argentina,
Alejandro Perco is a CoCo owner who's
looking for bulletin boards and database
services that are linked through the
ITT/GTE Telnet packet communica-
tions network he can hook up to.
Besides CompuServe and The Source,
both of which are accessible through
Telnet, there are numerous other
commercial database services available.

If you're running a bulletin board
that's accessible through Telnet and
might enjoy some real "DX" (that's
amateur radio talk for long distance
communications), let me know, and I'll
pass the information along to Alejandro.

For other readers outside the United
States who might be interested in
getting online with one of these infor-
mation utilities, a check with your local
PTT (Post, Telephone and Telegraph)
or communications network office
should provide information on how to
gain access to the international packet
switching networks, thus access to The
Source and CompuServe.

From Boissise Le Roi, France, Les
Kalemkarians mentions that there's a
group of CoCo enthusiasts who are
becoming more active online, as well
as learning the OS-9 operating system.

Now I'm wondering if there are any
foreign CoCo BBSs out there that
American enthusiasts might be interest-
ed in calling? If you know of one, or
better still, if you operate one that is
capable of being accessed with U.S.
standard modems (European systems
normally use the CCITT standard tones,
which are different from the American
standard of modems), please let me
know and I'll pass the information
along.
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MATH TUTOR
Here's help in basic arithmetic skills! MATH TUTOR lets you practice everything from simple addition through long division, with varying levels of difficulty. It's 5 programs in 1! Each program guides you through every problem step-by-step including regrouping and trial quotients. When repeated errors are made, MATH TUTOR not only provides the correct answer— it shows you how to get it! Accuracy, not speed, is rewarded!

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Puts YOU in charge of your schedule. • Graphically displays any monthly calendar between 1700 and 2099. You put in up to twelve 28 character memos per day... calendar shows where the memos are... call up of day shows details. • Use for appointments or a log of past activity. • Search capability allows you to list or print all memos between two specified dates or only ones meeting key-word criteria. • Date computation shows elapsed time between two dates in days, weeks, months, and years. • Printed graphic calendar available with optional Graphic Screen Print Program. • Requires 32K in BASIC TAP£ DATE-O-BASE CALENDAR • $16.95 (max. 400 memos/tape file) DISK DATE-O-BASE CALENDAR • $19.95 (over 400 memos/disk... max. 300 memos/month)

GRAPHIC SCREEN PRINT PROGRAM

Works in all PMODES and lets you shift screen image anywhere on the printed page. • Relocatable code lets you use all of your 16K or 32K machine. • Available in Color Basic 1.0 and 1.1/1.2. Use EXEC 41175 to see which you have and SPECIFY WITH ORDER. • SPECIFY PRINTER TYPE.

$7.95 • TRS-80® LP-VIII & DMP 100/105/200/400/420/420 $9.95 • Epson GRAFTRAX®, NEC® PC 8023 A-C, IDS 440/445, Paper Tiger® 460/560, Micro Prism® 480, Prism® 80/132 (with dot plotting), TRS-80® DMP-120, DMP-110, TDP-1, PROWRITE®, Centronics 739, Microline® 82A/83A (with Okigraph 1)/84/92/93, Star Micronics, Inc. GEMINI 10/10x/15 and Gorilla Banana (Trademarks of Tandy Corp, Epson America, Inc., C-1toh, NEC America, Okidata Corp., Integral Data Systems, Inc.)

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Works great with GRAPHIC SCREEN PRINT PROGRAM! • Subroutine designed to let you add any keyboard character to your graphic displays. • You define X and Y coordinates and a string variable of one or more characters...ALPHA-DRAW does the rest! • BONUS— includes instructions for a true line-numbered merge of tape files.

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If you have spent hours trying to balance your Debts and Credits, DISK DOUBLE ENTRY is for you! • Designed for small business, club and personal use. • Enter transactions in a journal type format. Program will maintain current account balances, produce Trial Balance, Income and Balance Sheet reports and complete Account Ledgers. • Will handle up to 300 accounts including report headings and totals. • Up to 1400 average transactions on a diskette. • Summary reports and four levels of subtotals available. • Requires 32K and an understanding of standard double entry accounting concepts.

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For use with (and requires) Disk Double Entry • Produces statements suitable for billing from your Receivables accounts. • Provides account summaries and mailing labels to use with your statements. • Designed and documented to allow you to change formats to accommodate your own special needs.

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All programs require Extended Color Basic and are delivered on cassette. All, except Tape Date-O-Base Calendar, are DISK System compatible. U.S. and CANADA add $1.00 per order for shipping. Overseas $2.60 per order. All prices in U.S. dollars. Florida residents add 5% sales tax. Return within two weeks if not completely satisfied.

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PARALLEL PRINTER INTERFACE

POWER SUPPLY not needed with Gemini printers

WORKS WITH ALL STANDARD PARALLEL PRINTERS

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BUILT-IN MODEM CONNECTOR same pins outs as Color Computer serial I/O port

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WITH MODEM CONNECTOR AND SWITCH
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* TEAC FD56B DISK DRIVE
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P.O. BOX 8100 ROCHESTER, MI 48308 (313) 254-4242
RAINBOWfest-Princeton

As you're probably aware of by now, the location and dates of the next RAINBOWfest have been changed to Princeton, N.J., October 11-13. Again, I'll be honored to present a seminar on CompuServe and the Color SIG, and, while the major focus of the seminar will be on the CIS System, we always manage to include a pretty good discussion of local BBS systems and general telecommunications techniques as well.

The Color SIG will also be moving its headquarters to Princeton for the weekend, where we'll be demonstrating the system, and have plenty of folks there to give you some one-on-one help. I hope we'll see you there!

Some BBS Topics

To close this month, I'd like to discuss a few things that are primarily of interest to SysOps of BBS systems; there are more of you out there each day! As you know, each of the BBS listings published in this column are called and verified to be operational prior to being published. This cuts out the boards publicized prior to going online, but that never really make it; it doesn't prevent listings from systems that go down after it has been verified, but before the publishing of the information.

In addition, the lead time for this column is two months prior to the cover date and, though this is a shorter time than most magazine deadlines, it still is significant, since my experience has been that most systems that go offline do so in the first three months of operation. Please try to understand if we don't get a chance to help you publicize your board in the first 30 days after the listing comes through.

One thing I've noticed while calling BBS systems across the United States and Canada is that many SysOps are not quite putting themselves in the position of long-distance callers. Consider three things that make life a lot easier for callers outside of your normal coverage area:

A) Be sure to identify both your system and location on your initial screen. Notice the systems listed with a city of "unknown" in the current update. Even with looking at the information files and the system bulletins, I was unable to find out just where the BBS is located.

B) Consider granting as much initial access to your system as possible while still maintaining security for your system. For example, my BBS, TBBS Fort Worth, allows new users 20 minutes of access time and full access to all of the facilities of the BBS, with the exception of leaving messages visible to the public, uploading files and changing their password. This gives the unregistered user a chance to see whether he wants to call your system again (which is what you're after, isn't it?) without taking the chance of profane public messages. Once you've got your long-distance caller hooked on what you have to offer, you've got someone who really wants to call your BBS!

C) Finally, consider keeping the amount of "new user" information someone is required to read at a minimum. This helps the caller to get into the "meat" of your system as soon as possible. For example, one BBS I recently called had no less than eight minutes worth of "required reading" prior to getting access to a menu which left me with one option — logging off! Needless to say, that's one board I probably won't call back.

Let's face it, one of the primary reasons most folks operate BBS systems is not only to provide information to students daily basis. Sound educational content Long lasting value Creative and colorful screen designs

B5 Programs Maintain a Consistent Quality of Excellence

B5 Programs:
• Assist modern teachers in classrooms across the nation on a daily basis
• Help teachers motivate students and build enthusiasm for learning
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Now Your Popular B5 Educational Programs are Available Through Radio Shack

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Grade 2 Spelling ... 90-5206. Cassette $4.95
Grade 3 Spelling ... 90-5207. Disk $10.95
Grade 4 Spelling ... 90-5208. Cassette $3.95
Grade 5 Spelling ... 90-5209. Disk $10.95
Grade 6 Spelling ... 90-5210. Cassette $3.95
Grade 7 Spelling ... 90-5211. Disk $10.95

All programs listed are for the Radio Shack Color Computer and Color Computer II, in 16K, 32K, and 64K models with ECB.

B5 Programs Maintain a Consistent Quality of Excellence

B5 Programs:
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• Sound educational content
• Long lasting value
• Self-paced with skill levels
• Creative and colorful screen designs
• Rewards to build confidence and self-esteem

Refer to Radio Shack's Education Source Book, or write for a free catalog and complete information.

September 1985 THE RAINBOW 93
Thinking about the Future

While some folks are having problems accepting the idea that 1200 Baud may have a valid place in the operating techniques of CoCo telecommunicators, there are several BBS systems now offering the choice of using 2400 Baud dial-up lines. A new generation of smart modems, led by the U.S. Robotics Courier 2400, is beginning to find its way into the hearts of BBS users and SysOps.

USR decided that one way to get the word out to many of their potential customers would be to offer local BBS SysOps the opportunity to purchase a 2400 Baud modem at a very substantial discount. While I was unable to get definite word whether this promotion will still be in effect by the time you read this, preliminary information is that it will. So, if you're currently running a BBS at 1200 Baud and wish to upgrade to 2400 Baud, you might want to contact U.S. Robotics at 800-342-5877 (800-DIAL USR) and inquire as to whether you qualify for their offer.

Will 2400 Baud be of any advantage to CoCo users? It surely is, when you consider file transfer times will be twice as fast as at 1200 Baud, or eight times as fast as at 300 Baud.

Will everyone ever go to 2400 Baud? It's my guess, at least for the foreseeable future, the majority of personal computer owners will continue to operate at 300 Baud, with a fairly good percentage operating at 1200 Baud (I see about 20 percent of the TBBS users operating at 1200 Baud) and a dedicated few operating at 2400 Baud. But, as the future draws nearer, technology will continue to decrease the cost of high speed modems (witness Radio Shack's DC2212 at less than $400) and users will begin to demand more from their systems, so I see a day when those percentages could shift appreciably.

A final thought: While there are several terminal programs now available which attempt, and even somewhat succeed in supporting 1200 Baud through the normal RS-232 port on the CoCo, the "bit banger" approach will never work at 2400 Baud full duplex. You can bet that programmers of terminal programs, if they hope to keep up with the future, should be looking at the probability of supporting a hardware UART like the one contained in the RS-232 ROM pack for those high-speed terminal programs.

Now, if someone would come up with a fiber-optics RS-232 port for my CoCo!

(As always, I can be contacted through TBBS Fort Worth (817) 232-2087 (300/1200 or 2400 Baud), CompuServe (ID=76703,376) or directly at: P.O. Box 79074, Fort Worth, TX 76179-0074. Please enclose a SASE if you desire a direct reply.)
The listing: OCNVRT

1 CLS:PRINT"WHEN YOU HAVE A DISK READY":PRINT"FOR SAVING THE PROGRAM"
2 INPUT"HIT <ENTER> 11 ;H$
3 CLS:PRINT"POKING M/L ...":SA=&HF,0,0
4 CK=,0
5 FOR I=1 TO 32
6 READ H$:IF H$="X" THEN 15
7 PRINT@2,06,HEX$(SA)
8 POKE SA,VAL("&H 11 +H$")
9 CK=CK+PEEK(SA) :SA=SA+1
10 NEXT I
11 READ I
12 IF I=CK THEN 4
13 PRINT:PRINT"CHECKSUM ERROR!"
14 STOP
15 SAVEM"OCNVRT":&HF,0,0,&HF2C
16 PRINT:PRINT"YOUR COPY OF 11 ;PRINTCHR$(34) ;:PRINT"OCNVRT";
17 PRINT"HAS BEEN SAVED TO DISK."
18 END
19 DATA B6,9,82,27,8,BE,9,83,AF,6A,7F,9,82,3B,B6,FF,3,2A,18,B6,F,
20 F,2,B6,9,85,27,10,7A,9,85,26,B,2
21 941
22 Ø DATA B6,9,86,84,BØ,B7,9,86,B7
23 ,FF,4,Ø,3B,1A,5Ø,10,CE,E,FF,1,Ø,DF
24 ,27,8E,F,Ø,BF,1,A,8E,F,E,BF,1,31
25 17
26 21 DATA D,CC,3Ø,FA,B7,FF,23,F7,F,
27 F,22,CC,35,34,F7,FF,23,B7,FF,3,F
28 7,FF,1,F7,FF,21,BE,17,7E,BF,18
29 Ø,BF,4721
30 22 DATA 17,86,BF,17,82,BF,17,84,
31 7F,16,F4,BD,18,1,F,FC,CØ,Ø,10,83,4
32 4,4B,10,26,7,43,7F,17,65,7F,16,F
33 5,B6,3143
34 23 DATA C1,42,81,3Ø,26,5,7F,16,F,
35 5,2Ø,A,B6,C1,55,81,31,26,3,73,16
36 ,F5,1C,AF,10,DE,27,BD,A9,28,BE,1
37 ,8F,3188
38 24 DATA 8C,15,FB,27,17,B6,1,8E,B
39 7,16,F9,BE,1,8F,BF,16,FA,B6,7E,B
40 7,1,8E,8E,15,BF,1,8F,BD,A4,2D
41 ,F,3798
42 25 DATA 78,8E,17,59,C6,B,6F,8Ø,5
43 A,26,FB,BE,17,7E,BF,17,8Ø,C6,1F
44 F7,17,5E,F7,17,5F,7D,17,64,26,B
45 ,86,FF,3526
46 26 DATA B7,17,64,8E,17,8C,17,6,Ø
47 ,BD,16,33,BD,16,8Ø,49,6E,70,75,7
48 4,Ø,BD,13,E9,96,EB,B7,17,66,B6,1
49 6,FC,3327
50 27 DATA B7,17,61,8E,9,4C,EC,84,1
51 Ø,83,5E,5E,10,27,6,D4,10,Ø,18,76,
52 7,C6,B,6Ø,8Ø,A7,AØ,5A,26,F9,BD,1
53 6,6Ø,33Ø4
54 28 DATA 4F,75,74,7Ø,75,74,Ø,BD,1
55 3,E9,96,EB,B7,17,72,B6,16,FC,B7,
56 17,62,8E,9,4C,10,8E,17,73,C6,B,A
57 6,8Ø,3589
58 29 DATA A7,AØ,5A,26,F9,8E,17,67,
59 1Ø,8E,9,4C,C6,B,A6,8Ø,A7,AØ,5A,2
60 6,F9,B6,17,66,97,EB,B6,17,61,B7,
61 16,FC,3874
62 30 DATA 7E,10,A9,8E,17,73,10,Ø,8E,
63 9,4C,C6,B,A6,8Ø,A7,AØ,5A,26,F9,B
64 6,17,72,97,EB,B6,17,62,B7,16,FC,
65 7E,10,3648
66 31 DATA EF,BD,16,6Ø,D,41,6E,6F,7
67 4,68,65,72,28,66,69,6C,65,3F,2Ø,
68 28,59,2F,4E,29,29,Ø,BD,A1,B1,BD,
69 16,28,2928
70 32 DATA 81,59,10,27,FE,F1,7E,16,
71 E4,17,1,2,10,7E,FE,E7,BE,17,86,B
72 F,16,F7,7F,16,F4,17,1,4B,7D,17,6
73 3,27,3295
74 33 DATA 12,BE,16,F7,3Ø,1F,A6,8Ø,
75 81,D,27,7,86,D,A7,BØ,BF,16,F7,BE,
76 ,16,F7,BC,17,88,23,8,8E,10,81,34
77 ,4Ø,3192
78 34 DATA 16,2,CE,BF,17,8Ø,BF,17,8
79 4,BD,16,33,16,FF,74,8D,BD,10,27,
80 FE,A2,BE,17,86,7D,16,F4,27,3,BE,
81 17,82,3337
82 35 DATA BF,BF,16,F7,8E,11,8,34,1Ø,1
83 7,Ø,73,16,FF,73,7D,16,FC,10,27,2
84 ,CA,7D,16,F5,26,5,BD,C6,5F,2Ø,3,
85 BD,3Ø24
86 36 DATA C6,8C,7D,9,73,27,3F,BD,1
87 6,6Ø,D,46,69,6C,65,2Ø,61,6C,72,6
88 5,61,64,79,28,65,78,69,73,74,73,
89 2E,D,2926
90 37 DATA 4F,76,65,72,2D,57,72,69,
91 74,65,2Ø,69,74,3F,2Ø,28,59,2F
92 ,4E,29,2Ø,Ø,BD,A1,B1,BD,16,28,BD
93 ,A3,A,2827
94 38 DATA 81,59,10,26,FF,1B,F,7Ø,8
95 E,1,FF,BF,9,57,7D,16,F5,26,5,BD,
96 C9,56,2Ø,3,BD,CA,4,16,2,68,BE,16
97 ,3847
98 39 DATA F7,A6,8Ø,7D,16,F4,27,5,B
99 C,17,84,2Ø,3,BC,17,8Ø,10,22,2,4F
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How Valuable Is The ‘Hands-On’ Lesson?

By Michael Plog, Ph.D.
Rainbow Contributing Editor

When I was in high school, one project in biology class was the dissection of a frog. One girl in our class lived on a farm with a pond, and provided a host of frogs for the class. We were given little knives (scalpels), a tray half-filled with wax and other dissection equipment. We then cut the frogs apart to discover some of the mysteries of anatomical organization of living beings. This is still an exercise associated with science education.

Our teacher was a somewhat nervous and eccentric person, fighting an uphill battle trying to get her students to appreciate the workings of a biological mechanism. After I became an adult, I realized that most science laboratory teachers are somewhat nervous, and the best ones are probably a little eccentric. Every year, a student will cut a finger with a scalpel; another will faint at the realization of the mess and gore of the biological mechanism; and instead of using a straight pin to keep parts of the frog out of the way of the work area, a student will use it to draw human blood! (It is no wonder science teachers are a little nervous when turning a group of students loose with these dangerous “weapons.”)

I have even more sympathy for my biology teacher, because she was also the chemistry teacher. After mixing several concoctions with difficult names, including hydrogen sulfide (smells like rotten eggs), we made gun powder. After mixing small batches of the stuff, we went outside and got to see whose batch would explode and whose batch was improperly made.

There is no doubt about it — science laboratories can be dangerous places. Acids which burn skin and clothes have to be used in chemistry classes; scalpels have to be used in biology classes. Or do they?

Imagine, if you will, the dissection of a frog without touching it — without touching a scalpel or a pin or even a wax tray. Imagine mixing volatile chemical solutions and testing for an explosion, with no fear that some student will be careless and get injured.

Such lessons are being planned right now. The frog will get dissected and the mixture will explode, but no student will get hurt. In fact, no student will be at a bench in a laboratory. The students will control the laboratory experience through a computer and video program.

The technology for this class is called computer-interactive videodiscs. That technology has been around for about 20 years, but has not been applied to middle and high school science laboratories before. The videodisc is to be connected to a computer as sort of a combination disk drive and screen controller. Students, based on keyboard entry, control which area of the video-disc is accessed and in what sequence. Thus, students can “control” the dissection of a frog by using a keyboard instead of a scalpel. All internal organs can be examined and “removed,” then examined again. Students can “back up” and review the entire dissection or just one part.

A videotape would be inappropriate for this application. The videodisc is more like a “random access file,” where students can skip around to different places on the disc with very little trouble. The videotape is like a “sequential access file,” which has to be accessed from the beginning completely through to the end.

The amazing thing about this type of classroom use of the computer is that it is not futuristic at all. At RAINBOWfests, you can see the Color Computer connected to all sorts of video equipment. The interaction

(Michael Plog received his Ph.D. degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district, and currently is employed at the Illinois State Board of Education.)
process between a videodisc and computer is certainly beyond my capabilities, but not to some of the hardware buffs who have helped enhance the Color Computer with all sorts of inventions.

The current push to implement this technology in schools is coming from the National School Board Association (NSBA). That group is promoting a $15 million public school project (called "Sci-Lab") to teach biology, physics and chemistry experiments on computer. NSBA hopes to produce 20 lessons in each of the three sciences — enough for a year in each subject. A Sci-Lab would look like a laboratory, but have work stations instead of benches. Students would face a screen and keyboard to conduct the experiment.

The price of Sci-Lab will be about the same as a new laboratory: around $100,000 for 25 work stations. A school, however, would have three laboratories in one, since each work station could conduct experiments in biology, chemistry and physics. It might even be possible to buy just a few stations or have the Sci-Lab mobile, so several districts could benefit from the same equipment.

There are, I am told, a few problems to this particular application of technology to education. (Well, there are problems to everything.) In the first place, the production of videodiscs is more expensive (and more complicated) than production of a videotape. Thus, you will probably not see individual school districts producing lessons on videodiscs. Instead, the lessons will be provided from NSBA itself, relying on specialized talent. After the lessons are produced, they would be given away or licensed to a marketer (depending on who financed the project).

The questions that should be asked about the technology, however, relate more to whether or not students will learn more about the subject matter from this approach or the more traditional approach. There are some positive features of this simulation approach. Students can repeat each lesson as many times as they (or their teachers) want. This may indeed help students to enhance their level of science knowledge.

NSBA representatives have also talked about a system which will allow teachers to monitor student progress and will even test students and grade exams. That would certainly free the teacher for more time for individual help to students.

What about the negative aspects of this idea? Might students learn more about controlling a keyboard than the digestive system of a frog? There is a folk wisdom used a lot by teachers that students "learn by doing." This implies an active approach to education on the part of the student.

The computer-integrated videodisc is more passive than a literal "hands-on" lesson, but more active than watching a film about a dissection. Also, if students do learn by doing, what do we want students to learn from an exercise in dissection? Not only are students supposed to learn about the insides of an animal, but are supposed to learn about processes of science as well.

Laboratory teachers have many objectives for an exercise such as dissection. Students are expected to learn about (by doing) the procedures used in a science lab. They are supposed to learn techniques that will help in more advanced scientific work. The "feel" of a scalpel through dead tissue is a skill that advanced students should have before attempting an examination of the nervous system of a mammal. That skill cannot be learned from a videodisc.

I must confess ignorance and confusion about this application of technology to education. In the first place, while it seems probable that students will learn more about the specific scientific experiment (dissection, chemical reactions, etc.) by the ability to repeat the lesson, there is no hard evidence that such additional learning will take place. There is also no hard evidence that the lack of a hands-on approach will damage students' skills or learning.

There is no guarantee that NSBA's project will ever be successful. The entire program may die from something as simple as lack of funding or something as complicated as the inability of a television screen to adequately differentiate between a nerve and a blood vessel. If successful, this application of technology to education could open entire new fields for schools as well as home education.

If you have any thoughts on this innovative use of computers in schools, I would like to hear from you. My address is 829 Evergreen, Chatham, IL 62629. We are without question living under the ancient Chinese curse: "May you live in interesting times!"
Return Of Baseball Fever

By Fred B. Scerbo
Rainbow Contributing Editor

This time, a salute to the National League teams . . .

Editor's Note: If you have an idea for the “Wishing Well,” submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget that this is BASIC. All programs resulting from your wishes are for your use but remain the property of the author.

Here we are in our September issue which should be in your hands sometime in the month of August. The sun is out, the temperatures are high and we are still in the midst of the season for America’s most popular spectator sport: baseball.

Since more than half of my mail during the last year has asked for part two of last year's highly popular Baseball Fever! (June 1984, Page 90), which depicted the graphics logo of each of the American League teams, this month you will find Baseball Fever2, or Fever2, if you like, which will repeat the same function as Part I, only using the National League teams.

Fever2 is written entirely in Extended Color BASIC and the program requires either 32K or 64K. Fear not, however, as I will show all of you 16K owners how to use the logo of your choice in 16K ECB. You will notice that I have incorporated many of the techniques which went into Football Fever Parts 1 and 2 (November 1984, Page 177 and December 1984, Page 107), as well as some of the extra PMODE colors introduced in previous “Wishing Well” articles.

To make it easy for those of you with 16K, I have included separate DIM statements in each logo that use these extra colors. Therefore, anyone who wants to type in an individual logo will have to add four lines, at best, to make the routines run effectively. In previous listings, you often had to add all the starting routines to generate the extra colors. Since I am only using two of these extra colors, yellow and brown, it was easy to include the routines only when needed. I have also made the arrays smaller to make them paint these colors much more quickly.

Enough talk. Let's get down to business.

The Wish
Some of this is old territory, so I will be brief. I have always stated in the “Well” that the best way to learn graphics is to type in someone else's graphics routines. I am all for the “CoCo Gallery,” but I do not like seeing everyone using the various graphics programs. Don't any of you believe in using the graphics language that comes in your CoCo? Aren't there any purists left out there? I challenge you folks to start submitting some Extended BASIC winners. I know you can do it.

Anyway, Fever2 is designed to encourage those of you who want to learn how to create your own graphics as part of a BASIC program. Many of you have submitted this wish. Before we finish, I'll give you all some hints on how to draw these graphics on your own from your own original ideas.

The Program
Like Fever!, this program will, upon being RUN, display a title card which has a crisscrossed printing of “BASE” and “BALL” with “FEVER 85” down
in the corner. Both the letters 'A' and 'B' in baseball will be either red or blue. To get to the menu, press whichever letter, the 'A' or 'B,' is red. This will assure the correct color set which usually occurs at random. It is a much easier method to use than constantly pressing the Reset button. Those of you who have 16K will have to use the old reset method, however.

The 12 teams will be listed on your menu. By pressing the letter next to the team you wish to display, the screen will create the graphics before your eyes. You can easily restart the program by pressing ENTER. The reasons I have chosen this method rather than simply returning to the menu are two-fold. First, the original Fever I was too large to fit in 32K with the disk controller in place. The variables used were too many, and we would fall just a few bytes short on the memory scale. Rerunning the program let the program work without getting an ?OM Error. From what I can tell, the way BASIC uses pointers with GOSUBs, the accumulation of pointers caused the ?OM Error. A fresh RUN cleared all these pointers. Even though Fever2 is not as large and does not require the extra bytes, I thought I should keep the two programs the same.

Secondly, using this method makes it easier to take parts out and use them in 16K. Since the routines are not called by GOSUB, you will not get an ?RG Error (return without gosub) if you use only parts of the program. Everything just flows forward in the program.

For 16K Users
If you wish to type in just one graphics, go to the listing and type in the lines between the REM statements showing the start of that team and the next team's beginning. After you have done this, include the following lines:

```
10 MODE4,1:PCLS1:SCREEN1,1
20 MODE3:PCLS2
30 IF INKEY<$CHR$(13))THEN30
40 R=2:R$="C2":B=3:B$="C3"
```

Upon running your short listing, if the screen is red, press ENTER. If it is blue, press Reset and RUN again until the screen comes up red. That's all it takes.

A Few Secrets
I have probably mentioned some of these techniques in previous columns or at the RAINBOWfest, but they are worth repeating for any new readers of the "Well":

I always use the variables 'R' and 'B' for red and blue. This makes it much easier than trying to remember which number, '2' or '3,' generates the correct color under a given circumstance.

I also use RS$ for the color value of red in a DRAW statement, and BS$ for the value of blue. Thus, when I want to draw a specific color, I DRAW RS$+" . . . " whatever string of information I need to create my graphics. Believe me, this saves a great deal of work.

Also, many of you have written and asked whether or not I use graph paper when I create these designs. The answer is: No, I do not use graph paper. I...
actually create the graphics as I go along. This is not as difficult as you may think it is. If you remember that your screen is 256 by 192, it is easy to remember that dead center is roughly 128 by 96. I will start a CIRCLE or DRAW statement at X,Y coordinates based on this relationship.

When I create, I make each logo an individual program and merge them together at the end. I use the lines I showed you for crushing this program into 16K, then add on this line at the end of the list:

```
1000 IF INKEY$="" THEN 1000 ELSE
CLS: LIST-999
```

This line will hold the graphics screen in place until a key is pressed, at which point the screen lists the program up to the point where I last left off. Since I use a full-screen editor program, I can easily move the cursor to the last line I worked on and add any DRAW or directions or change an X,Y coordinate as needed.

If you don't use a full-screen editor, you can simply EDIT the last line used. You can even add the EDIT command to the end of the IF/THEN statement, but you will have to change the line number each time you want to start a new line.

Using this technique, I can adjust my graphics as I create it. Try this method; I think you will find it greatly speeds up your graphics programming.

Conclusion

I hope you are now all satisfied that Fever2 has seen the ink of these pages. It took a great deal of time to create, so it may be some time before we see the NBL logo program many of you have also asked for. Be patient. Like all good things, you will find it is worth the wait.

The listing: BASEBALL2

```
2 '***************************************************************
4 '* BASEBALL FEVER '85 PT. 2*
6 '*BY FRED B. SCERBO (C) 1985 *
8 '***************************************************************
10 PMODE=4,1:PCLS1:SCREEN1,1:PMODE=3
12 FOR I = 20 T0 24: I$ = STR$(I): DRAW"S
16BM"+$+$",102C3U12R6F2D2G2NL6F2
D2G2NL6BR8C2M+6,-12M+3,+6NL6M+3,
+6BR8C1NH2R4E2U2H2L4H2U2E2R4NF2B
R1NR6D6NR6D6NR6" : NEXT
14 FOR I = 30 T0 34: I$ = STR$(I): DRAW"B
M"+$+$",48C3U12R6F2D2G2NL6F2D2G2
L6C1BD16DBNR8BD2DBR8B": NEXT
16 DRAW"S4BE26BU28U6NR6U6R6BR8NR
```

6D6NR6D6R6BR6BR2BU12M+4,+12M+4,-
12BR6NR6D6NR6D6R6R8U12R4F2D2G2N
L4F2D4: FORY=1TO4: FORI=15TO17FI5:
TEP20: CIRCLE(180+Y, I), 20, 2, 6: NE
XT2, Y
18 DRAW"BM216, 149C2R2D2L2SR2R2N
U2B": FORY=1TO4: CIRCLE(220+Y, 170FI5,
20, 2, 6, 72, 3: NEXTY
20 CLEAR266
22 X$ = INKEY$: IF X$ = "A" THEN 24 ELSE
24 R = 2: B = 3: R$ = "C2": B$ = "C3": OF=$0:
GOTO28
26 R = 3: B = 2: R$ = "C3": B$ = "C2": OF=-1
28 CLS: PRINT": STRING$(30, ")
30 PRINT
32 PRINTTAB(5) "A) HOUSTON ASTROS"
34 PRINTTAB(5) "B) MONTREAL EXPOS"
36 PRINTTAB(5) "C) NEW YORK METS"
38 PRINTTAB(5) "D) PHILADELPHIA PHILLIES"
40 PRINTTAB(5) "E) PITTSBURGH PIRATES"
42 PRINTTAB(5) "F) LOS ANGELES DO
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Every RAINBOWfest features many delightful surprises because it’s a great opportunity for commercial programmers to show off many new and innovative products for the very first time. You get the jump on new capabilities for your CoCo. In exhibit after exhibit, there are demonstrations, opportunities to experiment with software and hardware, and special RAINBOWfest prices.

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

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

To make it easier for you to participate, we schedule RAINBOWfests in three parts of the country. If you missed the fun in Irvine, Calif. and Chicago, why don’t you make plans now to join us in Princeton, N.J.? For members of the family who don’t share your affinity for CoCo, you’ll be comfortable knowing that RAINBOWfest is located in an area with many other attractions.

The Hyatt Regency - Princeton offers special rates ($65, single or double room) for RAINBOWfest. The show opens Friday evening with a 7 p.m. to 10 p.m. session. It’s a daytime-only show Saturday — the CoCo Community Breakfast is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs continuously until 6 p.m. (There will be no exhibition hours or seminars Saturday evening.) On Sunday, the exhibit hall opens at 11 a.m. and closes at 4 p.m.

When you attend other computer trade shows, you are often disappointed. But you’ll love RAINBOWfest because it is the only major show completely dedicated to the
Tandy Color Computer. Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a special reservation form so you can get your special room rate.

Come to RAINBOWfest! Let's all celebrate the CoCo Community!

Keynote Speaker

Our guest speaker for the 8 a.m. CoCo Community Breakfast on Saturday is Bill Barden, one of the country's most widely read computer authors. In addition to hundreds of articles, Bill has written 30 books, including TRS-80 Assembly Language Programming, Color Computer Assembly Language Programming and Color Computer Graphics. Bill will discuss "Where We've Been, And Where We're Going." (Separate tickets are required.)

Free Seminars

**Dennis Kitsz**
Dennis Kitsz, RAINBOW's newest contributing editor, is a composer, veteran hardware and software designer and president of Green Mountain Micro. His new column in our RainbowTech section debuts in the October issue.

**Paul Hoffman**
Paul Hoffman is an independent designer/artist and Color Computer programmer. He is the author of *Master Artist* and other graphics programs from Owl-Ware.

**Dale L. Puckett**
The author of *The Complete Rainbow Guide To OS-9* and *The Official BASIC09 Tour Guide* will discuss the advantages of the BASIC09 language, explain the available commands and demonstrate various functions. He also will give an overview of how to use the multitasking OS-9 operating system. Dale will be autographing copies of *The Complete Rainbow Guide To OS-9*.

**Bill Barden**
As well as keynoting our CoCo Community Breakfast (Saturday at 8 a.m.), Bill will hold a seminar discussing the right language for your application. His overview will cover the most popular microcomputer languages, including BASIC, C, PASCAL and Assembly.

**Dan Downard**
Dan Downard is the technical editor for THE RAINBOW and an electrical engineer. He has been involved in electronics for 25 years through ham radio (K4KWT). His interest in computers began about six years ago and he has built several 68XX systems.

---

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Advance ticket deadline: October 4, 1985. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price.
This program provides practice in the correct use of frequently misused contractions and possessives (its, it's, your, you're, etc.). It works well with my seventh graders; language arts teachers from grades three on up should find it useful. It can be easily modified to include vocabulary and spelling words for any grade level.

Tricky Words uses a randomly colored background and a colorful border to highlight a sentence which is missing a word. Two choices are given, one of which will correctly fill in the blank. I designated the choices '1' and '2' instead of 'A' and 'B' because numbers are easier to find and closer together on the keyboard than letters.

If the correct answer is picked, one of 10 different words indicating success will flash on the screen. If an incorrect response is given, one of 10 different words indicating an error will flash, then the correct answer will be printed on the screen. If the same response is always given when the student picks the right or wrong answer, it can quickly become boring, so I wanted to make sure each response is different.

If the student completes eight out of 10 questions correctly, he will be greeted by a message which says he has done a good job and is finished. If, however, the student gets less than eight correct, he will be notified by a message that he must do the exercise again until he gets at least eight correct; the computer will automatically restart the program. Tricky Words can be easily modified for use with any kind of exercise which can be set up to have two choices of answers, one of which correctly fits into a blank in a sentence or correctly answers a short question. Changing the sentences or questions only involves retyping the last 10 data statements of the program, lines 401 through 410. Each statement contains seven pieces of information:

1) First, type the sentence or question. Put in the appropriate end mark for the sentence and follow it by a comma. Try to keep the sentence to 29 spaces or less. If more than 29 spaces are used, the program will still work, but the sentence will bleed into the border and will not look as attractive.

2) Type one of the two choices of answers you wish to provide for the sentence. Follow this with a comma.
THE LISTING: TRICKY WORDS

10 'TRICKY WORDS
11 'PENNY RAND
15 'R2 BOX 385E
20 'PRESQUE ISLE, MAINE 04769
25 'JANUARY, 1985
35 CLS
40 GOSUB3090
80 PRINT @234,'TRICKY WORDS';
85 FOR X=1 TO 2000:NEXT X
90 CLS4
91 PRINT@229,'TYPE YOUR FIRST NAME':PRINT@296,'AND PUSH ENTER.';
92 GOSUB3090
93 INPUT$:
94 C=0:W=0:RESTORE
95 FOR M=1 TO 1000:
96 Y=RND(8):IFY=1 THEN 96
99 PRINT@65,'PRESS 1 OR 2 TO INDICATE':PRINT@97,'THE CORRECT ANSWER THEN':PRINT@129,'WAIT FOR THE NEXT QUESTION.'
100 GOSUB3090
110 READ A1$,A2$,A3$,A4$,A5$,A6$,A7$,A8$
119 'SET UP QUESTION AND TWO ANSWERS
120 PRINT@194,A1$;:PRINT@265,'1)"A2$":PRINT@297,'2)"A3$";
130 B$=INKEY$
140 IFB$="THEN 130
149 'CORRECT RESPONSE
150 IFB$="THEN PRINT@386,'A6$":SOUND 1475:SOUND 1755:FOR T=1 TO 500:NEXT T:C=C+1
159 'INCORRECT RESPONSE
160 IFB$<>A4$THEN SOUND 505;PRINT@353,'A7$":"N$":";PRINT@385,"THE CORRECT ANSWER IS "A5$".";F
OR T=1 TO 1800:NEXT T
170 NEXT M
200 CLS(Y)
210 PRINT@65,":S"
219 'END DISPLAY IF SATISFACCTORILY COMPLETED
220 IF C>7 THEN PRINT@161,'"YOU GOT"C"CORRECT OUT OF 10."':PRINT@1
93,"YOU ARE FINISHED. GOOD JOB!":GOSUB3090
229 'END DISPLAY IF UNSATISFACCTORILY COMPLETED
230 IF C<8 THEN PRINT@161,'"YOU T"C"CORRECT OUT OF 10."':PRINT@19
3,"YOU MUST DO THIS PROGRAM OVER ":PRINT@225,'UNTIL YOU GET AT LEAST 8 RIGHT."':PRINT@289,"wait!! THE COMPUTER WILL RESET":PRINT@3
21,"ITSELF."':GOSUB3090
250 GOTO250
290 'BORDER
300 H=RND(128)+127
310 FOR X=32 TO 63:PRINT@X,CHR$(H);:NEXT X
320 FOR X=48 TO 511:PRINT@X,CHR$(H);:NEXT X
330 FOR X=0 TO 448 STEP 32:PRINT@X,CHR$(H);:NEXT X
340 FOR X=31 TO 479 STEP 32:PRINT@X,CHR$(H);:NEXT X
350 RETURN
400 'QUESTIONS AND ANSWERS
401 DATA? HIS APPLE.,ITS ,IT'S,CORRECT,SORRY
402 DATA? MAIL IS LATE.,YOUR ,YOU'RE,l,YOUR,GOOD GOING,WHOOPS
403 DATA? BOOKS ARE RUINED.,THEIR,THERE,l,THEIR,ALL RIGHT,TOO BAD
404 DATA? ARE SIX BOYS ABSENT.?,THERE ,THEY'RE,l,THERE,NICE GOING,NOT QUITE
405 DATA? THE CAR HAS LOST ?,SHINE.,ITS ,IT'S,l,ITS,EXCELLENT,INCORRECT
406 DATA? I EARNED ?,DOLLARS.,TOO,TO ,2,TO,GREAT,AFRAID NOT
407 DATA? NOT BEING QUIET!,THEY'RE,THEIR ,l,THEY'RE,VERY NICE,NOT REALLY
410 DATA? INVITED TO MY PARTY.,YOUR ,YOU'RE,2,YOU'RE,GOOD,OOPS
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NEW KID. A three-year plan to raise $4.5 million to equip each of the 85 elementary schools in the Louisville, Ky.-area school system with 32 computers is off to a fast start. The “New Kid in School” program was launched in 1984 and $1.4 million has been raised by the system in cooperation with business and industry.

One of the school system’s most unique fund-raisers was a series of yard sales at the schools, which raised $47,000 in one day. Other attractions included bake sales, pizzas, tethered hot-air balloon rides, movies, break dance lessons, chili suppers and door prizes.

OS-9 PROCESSING. Computerware has introduced the OS-9 Text Formatter which provides documentation for reports. Features include centering, special margins and spacing, footnotes, page headings, etc.

The program interfaces with any editor that produces standard ASCII text files. It also is a UNIX-type formatter and said to be easy to use. The user simply embeds any of dozens of print commands in the text file to format the document.

Write: Box 668, 4403 Manchester Ave., Suite 102, Encinitas, CA 92024.

CHANGE OF ADDRESS. JTJ Enterprises, the company that developed CoCo Solver (an equation-processing program) and CoCo Base I (a database sorter) has a new address. Mail inquiries to: P.O. Box 118041, Nashville, TN 37211; telephone: (615) 331-0364.

SPORTS LINE. The sports and racing database of Computer Sports World (CSW) of Las Vegas is now carried by Business Computer Network. CSW provides up-to-the-minute results, scores of games in progress, Las Vegas “line” data, statistics and current information on horseracing, football, basketball and other sports.

Subscribers to the Business Computer Network are automatically registered as CSW subscribers and will be able to access the database.

QUIET, PLEASE! A new printer stand has been introduced by Howard Medical Company that significantly reduces the noise and vibration of dot matrix printers. Shaped from a single piece of stylish smoke gray plexiglas, the stand has a permanently bonded cushioned top that muffles much of the sound. A thin tread of cork underneath the stand protects furniture and absorbs the vibration. Write: Box 2, Chicago, IL 60690.

HELP WANTED. Frustrated job seekers will want to access a new electronic service called U.S. Employment Opportunities, which is available through NewsNet and maintained by Washington Research Associates of Arlington, Va.

“Professional job hunting is an information-gathering process perfectly suited to computer application,” says Joseph Ryan, editor of the service. “Job hunters in the ‘80s use virtually the same methods of gathering information as they did in the ‘60s — not the 1860s.”

Ryan says that companies from across the country send job vacancy information daily for inclusion in the new database.

Currently, USEO has job information for three major fields — banking/finance, advertising/public relations and federal government employment. A fourth, the computer field, is expected soon. Within two years USEO expects to have 20 or more separate fields.


STAR BRIGHT. An annotated bibliography of astronomical software has been published by the non-profit Astronomical Society of the Pacific. The list includes 45 programs available on disk or cassette for a variety of computers, including Tandy. Each description includes details on what the software does, along with the address of the manufacturer. The bibliography also contains an introductory reading list of books and magazines.

To obtain a copy, send a donation of $1 to A.S.P., Computer List, 1290 24th Ave., San Francisco, CA 94122.

VOICE MAIL. Now you can get your electronic mail and Telex messages without a computer. Mnematics Videotex has introduced Voice Mail Service, which allows subscribers with touch dialing features to call a special number and have E-Mail and selected features read to them by computer-generated speech.

The caller enters his/her I.D. number and password using the telephone’s number pad. Voice prompts indicate if E-Mail is waiting, the name of the sender, the subject and the time required to read each letter. Write: Mnematics Videotex, Sparkhill, NY 10976-0019.
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Test your geographical knowledge or use it to learn; either way you’ll find this program educational as well as enjoyable.

Oh! Canada

By Russ F. LaBelle

An educational program which was originally designed for my children to assist them in their geography, Canada is written in Extended BASIC and begins with a cover page of the map of Canada. A few bars of the Canadian national anthem are played prior to the test.

The test itself consists of 11 questions asking the student to name the capital cities of all 10 provinces plus the nation’s capital. If the student answers correctly the “Charge” is played. If they answer incorrectly, the “Death March” is played and the correct answer is displayed. I included a “Press ENTER to continue” portion here so the kids had enough time to study the correct spelling of the cities.

Upon conclusion, the students are given a report card which tells them how many correct answers they gave. The program also gives them the option of trying again.

(Any questions about Canada may be directed to Mr. LaBelle at Box 1528, Bonnyville, Alberta, Canada T0A 0L0, phone 403-826-5231.)
To help celebrate Spectrum Projects Fourth year in supporting the CoCo, we are offering a truly unbelievable once in a lifetime deal! Buy any software from our 2 page “Colorful Utilities” ad* and get a set of (8) 64K CoCo chips for only $14.95 and/or a Disk Drive Ø for only $199.95. Expires 10/10/85. Order now as quantities are limited! Sorry, no rainchecks! (*Or CoCo Max)

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The listing: CNDCAPTL

1 ' CANADIAN CAPITAL CITIES
2 ' BY RUSS LABELLE
3 ' BOX 1528
4 ' BONNYVILLE, ALBERTA, CANADA
5 PMODE=3,1:FCLS:SCREEN1,
10 DRAW"BM44,4G4F4G2D2F2D2R2F4D
4G2D1G2D1G2F2D4F2D2F2D4G2D6G
2D8G2D4G2D4F2D2R2F4R2F6R2F
4F2R2F2R6F2R6F2R6F2R6F2R1F2F
R7G2F2G2D2G2D2G2D6G2R2F2E2R2E2U2E
2U2E2R2E2R4E2R4E4U6E2U6E4R4F
2D4F2R2F2R2E2U4E2R2G6G6D6D4U4U1F
E2U12L2D2G2D2L8H4U1H2U4H2L2
15 DRAW"BM212,12G2G2D2G8D2G4L2G2L
2H2E1U4E2U2E1U6E4U8R2E2R
2E2R2E2U1H2E2U2E2U2E2U2H2L1L2G
2L6H2L2U2L6H1U2H2L2G2D6F4D1L1H
4U2H8L2H2L2H1G2D2L2G2L6G2D4F
2D4F2R4F2D4F2D2G8D2G2D8F4
2D2F2D2F2G4L2G2L2H2L2U6H2U2H2U4H
2L2H2L1L0U2H2L2H2U8H2U2H2L2H
2O DRAW"BM196,74U2H2U2E4U2R2E1U0U
4H4L2U2L2H2U4U2E2R2E2E2H4U2H
2U2H2L4G2D2L2D8G2D2L2H6L2D2L2H
2U4H4L2H2L2H6L4H2L2G2L2H4L2H2
25 DRAW"BM254,124R2F4D4G2D6F2D4G2H
2U4H2U1B6U124R7G4D2R2F8R2F2F
2E4H4U2E2U2H2L0H2L2B3G4D2L2G2
D2R4F2R4E2R2E4R2F6R4F2D6L2G2
2D2R2E8R2F2R4E2U2L2H2L4E2E2U
2H4L2H2L2H4L2H4L5R5B6D4B8L2B2G
2D6L2F4E2U2E2R2E2H2L2H2
3O DRAW"BM254,92L2H2U2D2L2G2U18G
4D14G2D2G2D4G2D2R4E2R2E2R2F2D4G
2D2G2F2E6U2B2L82B2L4D4D2L4H2U2R2F4
D2
4O PAINT(0,200),3,4
45 DRAW"C2;BM62,-44L1D14R1R1B18U
14R1D14U61L1R28BD6U14F6D2F2D2F
4U14B1R1U14D1R4U16L1R1B1D6B
R18U14R6F2D1L2G2B8R1U1R1D14U6
L10
5O DRAW"C2;BM6,122U8R6D4L6B12R4D
U8R6D4L6R2F4BR6U8R6D8L6B14U2H2U
4BR6D4G2D2BR8R4L2U8L2R4B4D8U8F4
D2F2U8BR6G6L8D6R6BR6L6U4R6L6U4
R6BR6L6D4R6D4L6B2U8R6D4L6R6D
4BR6U8F4D2F2U8BR6R4F2D4G2L4U8BR2
JOR6L6D8R6B8R6U6D4L6R6D4BR6U8R6D
4L6B14D1L2RU8L2R4B4R8L4D8
55 DRAW"C2;BM218,114R6D8U4L6U4D8
BR12U8D8R6BR6U4L6U4R6
6O PLAY"T202L2AO3CL8C02L2FP4L4GA
:11;O3CD02L2G;P4ABL8B03L2CP4L4DE
EDDL2C
7O CLS:PRINT"PRINT"CANADIAN PROV
INCES AND CAPITALS ************
*****************************
75 PRINT@164,"HOW WELL DO YOU KN
OW THE CAPITAL CITIES OF
 CANADA?"
8O PRINT@356,"PLEASE ENTER YOUR
 NAME ";:INPUTN$
19O RIGHT=0
195 RESTORE
11O DATA BRITISH COLUMBIA,VICTOR
IA
12O DATA ALBERTA, EDMONTON
13O DATA SASKATCHEWAN, REGINA
14O DATA MANITOBA, WINNIPEG
15O DATA ONTARIO, TORONTO
16O DATA QUEBEC, QUEBEC CITY
17O DATA NEW BRUNSWICK, FREDERICT
ON
18O DATA NOVA SCOTIA, HALIFAX
19O DATA PRINCE EDWARD ISLAND, CH
ARLOTTOWN
20O DATA NEWFOUNDLAND, ST.JOHN'S
21O DATA CANADA, OTTAWA
22O FOR X=1 TO 11
225 READ A$,B$
226 CLS(4)
23O PRINT@160," WHAT IS THE
 CAPITAL OF?"PRINT" "AS:PRINT
@256," ":INPUTC$
24O IF CS=B$ THEN RIGHT=RIGHT+1:1
FC$=B$ THEN CLS(3):PRINT@236,"CO
RECT";:PLAY"T2P4V15L1604CEGL805
CL1604AL45C"GOTO26$
25O CLS(0):PRINT@192," SORRY
THE ANSWER IS"PRINT" ":PR
INTBS:PLAY"V25T303P4L2CL3CL8CL2C
E=I8DL3DL8CLCO2L8B03L2CP2$
255 PRINT@322,"PRESS <ENTER> TO
CONTINUE";:INPUTA$
26O NEXTX
27O CLS:PRINT@162,N$"N'S REPORT C
ARD";PRINT@226,"NUMBER CORRECT =
"RIGHT:"OUT OF 11"
28O PRINT@386,"DO YOU WANT TO PL
AY AGAIN";:F$=INKEY$:IF F$="THE
N 28O ELSE IF F$="Y"THEN 1O0 ELS
E CLS:END

THE RAINBOW September 1985
"Destination: Moon Base Amphibia" (August 1985, Page 106): The printed listing on pages 108 to 119 of our August issue has a number of incomplete lines: The reason is these lines were packed with additional statements to such an extent that they did not list properly, and the incomplete printout was not discovered in time to correct. We regret any inconvenience and frustration this editorial oversight may have caused those readers who typed in this program.

What happened? BASIC stores each command word (GOTO, PRINT, FOR and the like) as a single-byte “token”; when you list a program to the screen or the printer, edit a line or save the program in ASCII (on tape or disk), a special routine puts the words back in place of the tokens. If an extremely long line has been entered (either by using the EDIT mode to cram them in or by using a special packing program) it’s possible for the de-tokenizing routine to run out of buffer space and just drop off everything after the first 248 characters.

If you have the August RAINBOW ON TAPE, please note that the copy of Amphibia on the tape does run properly, but if you try to LIST or LLIST it you will have the same problem that we did for the same reason. The commands are there, but you just can’t see them or print them out.

To solve the problems that the packed lines cause in entering the program by hand, follow these instructions.

Using the EDIT command, change the ends of the following lines in Listing 1:

20 - Delete : (just the final colon)
910 - Delete : (just the final colon)
1000 - Leave as is (Although commands are missing, they will be inserted in a separate line.)
1016 - Delete :PAINT(214
1100 - Leave as is
1200 - Delete :IFY<72THENY=73ELSEIFY>88THE NY=87
1219 PAINT(116,52),,1:PAINT(216, 49),,,1
1301 D1$="U4E2R1U4E2H1U1H1U1E1U1E1R1U1E1D1F1U1F1D1F1R1 U1E1U1E1R1U1E1D1F1U1F1D1F1R1 F1D1F1D1G1D1G1D1G1D2F1D4R1F2D4L1 2":DRAW"C1S16BM156,160;XD1$;"
3001 GET(20,90)-(46,105),A1,G:CO LOR1,0:L ine(20,90)-(46,105),PRE S ET,BF
3011 PAINT(40,55),,1:COLOR1,0:CI RCLE(20,58),4,1:CIRCLE(32,58),4, 1:CIRCLE(52,58),4,1
3029 LINE(102,19)-(106,24),PRES ET:PMODE4,5:COLOR1,0
3053 LINE(X,Y)-(X+8,Y),PSET=X-X= 2:NEXTY:COLOR2,1:FORX=218TO234ST EP4:PSET(X,17):NEXTX
3101 FORX=128TO130STEP4:PSET(X,4 7):PSET(X,48):NEXTX:D2$="E2R1F2G 2L1H2"
3143 PAINT(95,34),,1:PMODE3,5:CO LOR2,1:L ine(94,33)-(256,64),PSet ,B
3163 PMODE3,5:COLOR3,1:L ine(12,1 92)-(64,192),PSET
3221 PMODE4,5:POKE178,1:PAINT(11 0,79),,1:PMODE3,5:DRAW"S16BM12, 90;XD2$;"
3247 PMODE3,5:DRAW"C3S12BM24,120 ;XD4$;"PAINT(28,116),3,3
3301 PAINT(100,41),,1:COLOR1,0
3317 DRAW"BM"+STR$(X)+",48;XD1$; BM"+STR$(X)+",68;XD2$;":NEXTX:L I NE(129,39)-(255,77),PRESET,BF:RE TURN
6906 GOSUB6300:GOTO7000
7906 FORI=1TO30:PRESET(RND(255), 161+RND(7)):NEXTI:GOSUB6500
9501 PRINT:PRINT"BONUS 2000!!!": S1=S1+2000:FORI=1TO800:NEXTI
9901 PRINT@227,"PRESS <ENTER> TO C ONTINUE"
Combined with some rhyme and reason and a little inspiration from you, CoCo will be an aesthetic composer.

CoCo-etry

By Elizabeth Ligon

The computer write poetry? Sure it can! You have to feed it some words, of course, and what comes out can be very interesting. It may not rhyme, but the results can be very pleasant.

Teachers or parents who wish to encourage creative writing will find Col-Poem very helpful. My daughter, who looks upon writing in general and computers in specific with a jaundiced eye, will spend an hour composing poems with the computer's help.

The computer asks you to pick a number from zero to eight, and then flashes that color on the screen. It asks you what color you see, then asks a series of questions about the color. It takes your statements and composes a poem. If you like the poem, and have a printer, the computer will even print the poem for you.

(Elizabeth Ligon, a reading professor who is not at all technically inclined, has surprised herself by becoming a computer hacker and enjoys making up simple programs. She lives in Miami, Fla., with her husband and 11-year-old daughter.)
### Printers
- **Endicott**: Printers
  - *Sprint 80 (CP/M F/T)*: $214.00
  - OkiData 82 (SER) w/COCO Cable: $329.00
  - OkiData 92 (PAR): $394.00
  - Panasonic KX 1091 (PAR): $155.00

### Monitors
- **Endicott**: Monitors
  - ADEK 120 (24 x 30" CRT):
    - Color 300 (Color Composite and B&W Model): $369.00
    - Color 300 (Green, No Glare): $149.00
    - Color 300A (Amber, No Glare): $155.00
    - NAP (Amber/Waudio): $109.00

### Printer Interface
- **Endicott**: Printer Interface (Serial to Parallel)
  - PB/Printer & MODEM Connections: $65.95
  - Purchased with Printer: $59.95

### MODEMs
- **Endicott**: MODEMs
  - VolksMODEM 1200 with All Cables: $224.95
  - VolksMODEM 1200 (See below): $349.95

### Tapes
- **Endicott**: Tapes
  - C-10 One Dozen: $7.50
  - Two or More Dozen: $7.00

### Disk Storage
- **Endicott**: Disk Storage
  - Flip File 10: $5.45
  - Flip File 25: $16.95
  - Flip File 50: $22.00

### Joysticks/Adapters
- **Endicott**: Joysticks/Adapters
  - Wico Joystick Adapter: $18.95
  - Wico Analog Joystick: $38.95

### Look at These Discounts and Compare...

<table>
<thead>
<tr>
<th>Software</th>
<th>Discounted Price</th>
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<tr>
<td><em>SPECTRAL ASSOCIATES</em></td>
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<td>ELITE SOFTW</td>
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<td>Coloring Kit (Programming Utility)</td>
<td>$27.95</td>
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### DEFT Systems
- **Endicott**: DEFT Systems
  - DEFT PASCAL: $24.95
  - DEFT BENCH: $24.95
  - DEFT EXTRA: $24.95

### Pxe Computing
- **Endicott**: Pxe Computing
  - AUTOTERM: $31.95

### Prickly-Pear Software
- **Endicott**: Prickly-Pear Software
  - ELITE WORD: $5.95
  - ELITE WORD/SPEL: $99.95
  - ELITE CALC (Ver 3.0): $5.95
  - ELITE LIST: $19.95

### XV Computing
- **Endicott**: XV Computing
  - AUTOTERM: $31.95

### Spectrum Projects
- **Endicott**: Spectrum Projects
  - Coco Chequer: $19.95
  - Adventure Generator: $19.95
  - Apple SCOT: $39.95
  - 64K Disk Utility: $19.95

### Adventure International
- **Endicott**: Adventure International
  - Fire Copter: $19.95

### Mark Data
- **Endicott**: Mark Data
  - Tuf's Tomb: $19.95
  - Sherbangan: $19.95
  - Black Suntan: $19.95
  - Sea Quest: $19.95
  - Atoll Island: $22.35

### Note
- **Endicott**: Note
  - ALL SALES FINAL. NO RETURNS UNLESS DEFECTIVE.
Col-Poem is simple enough for the person new to computers and who doesn't have Extended Color BASIC. Those with Extended Color can change the input commands in lines 190-220 to line input commands, thus allowing for punctuation. Additionally, the printing commands (lines 415 to 510) can be changed to fit your printing needs.

Run the program and see what happens. You may find, with CoCo's help, that you have some poetic talents!

(Any questions concerning Col-Poem can be directed to Ms. Ligon at 16501 SW 102 Place, Miami, FL 33157. Please include a SASE.)

The listing: COL-POEM

10 CLS (0)
20 """"COL-POEM""""
30 """"BY ELIZABETH LIGON"
40 PRINT @96,"COLOR POEMS"
50 PRINT
60 PRINT "THE COMPUTER WILL HELP YOU COMPOSE A COLOR WORD PICTURE. ANSWER EVERY QUESTION AS BEST YOU CAN."
70 PRINT
80 PRINT "USE NO PUNCTUATION."
90 PRINT
100 PRINT "KEEP YOUR ANSWER TO ONE LINE."
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$85.00

Color Connection III

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Color Connection IIU

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Video Plus IIU

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<table>
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<td>Beyond Words 2-3 parts</td>
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<tr>
<td>with Lightpen</td>
<td>1-2</td>
<td>32K-disk</td>
<td>44.95</td>
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</table>

*tape* - indicates available on tape only. add $5.00 for any program on disk.
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LIGHTPEN PROGRAMS
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A hi-res 4 part program that drills high school students in Elements and Symbols, Naming Compounds, Common Ions, and Balancing Equations. Correct answer given after two incorrect responses. A valuable tool for studying Chemistry.

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RESEARCH STRATEGIES
Grades 2-3
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A reading program wherein the child uses the context to choose the correct answer. Multiple choice format. Hi-res screen.

CHEM TUTOR
32K Disk Only $29.95
A hi-res 4 part program that drills high school students in Elements and Symbols, Naming Compounds, Common Ions, and Balancing Equations. Correct answer given after two incorrect responses. A valuable tool for studying Chemistry.

CONTEXT CLUES Grades 2-3 32K Tape $19.95 Disk $24.95
A reading program wherein the child uses the context to choose the correct answer. Multiple choice format. Hi-res screen.

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All payment in U.S. funds.
Sprucing Up
An Old Design

By Joseph Kolar
Rainbow Contributing Editor

The last time around, we delved into the little used 'A' option and developed an interesting symmetrical creation using only one design element. In order to make the resulting display even more interesting, we are going to use the same old design unit to add a bit more pizazz to what we created.

Without further ado, we will continue where we left off. If you CSAVED Listing 2, LOAD it and change Line 0 to read Listing 1. Place REM markers in front of lines 30, 50 and 60. If you didn't save the listing or want to start from scratch, key in lines 0 through 60 and 500.

We are going to create essentially the same design we made last month. Geometrically, it is impossible to make this new element identical to our original design unit. It will be a close approximation.

The difference is due to its orientation. The original A$ (horizontal orientation) radiated left from the initial starting point. The four 'A' options created a cross. Today, the orientation will be on the diagonal, up and to the left from the starting point, and the four 'A' options will create an 'X,' so get out the old graph paper (see Figure 1).

The length of the original design unit, A$, was 28 boxes (units) wide. (You can count it by tracing out the design in Line 20 on graph paper.) Rule a line 28 units long on the bottom of a clean sheet of graph paper. Mark the right-hand end with a prominent star and label this line “BOTTOM.” From the star, rule a line 28 units up; label this line “RIGHT.” From there, rule a line 28 units to the left and label it “TOP.” Label the unruled side “LEFT.”

Rule a diagonal line from the star to the left end of the TOP line. This diagonal line is the center line of your new design unit.

You would begin like this: up and to the left two units, H2; left two units, L2; down and to the left six units, G6. Finish it up and compare it with Line 20.

After you have completed it, you may be amazed to discover that even though you faithfully followed the directional instructions in Line 20, the design's area is much smaller. To give it relatively the same shape, we lost eight units somewhere. Don't fret! It is the shape we want to replicate. The fact that it is smaller will only enhance our final creation.

Reorient the graph paper so the BOTTOM is (guess where) at the bottom. Look at Line 70, C$. Trace out the directions and see what you have wrought. Rotate the graph paper so RIGHT is now at the bottom. Again, trace it out, using the information in Line 75, D$, as a guide. Now flip it so TOP is on the bottom. Remember, we always begin at the point of origin (star). Look at Line 76, E$, and trace it out, then rotate once more so LEFT is on the bottom and trace out Line 77, F$.

These four program lines, 70, 75, 76 and 77, create a near-clone to A$ in four different orientations, radiating in
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the four diagonal directions from a central point.

Key in the four lines and Line 88. Note Line 88: Among the instructions to CoCo, you will see BH3. Without BH3, the element would butt right up to the central point. It would look crowded and become indistinct. One solution is to back off from the jammed-up central point by three units in the direction of the radiation. Type RUN and press BREAK.

To see this better, temporarily key in cross hairs: BS DRAW"BM0,56R12BN R12BNJ6D96" and RUN. Press BREAK; key in and check lines 90, 91 and 92 one at a time.

Then, if you want to see the four units butt up to the central point, remove the back-off instructions in each of the four lines: BH3 from Line 88; BE3 from 90; BF3 from 91; and BG3 from 92 and RUN. See?

Note that these four lines all used AO because they were placing the four differently oriented elements: C$, D$, E$ and F$.

Press BREAK and place a REM marker in front of lines 88, 90, 91 and 92 to deactivate them.

Key in Line 80. This time, CS will be put through its entire cycle of 'A' options. The results are the same. RUN to check it out and press BREAK.

Delete Line 85 and remove the REM marker in lines 88, 90, 91 and 92, and RUN. You've got an interesting design! Now hit the BREAK key.

Replace the back-off elements: BH3 in Line 88; BE3 in 90; BF3 in 91; and BG3 in 92 and RUN.

What happened? Backing off three units placed the elements over the ones drawn by Line 80, CS. Which is better? Drawing four separate orientations with all the attendant problems and placing each individually on the display, or drawing one orientation and rotating it, using the 'A' option, through the four orientations?

Press BREAK and while we are at it, change S8 to S4 in Line 88; RUN it and hit BREAK. Now, change S4 to S12 in Line 88. RUN it and press BREAK, and change it back to S8.

Key in Line 81. This effectively keeps out the superimposed design elements. We may want to call on them later.

You have glimpsed designs that were created with these overlapping and rotated elements. What do you say to adding some of the designs we developed last time? Take the REM marker out of Line 30 and RUN.

Do you see why we backed off three units from the central point? No? Press BREAK, take the REM marker out of Line 60 and RUN. See how jammed up it is in the middle?

For the heck of it, BREAK and put a REM marker in Line 81. In Line 88, change BH3 to BH12 and RUN. If you like what you see, BREAK and change BE3 to BE12 in 90, BF3 to BF12 in 91 and BG3 to BG12 in 92 and RUN.

Move these four design units back and forth along the center line by increasing or decreasing the numerical value in the 'B' back-off instructions. Experiment! You may want to try your hand at creating your own designs. Go to it and see what you can create. It will be original and afford you a lot of satisfaction.

Now, back to basics! Most beginners own a cassette-based CoCo. From personal experience, I have determined that so-called computer grade cassette tapes are not much better than cheap 60-minute tapes. Both are equally unreliable, sad to say, and full of faults that cause I/O errors to the consternation of beginners who are valiantly attempting to SAVE their first efforts in programming.

This is of vital concern to beginners who, compelled to wade through new concepts and complex procedures, want a copy of their hard-earned work. For them to lose the fruits of their first programming efforts, due to faulty tapes, is truly tragic because they may be unable to duplicate their original work. Faults in the oxide coating of a cassette tape are like dormant booby traps which reveal themselves as I/O error messages when the program is CLOADed.

Here are some hints on how to attack this vexing problem:
- Always use program Line 0 of your listings as a REM line, reserved for the title of the program, (i.e., 0 'PICTURE').
- Expect to make three copies of every listing, working or completed, that you value. No matter what brand of tape I use, it seems that at about 012 to 016 (using CTR-80A cassette counter numbers) there is a tendency to generate I/O error messages due to some fault in the tape.

For example, you have a program in memory and insert a fresh cassette, sides properly identified, into your recorder. Fast forward the tape to about 20 counter numbers to take up any slack, then rewind to the beginning. Set the counter to 000. Fast forward to a

---

Figure 1

Do you see why we backed off three units from the central point? No? Press BREAK, take the REM marker out of Line 60 and RUN. See how jammed up it is in the middle?

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For example, you have a program in memory and insert a fresh cassette, sides properly identified, into your recorder. Fast forward the tape to about 20 counter numbers to take up any slack, then rewind to the beginning. Set the counter to 000. Fast forward to a
safe starting location, say about 020 and make a note of the number.

Type LIST, the name of your program will appear on the screen. Press the Record and Play buttons on the cassette recorder. Key in CSAVE "PICTURE".

Before you press ENTER, compare the two lines on the screen to make sure the spelling is correct. This is a good time to stop and think, "Is this a variation and does it need a new title?" (i.e., 0 'PICTURE'). When you are satisfied that it is the correct spelling and correct name of the version of the program you are saving, press ENTER.

When it is CSAVE'd, press Stop on the recorder. Copy the ending counter number, say 025. Rewind the recorder to at least one or two digits before the starting number, which you previously copied. Press the Play button on the recorder, key in SKIPF and ENTER.

If you have a good CSAVE, CoCo will search for 'S' on the screen; find the program F PICTURE and after passing through it, "OK" will appear on the screen and the recorder will stop; press the Stop button. Advance about 005-010 counter units to locate for your next CSAVE.

If there is a fault, you may or may not reach F PICTURE before getting an I/O Error, you might get it on 'S'. You will get the dreaded ?IO Error with OK underneath. The recorder will stop. Now press Stop. A glance at the counter will tell you where the error occurred — say 022. I usually make a notation of this on my cassette file card (i.e., 1/0 22 — 20 PICTURE 25).

You never know when you might erase and reuse a tape. There is not much sense in CSAVEing over a bad spot.

Advance the recorder about 005-010 units after the unsuccessful CSAVE and try again. Use this procedure until you have three good copies.

If you have an especially valuable listing, even though SKIPF indicates a good copy, rewind to a counter location in front of the beginning of the first CSAVE and run through the SKIPF procedure again before taking the listing out of memory with NEW or turning off CoCo.

Sometimes on CLOADing a program, you may get an I/O, but if you go back, type NEW or press Reset and try again, then you may get a good CLOAD.

At other times, when CLOADing you may get an I/O Error while searching. The chances are good that you might be past the beginning of the program and drive CoCo nuts. Back off a few counter units and try again.

The last result is also possible when

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"You may want to try your hand at creating your own designs. Go to it and see what you can create. It will be original and afford you a lot of satisfaction."

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**THE RAINBOW** September 1985
you failed to reset the counter to 000 after rewinding to the beginning.

An alternative system is to CSAVE three copies in succession with appropriate gaps between copies. Rewind in front of the first copy, then type SKIPF and ENTER. When the cassette stops and a good copy is indicated by OK, just type SKIPF and ENTER without stopping the recorder. After passing through the blank area, it will pick up the second copy and stop at the end. Again, if it is OK type SKIPF and ENTER, and continue until you get an OK after the third copy.

This is no guarantee that you will always get good CSAVES or CLDADs because "spikes" might occur and short-circuit your efforts, but you can make a prudent attempt to record your important programs and keep losses to a minimum.

---

**Listing 1: BASTRAIN**

```
0 'LISTING1
5 CLEAR500
10 PMODE4,1:PCLS:SCREEN1,1
20 A$="H2L2G6L8H6L2G2F2R2E6R8F6R2E2"
60 'DRAW"S0A0BM128,96"+A$+"A1"+A$+"A2"+A$+"A3"+A$
70 C$="U2H2L6H8U6H2L2D2F2R2E2U2"
80 D$="U2E2R6E8U6E2R2D2G2L6G8D6G2L2"
90 'DRAW"S8A0BM128,96BG3"+F$
500 GOTO500
```

**Listing 2: ZIP**

```
0 'ZIP
10 '(C) 1984, J. KOLAR
20 PMODE3:PCLS:PMODE4
30 A=84:B=76:R=76
40 DIM S(7),T(7)
50 CIRCLE(8,8),8,1:CIRCLE(7,7),8,1
60 DRAW"BM8,8BL3UR2FD2GL2HU"
70 GET(0,0)-(16,16),S,G
80 CIRCLE(38,8),5,1:PAINT(40,8),1,1
90 GET(30,0)-(46,16),T,G
80 FCLS:SCREEN1,1
100 FORZ=-20:TO=187.5 STEP+.5:C=Z
```

---

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September 1985 THE RAINBOW 141
Making Your Own Mandala*

*Guaranteed Not To Melt!

By Bob Albrecht and Ramon Zamora
Rainbow Contributing Editors

A mandala is a symmetrical pattern and nice to look at. A snowflake is beautifully symmetric about its center. Snowflakes are great mandalas but melt all too soon. Use this program to make your own mandala. Each time you press two letter keys, one at a time, the CoCo will put four color blips on the screen, arranged symmetrically about the center of the screen. The color is selected randomly.

Listing 1: MANDALA

100 REM**MAKE A MANDALA SCH 17-1
110 CLS 0
199 '
200 REM**GET TWO LETTERS
210 H$=INKEY$:IF H$="" THEN 210
220 IF H$<"A" OR H$>"Z" THEN 210
230 V$=INKEY$:IF V$="" THEN 230
240 IF V$<"A" OR V$>"Z" THEN 230
299 '
300 REM**COMPUTE OFFSETS +COLOR
310 H = ASC(H$) - 65
320 V = ASC(V$) - 65
330 V = INT(V/2)
340 KOLOR = RND(8)
399 '
400 REM**TURN ON 4 BLIPS

(Well-known author Bob Albrecht has written numerous articles and books on personal computers through his association with DragonQuest. Ramon Zamora is author and co-author of several books, co-founder of Computer Town USA!, and is currently designing computer games for kids at Child Ware Corp. in Menlo Park, Calif.)
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Enter and run the program. You see an empty black screen (Line 110). The CoCo waits for someone to press a letter key as the value of HS (lines 210 and 220). After someone does this, the CoCo then waits for a second letter as the value of VS (lines 230 and 240). Make sure CoCo is in uppercase mode — characters that are not uppercase letters are ignored.

Suppose a child presses two letter keys. The CoCo now goes on to block 300. Line 310 computes the value of 'H,' the horizontal offset. This is how far to the left and right of center the blips will appear, zero for 'A,' one for 'B,' two for 'C,' and so on up to 25 for 'Z.' Lines 320 and 330 compute the value of 'V,' the vertical offset. This is how far above or below center the blips will appear. The value of 'V' will be zero for 'A' or 'B,' one for 'C' or 'D,' two for 'E' or 'F,' and so on, up to 12 for 'Y' or 'Z.' Line 340 computes one random color for all four blips.

On to block 400, which turns on the four blips. Here is a screen map showing blips if you press AA, MM and ZZ. The blips for AA are closest to the center of the screen and the blips for ZZ the farthest from the center.

Of course, let your child discover these things by pressing keys. Soon she will be able to make mandalas that please her!

Graphics Characters
ASCII codes 128 to 255 are graphics characters. Each graphics character occupies one print position. A graphics character is a simple shape in black plus one color. There are 16 distinct shapes, numbered zero to 15, shown here in black and white. Substitute any color (one to eight) for white.

Color the above 16 characters green. These are ASCII graphics characters 128 to 143. Color the above characters yellow. You now have graphics characters 144 to 159 — and so on, as shown by the following table.

<table>
<thead>
<tr>
<th>Color</th>
<th>ASCII Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>128 to 143</td>
</tr>
<tr>
<td>Yellow</td>
<td>144 to 159</td>
</tr>
<tr>
<td>Blue</td>
<td>160 to 175</td>
</tr>
<tr>
<td>Red</td>
<td>176 to 191</td>
</tr>
<tr>
<td>Buff</td>
<td>192 to 207</td>
</tr>
<tr>
<td>Cyan</td>
<td>208 to 223</td>
</tr>
<tr>
<td>Magenta</td>
<td>224 to 239</td>
</tr>
<tr>
<td>Orange</td>
<td>240 to 255</td>
</tr>
</tbody>
</table>
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Entry Blank

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Address __________________________
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(818) 341-3719
Or, compute the ASCII code as follows:

1) Pick a SHAPE, zero to 15.
2) Pick a KOLOR, one to eight.

Compute the ASCII Graphics Code (GC), as follows:

\[ GS = 128 + \text{SHAPE} + 16 \times (\text{KOLOR} - 1) \]

For example,

Pick a SHAPE: \( \text{SHAPE} = 9 \).

Pick a KOLOR. Choose red. \( \text{KOLOR} = 4 \).

\[ \text{GC} = 128 + 9 + 16 \times (4 - 1) = 185 \]

Try it. Type `PRINT CHR$(185)` and press ENTER.

In case you haven't memorized the shapes and their numbers, don't bother. Here is an easy way to compute shape numbers.

Remember this:

```
8
4
```

Here are shapes zero through 15.

Got it? If not, note that \( 3 = 2 + 1 \), \( 5 = 4 + 1 \), and \( 7 = 4 + 2 + 1 \). That's right, just add up the numbers in the blocks that aren't black.

Use the following program to put graphics characters on the screen. Try to build some pictures. Use a screen map to help you decide where to put each graphics character. You are working on a black screen.

**Listing 2: SHAPEMKR**

```basic
100 REM**SHAPE MAKER SCH 17-2
105 REM**FROM TRS-80 COLOR BASIC
110 CLS

199 ' 
200 REM**TALK TO SHAPE MAKER
210 PRINT @,0,CHR$(128 + SHAPE) 
220 INPUT "SHAPE (0 TO 15); S"
230 PRINT @,C,CHR$(GC)
240 INPUT "COLOR (1 TO 8); C"
250 PRINT @,S,CHR$(GC)
260 INPUT "WHERE (32 TO 519); W"
270 REM**PRINT GRAPH CHARACTER
280 GC = 128 + SHAPE + 16*(COLOR - 1)
290 PRINT @,C,CHR$(GC)
300 REM**SOUND OFF + GO AROUND
310 SOUND 89; 1: SOUND 89; 1: SOUND 89; 1
320 GOTO 210
```

Listen and Guess My Number

Ready for a guessing game? The CoCo "thinks" of a number. You guess, then listen. The computer plays a tone. High tone means you are far away; low tone means you are close. The lower the tone, the closer you are to the computer's secret number.

**Listing 3: LIGUESS**

```basic
100 REM**LISTEN & GUESS SCH 17-3
105 REM**FROM TRS-80 COLOR BASIC
110 LO = 1
120 HI = 255

199 ' 
200 REM**TELL HOW TO PLAY
```

---

**E.T.T. Electronic Typing Teacher**

by CHERRYSoft

Learning to type the right way can save you hours of tedious work when entering programs into your CoCo, and this is just what ETT was designed to do. Devote a little time every day practicing with ETT and before you know it you will be typing with confidence. Entering those programs will no longer be the chore it used to be.

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- **Disk** $29.95

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**CoCo Warehouse**

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500A N. DOBSON - WESTLAND, MI 48185
Phone (313) 722-7957

---

*THE RAINBOW* September 1985
210 CLS
220 PRINT "I'LL THINK OF A NUMBER"
230 PRINT "FROM " TO " HI "."
240 PRINT
250 PRINT "GUESS MY NUMBER, THEN LISTEN."
260 PRINT "HIGH TONE MEANS FAR A WAY."
270 PRINT "LOW TONE MEANS YOU ARE CLOSE."
280 PRINT 
290 REM**COCO 'THINKS' OFF NUMBER
310 N = RND(HI-LO+1) + (LO-1)
390 I
410 REM**GET A GUESS
420 INPUT "YOUR GUESS" ; G
490 I
510 IF D=0 THEN 810
590 REM**WINNER!
810 PRINT "CONGRATULATIONS! YOU GOT IT."
890 I
900 REM**CRAZY 'MUSIC' PLAY AGAIN
910 FOR Z=1 TO 100
920 : SOUND RND(255), 1
930 NEXT Z
940 GOTO 210

The range of possible numbers is set by lines 110 and 120. For younger children, you may want to change HI to a smaller number. For older kids, try various combinations of LO and HI.

Number Patterns, One More Time
Last time, we challenged you to write the final number patterns program. Here is our version.

Listing 4: NMBRPRTRN
100 REM**NMBR PATTERNS SCH 17-4
110 CLS
120 PRINT "TRY SOME NUMBER PATTERNS." : PRINT
130 PRINT "PRESS THE spacebar TO BEGIN."
210 If INKEY$="" THEN 140
190 I
220 REM**READ STARTING NUMBERS
230 READ S, M, A, B
250 IF S = 1E37 THEN PRINT "I'M OUT OF PATTERNS" : END
290 I
310 REM**SHOW 'LATEST' NUMBER
320 PRINT
390 I
400 REM**COMPUTE NEXT NUMBER
410 S = M*(S+A) + B
490 I
500 REM**WHAT TO DO NEXT
510 PRINT @48, "FOR NEXT NUMBER, PRESS spacebar"
520 PRINT "FOR NEW PATTERN PRESS clear";
530 K$=INKEY$: IF K$="" THEN 530
540 IF K$=" " THEN 310
550 IF K$=CHR$(12) THEN 110
ELSE 530
590 I
900 REM**VALUES OF S, M, A, B
910 DATA 1, 1, 1, 0
920 DATA 1, 1, 0, 1
930 DATA 2, 1, 2, 0
940 DATA 1, 1, 0, 2
950 DATA 2, 1, 2, 0
960 DATA 2, 1, 0, 2
970 DATA 2, 1, 3, 0
980 DATA 1, 2, 0, 0
990 DATA 11, 10, 0, 1
1000 DATA 32, 30, 1, 2
1010 DATA 34, 19, -1, 4
1020 DATA 1, -2, 0, 0
1030 DATA 1E37, 1E37, 1E37, 1E37

DragonSmoke and DragonFun

DragonSmoke is our newsletter about new ways to learn, including computers, role playing games, play-by-mail games, COPY ME stuff, public domain instructional materials, software for beginners, and our own play-by-mail game, DragonFun.

DragonFun is a play-by-mail role playing game for beginners. It is nonviolent and features cooperation, exploration, problem-solving and story-telling. How to play is described in DragonSmoke.

Teachers: DragonFun can be a great class project. We will start a new game in October 1985 specifically for grades 4, 5 and 6. Your class enters two characters and guides their adventures by mail, once a month throughout the school year.

DragonSmoke has become too big to stuff into self-addressed, stamped envelopes. For a sample copy, send $1 to DragonSmoke, P.O. Box 7627, Menlo Park, CA 94026.
Building A Spreadsheet With Template Repetition

By Richard A. White
Rainbow Contributing Editor

The basic simplicity of spreadsheeting is brought home in a new book, *1-2-3 from A to Z*, by Elna Tymes and Tony Dowden (Hayden Books, 1985). This book includes 59 complete templates for Lotus 1-2-3. With a few possible exceptions which I have not yet found, the templates will go directly into DynaCalc or VIP Calc. Some will also run in Elite*Calc* with minor syntax changes.

Many of these are very simple examples consisting of making lists and finding subtotals and final totals. The next order of complexity deals with interest calculations which are not much more than multiplication. @IF() is used a lot in some sheets, @SUM() shows up frequently, @AVG() less so and @NPV() very infrequently. Divisions show up frequently since a lot of time can be spent looking for usage per time period averaged over a certain period, or average cost per item when total manufacturing costs are known. Still, none of this is particularly complicated.

A problem I have is finding spreadsheet tasks that even start to challenge the capabilities of spreadsheet programs. A finite element analysis of the stresses and deflections in a flat plate secured at two sides and loaded in the center might do. But, I just don’t have any need for that information today and doubt that many of you do, either. Repetition of simple structures characterizes most spreadsheets.

We have talked in previous columns about REPLICATE and COPY commands. These work wonders in building the basic spreadsheet. Now, think about repeating your basic template a number of times in a single spreadsheet. It’s not hard, but it does raise a point to think about that we have not touched on before. For an example, let’s do some ordinary tax deduction figuring.

How many of you save your sales slips so you can total your sales tax for the year to deduct from your income tax? All that tax needs to be added up sometime, so let’s do it in a semi-organized way. We could take each sales slip off the pile, write down the tax and put it on another pile, then add up all the numbers. Or, we could build a budgeting spreadsheet where each purchase is categorized and entered in its category. The program then might calculate monthly subtotals by category, compare these to the budget amounts and show where we are over or under budget. Plus, this data helps in establishing future budgets.

I have real problems with this. My computer budget would have to be negotiated with my wife who is not particularly pro-computer. On the other hand, I am anti-garden mulch which causes her problems. She does not tell me how many bags of mulch she buys and I say very little about the new disk drives.

An intermediate approach is to organize the data just enough in a spreadsheet to impress the IRS (if needed) and say that’s enough. I decided to group the data by month with subtotals and then get a year-end total. To be able to check the entries, the date would be needed and a brief purchase description. Curiosity got the better of me, so I included a total sale column.

(Richard White has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the author of the TIMS database management program.)
The Rainbow Bookshelf

**The Complete Rainbow Guide To OS-9**
The book that demystifies the state-of-the-art operating system for the Tandy Color Computer. Authors Dale L. Puckett and Peter Bibbleshow you how to take advantage of OS-9's multi-tasking and multi-user features, and the capability of redirecting input and output commands at will. An easy-to-read, step-by-step guide packed with hints and tips, tutorials and free software in the form of program listings.

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City: ____________________

State: ____________________

ZIP: ____________________

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To order by phone, call: (502) 228-4922.
The strategy will be to build a template for one month within one high resolution display screen. *Elite*Calc fans will need Version 3.0. We will then duplicate this monthly template a number of times to get half a year into a single spreadsheet.

Why only half a year? There are only 255 rows available in *Elite*Calc and DynaCalc. Fifty of these would be tied up with monthly headings and totals. If you are going to save money by itemizing your sales taxes, you will probably have over 200 purchases requiring more rows than available.

If you are using *VIP*Calc, you have 1,024 rows available and can put the whole year in one spreadsheet, assuming there will be enough memory; it won't hurt to take the chance. If you do run out of memory in the middle of November, whip up a new template to finish out the year.

Now the joker in the back of the room who was selling 4K memory chips as antiques asks "why not put two six-month templates side by side."

This would work, but would not be as neat when we insert rows in months that have more than available.

In Figure 1, "MONTH-" and "PURCHASE" were added with leading spaces in DynaCalc. "TAX" and "TOTAL" in Row 2 were right-justified as was "MONTHLY TOTAL" in B14.

Finally, we enter the summation formula in Cell C14 and replicate it to Cell D14. Its *Elite*Calc form is =SUM(C3:C13) while *VIP*Calc and DynaCalc take @SUM(C3...C13).

The intention is for the user to type in the month and year into Cell B2 or its copies after the MONTH- that is in A2. You might also want to put the month in A14 so that row might read:

<table>
<thead>
<tr>
<th>[ A ]</th>
<th>[ B ]</th>
<th>[ C ]</th>
<th>[ D ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-JAN '85</td>
<td>MONTHLY TOTAL</td>
<td>X.XX</td>
<td>YY.YY</td>
</tr>
</tbody>
</table>

*DynaCalc* lets you use a formula to duplicate what you type into B2, say into A14 — it is @IF(@TRUE,B2). This works on both numbers and labels.

That completes our template for one month of entries. You will need more than 14 lines most months. In *Elite*Calc, put the cursor on Row 14 or its equivalent in copies and insert however many additional rows you need.

In *VIP*Calc and *DynaCalc*, you do the same thing, but you also must replicate a blank and formatted row of cells into the Column A range for the new rows inserted. Say you inserted six new rows. Cells A14 ... D14 become A20 ... D20. The cells in the range C14 ... D19 now are not formatted. Replicate A20 ... D20 to the target range A14 ... A19 to do the formatting.

Now is the time to put some data into the template to make sure it works right. The first law of computing is, "There are always bugs." It applies to spreadsheets as well as any other type of programming. It is most important to get this one right to avoid having the same errors show up in each copy.

Now that things are right and you have cleared your test data out, it's time to copy the one-month template a number of times to make the overall template. But, first we must observe the second law of computing, "Save early and often." For *Elite*Calc users this is a safety play. *DynaCalc* and *VIP*Calc users will need this file to build their complete templates.

*Elite*Calc's COPY command makes generating the full template a piece of cake. COPY A1:D14 to A16. *Elite* asks "Options (V,N,Q)." Choose 'V' and only the values are copied. Choose 'N' and the formulae will not be adjusted to reflect their new locations in the spreadsheet. We don't want either of these options. We might choose 'Q' and *Elite* will ask (Query) for each cell referenced if it is to be adjusted. Actually, we want all cell references to be

---

**Figure 1: One-Month Template**

<table>
<thead>
<tr>
<th>[ A ]</th>
<th>[ B ]</th>
<th>[ C ]</th>
<th>[ D ]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - MONTH-</td>
<td>PURCHASE</td>
<td>TAX</td>
<td>TOTAL</td>
</tr>
<tr>
<td>2 - DAY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 -</td>
<td></td>
<td></td>
<td></td>
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<td>4 -</td>
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</tr>
<tr>
<td>13 -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 - MONTHLY TOTAL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 -</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 - MONTH-</td>
<td>PURCHASE</td>
<td>TAX</td>
<td>TOTAL</td>
</tr>
<tr>
<td>17 - DAY</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The first order of business is to plan the column widths. The only column needing to be wider than the default nine characters is 'B' for purchase description. Set this at 16. Column A for the date, 'C' for the Tax and 'D' for the total sale can stay at nine characters.

Next comes formatting. In Column A, dates are to be neatly shown left-justified under the heading. In *Elite*Calc, strike 'F' to get the format command, then 'A' for Column A and finally 'L' to left-justify numbers. In a similar fashion, put a '$' format on columns C and D.

In *VIP*Calc and *DynaCalc*, one FORMATs individual cells and then REPLICATEs those cells down a column. *DynaCalc* won't format an empty cell, so put a space into the cell and then format it. *VIP*Calc has a centering format which you can use rather than the left justification for Column A. Once you have formats in cells A3, C3 and D3, hit /R to call replicate. You are asked the starting range which is A3 ... D3, then the target range which is A4 ... A15.

Labels can be typed in any time. Formats apply here and can be handled in a number of ways. *Elite*Calc and *DynaCalc* accept leading spaces and you can manually add the number needed to place the label just so. Too many? Edit the line to take one or more out. *VIP*Calc won't accept leading spaces, but you have the centering option available or right-justify the text with trailing spaces to move the label off the right cell boundary a space or two.

In Figure 1, "MONTH-" and "PURCHASE" were added with leading spaces in DynaCalc. "TAX" and "TOTAL" in Row 2 were right-justified as was "MONTHLY TOTAL" in B14.

---

150 THE RAINBOW September 1985
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- Requires 16K

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32K Disk
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adjusted, so hit ENTER.

Now we have two months' worth of templates ending at Row 29. Leaving Row 30 blank like Row 15, COPY A1:D29 to A61 to complete a sheet for six months of data. One last task is to provide totals for this sheet and year-to-date totals.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>89-</td>
<td>JUN '85 MONTHLY TOTAL</td>
<td>XX.XX YYY.YY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90-</td>
<td>TOTALS THIS SHEET</td>
<td>XXX.XX YYYY.YY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91-</td>
<td>TOTALS PREVIOUS SHEET</td>
<td>XXX.XX YYYY.YY</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92-</td>
<td>YEAR TO DATE TOTALS</td>
<td>XXX.XX YYYY.YY</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Cell C90 contains the formula =C14+C29+C44+C59+C74+C89. This adds up all the monthly totals. Note the pattern X4+X9+X4+X9... which results from our keeping 15 row increments for each month. Patterns like this make it easy to set up formulae from memory without having users substitute '+' for '='. Now replicate the range C90:C92.

Cell C92 contains =C90+C91. Now we have two months' worth of templates sending Row 15. INSERTing 15 rows above current Row 1 will make room.

_DynaCalc owners can simplify the effort by using keysaver. Put the cursor on A1 and press BREAK to clear the keysaver buffer, then key /, I, R to insert one row. Now key /, K, 14 to repeat the preceding sequence 14 times. It takes a little time, but you get to watch rather than work._

Now load the single-month template and save it. It will overlay the new blank rows you added, making a two-

**Figure 2: Example of One Month of Data in the Template**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>193-</td>
<td>MONTH-</td>
<td>MAY '85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>194-</td>
<td>DAY</td>
<td>PURCHASE</td>
<td>TAX</td>
<td>TOTAL</td>
</tr>
<tr>
<td>195-</td>
<td>1</td>
<td>TV TAPE</td>
<td>$1.80</td>
<td>37.62</td>
</tr>
<tr>
<td>196-</td>
<td>3</td>
<td>MEYER'S</td>
<td>$2.45</td>
<td>4.93</td>
</tr>
<tr>
<td>197-</td>
<td>4</td>
<td>MARSH</td>
<td>$4.65</td>
<td>51.91</td>
</tr>
<tr>
<td>198-</td>
<td>4</td>
<td>HARDWARE</td>
<td>$4.45</td>
<td>9.31</td>
</tr>
<tr>
<td>199-</td>
<td>5</td>
<td>MEIJER</td>
<td>$2.71</td>
<td>56.81</td>
</tr>
<tr>
<td>189-</td>
<td>10</td>
<td>CAR RENTAL</td>
<td>$8.94</td>
<td>187.69</td>
</tr>
<tr>
<td>111-</td>
<td>11</td>
<td>MARCH</td>
<td>$7.73</td>
<td>57.20</td>
</tr>
<tr>
<td>112-</td>
<td>13</td>
<td>LAWN MOWER REPAIR</td>
<td>$1.40</td>
<td>28.38</td>
</tr>
<tr>
<td>113-</td>
<td>18</td>
<td>MEIJER</td>
<td>$2.47</td>
<td>5.59</td>
</tr>
<tr>
<td>114-</td>
<td>18</td>
<td>MARCH</td>
<td>$2.11</td>
<td>114.51</td>
</tr>
<tr>
<td>115-</td>
<td>29</td>
<td>MEIJER</td>
<td>$4.92</td>
<td>8.75</td>
</tr>
<tr>
<td>116-</td>
<td>29</td>
<td>MEIJER</td>
<td>$4.94</td>
<td>8.84</td>
</tr>
<tr>
<td>117-</td>
<td>25</td>
<td>MCALPINS</td>
<td>$1.65</td>
<td>31.62</td>
</tr>
<tr>
<td>118-</td>
<td>25</td>
<td>MARCH</td>
<td>$1.29</td>
<td>97.87</td>
</tr>
<tr>
<td>119-</td>
<td>26</td>
<td>MEIJER</td>
<td>$2.95</td>
<td>6.99</td>
</tr>
<tr>
<td>120-</td>
<td>MAY '85</td>
<td>MONTHLY TOTAL</td>
<td>$22.75</td>
<td>699.93</td>
</tr>
</tbody>
</table>

**INCENTIVE SOFTWARE**

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The concept of building a basic template and then repeating it over and over has wide application both at home and in business.

The concept of building a basic template and then repeating it over and over has wide application both at home and in business. Data may be grouped in a variety of different ways depending on reporting needs. Weekly and monthly summaries are common. In business, monthly summaries are combined to produce quarterly reports and these are compiled into year-end reports. The implication is that data must be transferred from one spreadsheet to another.

VisiCalc pioneered data transfer through disk files and both DynaCalc and VIP Cale provide this capability. Our year-to-date totals are candidates for such transfers. It's true that for two numbers, writing them down and typing them into C91 and D91 of the new template when it is started would be easier. However, examples should be simple and easy to understand at the beginning; certainly transfer of two numbers qualifies on both counts. I will explain the DynaCalc steps.

Say it's the end of December and our summary at the end of the second spreadsheet for the year looks like this:

```
89-DEC '85 MONTHLY TOTAL 35.82 952.82
99-TOTALS THIS SHEET 154.87 3872.44
91-TOTALS PREVIOUS SHEET 182.65 5934.88
92-YEAR TO DATE TOTALS 337.52 8997.32
```

We need to bring the totals from the previous sheet over. Load that sheet and move to the "TOTALS THIS SHEET" row. Key into DynaCalc /, S, #. The disk will run to load the program that saves part of a spreadsheet as a data file.

Next, DynaCalc asks "SL" for save or load; key 'S' for save. Now it asks for a filename. You tell it and it comes back with "CDL," asking if the data is to be saved by columns, rows or default which chooses whichever direction was last used. For now, use 'D' since the order makes no difference in an example as simple as this. Last, the program asks for the range to save, which would be C90...D90 if we were using Example 1.

To load data, the cursor must be positioned on the cell where the loading is to start before the keystroke sequence /, S, #. Again, there is the disk operation and the SL options are presented; key 'L.' Next, you are prompted for a filename and finally the CDL option where you choose 'D' again. The disk works and the program comes back with something like this.

```
[ A ][ B ][ C ][ D ]
89-DEC '85 MONTHLY TOTAL 35.82 952.82
99-TOTALS THIS SHEET 154.87 3872.44
91-TOTALS PREVIOUS SHEET 182.65 5934.88
92-YEAR TO DATE TOTALS 337.52 8997.32
```

This method becomes really useful in larger business spreadsheets where the same data is used in two or more different spreadsheets, or where data in last month's spreadsheets must be moved to new locations to be ready to enter this month's activities.

We will deal with this some in the future. If you want to try this earlier, I would suggest you get the book referenced earlier or another on either Lotus 1-2-3 or VisiCalc that provides examples.
Pennsylvania-Fried CoCo

By Ed Ellers
Rainbow Technical Writer

• Help! I fried my computer. I have an ET board CoCo which I upgraded to 64K, two disk drives, a CCR-81 cassette recorder, an Olivetti ink-jet printer and a PBH serial/parallel interface.

I know I should not have done this, but the printer and PBH interface were on and the CCR-81 cassette was plugged in. I had not used the printer for months, so I put paper in it and "made sure it was ready." When I plugged the computer into the outlet, I heard a noise and smelled smoke. I didn't even push the plug all the way in. The computer was not switched on; I rechecked this as soon as it happened.

I opened the CoCo to inspect the damage. The fourth pin of the LM339N chip, U2 on the circuit board, was burned off and black, charred soot was on the resistor pack R5 on the board. I replaced this chip but got nothing.

I tried again the next day but could not get the screen to come in clearly. The middle sides of the screen seemed to disappear and the screen was wavy. I could see that the Extended BASIC sign-on message came up, but then it would go away. I also noticed that the 10000 uF 16V capacitor, C20, was split on the black plastic at the top. Could this be damaged, also? I don't know what else is damaged.

I have a number of questions.
1) What caused this? A power surge, the PBH interface, or having the printer on before turning on the CoCo?
2) Are my disk drives and controller OK? The power cords were not plugged in, but the controller was plugged into the CoCo.
3) The PBH interface shows burn marks at the modem and printer connections. Is this dead, too?
4) Are my joysticks still alive?
5) Could my printer be dead? (I did get the self-test to work.)
6) If I take my computer to Radio Shack, will they remove my 64K upgrade?

(Willa Stokes
Philadelphia, PA)

I don't think you did anything wrong. Radio Shack actually recommends turning on all peripherals before turning on the computer. What probably happened is the printer was damaged in some way that caused a short circuit from the power supply to the parallel interface connector. When you plugged in the CoCo, the high voltage had a path to ground — through the PBH interface and the CoCo.

Since the PBH interface was part of the path, it may have been damaged as well. Your joysticks and disk drives may or may not have suffered the same fate. When you get the computer running, try them out and see. Because the printer probably caused this incident, I suggest having a service technician check it out before trying to use it again.

Radio Shack's service center probably won't pull out your 64K RAM chips; if one or more are bad, though, they will probably replace the whole set.

Coffee Break

• While my wife was using my CoCo 2 she accidentally spilled a few drops of coffee down the air vent. The next
time we turned it on, everything was trashed. We sent it off to Radio Shack, and they sent it back "repaired."

When I got it home, the system would crash when I tried to use Tom Mix Software's P-51 and Worlds Of Flight. Both of these programs would work to load but would malfunction before loading was complete. According to Radio Shack, an "AX-9455, 64K PCB Stuffed was replaced. Tested unit and unit works OK."

I sent it back to them and explained that these certain programs would not work, but others would. They sent it back saying nothing was wrong. I ended up buying a new CoCo.

Can I fix my old one? Which chip do you think is the problem?

Steve Hewitt Versailles, MO

First of all, the "64K PCB Stuffed" means that Radio Shack replaced the entire main board of your CoCo, with all chips (with the possible exception of the Extended BASIC ROM). Since Radio Shack fixes so many computers, if a given machine is more difficult than usual to fix they will simply replace the whole board and send the old one in to a central location for reconditioning.

Your Extended BASIC ROM chip might have been damaged when the coffee was spilled, but in a way that isn't particularly obvious, and this same chip may have been installed in the new board. I'd try replacing it first.

**WEFAX on the DMP-100**

- I was very much impressed with the WEFAX program which appeared in the February 1985 issue of THE RAINBOW. I downloaded the Radio Shack printer version, WEFAXR, from The Color SIG on CompuServe. I have been trying to get the graphics to work on my DMP-100 printer.

It seems to work OK except that each pass spills over to the next line.

George M. Cox
Pittsburgh, PA

As you may know, a WEFAX frame has a resolution of 768 horizontal by 576 vertical. It takes up nine PMODE 4 screens. The DMP-100's horizontal resolution is 480 dots, so there just aren't enough dots to handle the picture.

If you have Graphicom (a WEFAX picture disk is compatible with this program), you can print each of the nine screens individually. Aside from that, I don't see any solutions.

---

**Border Dispute**

- The data sheet for the Motorola MC6847 video generator used in the CoCo indicates that the border in alphanumeric and "semigraphic" modes is black, and all other modes have a green or buff border. My question is, can you change this border to black?

Richard Beck
Portland, OR

My own reading of the 6847 data indicates that these border colors are fixed on the chip and can't be changed.

---

**Diskette Labels**

- I know you have been questioned about far more technical problems, but to be honest, this one is driving me batty. You see, I can't seem to make diskette labels stick. It seems no matter what brand I buy, the labels which are included won't stay on! It is very distressing to remove a disk from a drive and see the label start to come off in the drive. What can I do?

Charles M. MacLeod Taunton, MA

I personally use tractor-feed address labels that you would use with a mailing list program. They stick quite well, and since they are blank you don't have to bother with writing or typing between the lines.

---

**Color Switcheroo**

- What is it with CoCo that it can't control the display of red and blue in PMODE 4 (i.e., hitting Reset may reverse the colors)?

David A. Cromley Cheyenne, WY

These "artifact" colors are caused by the position of the dots on the screen and the relationship they have to the color subcarrier signal. When you switch on or reset the CoCo, the 6847 video chip locks in on its master clock signal. The 6847 may lock to either the positive-going or negative-going side of the signal, which it locks to determine whether you get red and blue, or blue and red.

---

**One-Liner Contest Winner . . .**

The first listing, *Division*, asks for a numerator, a denominator and the number of decimal places desired. It then computes the problem to the specified accuracy. (The last decimal place is not rounded off.)

The second listing, *Times*, simply displays a multiplication table.

**Listing 1:**

1 CLS:PRINT@10,"LONG DIVISION":PRINT:"INPUT""NUMERATOR ";N:INPUT:"DENOMINATOR ";D:INPUT"PLACES ";P:
FORC=1TOP+1:Y=INT(N/D):Y=SSTR$(Y):
Y=SRIGHT$(Y,1):PRINT$:IFF=Ø
THENF=1:PRINT":":N=1Ø*(N-(D*Ý))
NEXT:ELSE=N*(N-(D*Ý)):NEXT:EXEC44539:RUN

**Listing 2:**

1Ø CLS:PRINT@10,"TIMES TABLES";P
RINT:FORX=1TO10:PRINTX;:NEXT:FOR
X=2TO10:ISTRY=1TO10:PS=MID$(STR$(X
Y),2):PRINT030+32*X+3*Ý,PS:NEX
T:NEXT:EXEC44539

Leonard Dalenberg
Virginia Beach, VA

(For these winning one-liner entries, the author has been sent copies of The Rainbow Book Of Simulations, its companion Rainbow Simulations Tape, The Rainbow Book Of Adventures and its companion Rainbow Adventures Tape.)
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CDEFGHI ABCDEFGHI
nopqrstuvwxyz
efghijklmnopqrstuvwxyz

- Three different type styles
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Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world
your high score at your favorite micro-diversion. We want to put your best effort on record in THE RAINBOW's
Scoreboard column. All entries must be received 60 days prior to publication. Entries should be printed
- legibly - and must include your full name, address, game title, company name and, of course, your
high score. Each individual is limited to three score entries per month. Send your entries to Scoreboard,
c/o THE RAINBOW.
Current Record Holder

*

ASTRO BLAST (Mark Data) ·
51,700
•Wiiiiam Hearne, Decatur, AL
41,725
Erik Habres, Bordentown, NJ
35,600
Chris Morris, Colonial Heights, VA
ATOM (Radio Shack)
41
*Erik Huffman, Delran, NJ
BASEBALL (Radio Shack)
*Bob Dewitt, Blue Island, IL
• 525-50
BATS AND BUGS (THE RAINBOW)
24,600
•Michael Rosenberg, Prestonburg, KY
8,450
Bill Martin, Myrtle Beach, SC
7,200
Lezlee Bishop, Salt Lake City, UT
5,220
Brian Cook, Dixon, IL
'
4,000
Jon Hobson, Plainfield, WI
2.400
Steven Bullard, Allen, OK
BATTLE OF MIDWAY (Ark Royal)
1009:259
•Matt Hazard, Columbia Station, OH
BEAM RIDER (Spectral Associates)
577,330
*Bart Lyon, Queensland, Australia
BLACKJAK (THE RAINBOW)
$10,000
*Wayne Dewitt, Blue Island , IL
BLOC HEAD (Computerware)
*Michael Hebb, Victoria, Australia
41,975
27,000
Rodney Mullineaux, Gig Harbor, WA
23,500
Paschal Wilson, Kentwood , LA
BREWMASTER (NOVASOFT)
98,875
*Chris Cope, Central , SC
78,100
Steve Leonard , Roselle Park, NJ
38,875
Brandt Roberson, Collinsville, IL
9, 150
David Hart, Salt Lake City, UT
BUSTOUT (Radio Shack)
*Brett DuPont, Oregon, OH
15,520
14,500
Wayne Dewitt, Blue Island, IL
13,000
Ken Dewitt, Blue Island, IL
6,500
George Frausto, Blue l~land, IL
BUZZARD BAIT (Tom Mix)
*Blossom Mayor, East Greenbush, NY
3,091,700
CALIXTO ISLAND (Mark Date)
115
*Glenn Della-Monica, Sacramento, C/l
CANYON CLIMBER (Radio Shack)
286,800
*Beverly Herbers, Placentia, CA
162,500
Michael Sileo Jr., Glendale, NY
158,500
Scott Bellman, Davenport, IA
148,400
Brett Fancher, Hooksett, NH
140,500
Todd Wall, Durham , NC
129,000
Michel Lebrun, Anjou, Quebec
15,450
George Frausto, Blue Island , IL
CASHMAN (Mich Tron)
*Matt Mendez, Baltimore, MD
$17,850
CAVERN COPTER (THE RAINBOW)
2,431
*Jay Beam, Louisville, KY
1,535
Pierre-Jean Doulllard, Granby,
Quebec
Sean Conner, Summit, NJ
1,245
Doug Schwartz, Glendale, AZ
1,213
968
Michael Mefferd, Wren , OH
CHAMBERS (Tom Mix)
*Blossom Mayor, East Greenbush, NY
104,200
CLOWNS & BALLOONS (Radio Shack)
15, 130
*Brett DuPont, Oregon, OH
COLOR CAR (NOVASOFT)
*Dan Bouges, Niantic, CT
525,650
163,032
Frank Canepa Ill, Santurce,
Puerto Rico
154,600
Scott Cunningham, East Lyme, CT
COLORPEDE '(lntracolor)
3,107,194
*John Ray, Goodlettsville, TN
133,036
Mariano Frausto, Blue Island, IL
23,450
George Frausto, Blue Island, IL
15,056
Hiram Esparza, Blue Island, IL
COSMIC INVADERS (Spectral Associates)
16,400
*Mariano Frausto, Blue lslan.d , IL
CRYSTLE CASTLES (ThundsrVlslon)
527,155
*Chris Cope, Central, SC
83,297
Craig Hoffmann, Kenosha, WI

CU'BER (Tom Mix)
19,550
*Rodney Mullineaux, Gig Harbor; WA
DALLAS QUEST (Radio Shack)
.
93
*Robert Sunderland, Sacramento, CA
DEFENSE {Spectral Associates)
56,720
*Brett DuPont, Oregon, OH
DEMON ti (THE RAINBOW)
21,925
*Keith Schuler, Merritt Island , FL
12,475
Rhett Bagnall, Saskatoon,
Saskatchewan
10,075
Frank Canepa Ill, Santurce,
Puerto Rico
1,600
Bryan Ecker, Lusby, MD
DEVIL ASSAULT (Tom Mix)
64,741
*Eugene Little, Plerceland,
Saskatchewan
DOODLEBUG (Computsrwars)
*Susan Ballinger, Uxbridge, Ontario ·
825,370
Sean Colsen, East Lyme, CT
66,770
38,130
Bob Dewitt, Blue Island, IL
13,290
Jennifer Richardson , New South
Wales, Australia
DOUBLE BACK (Radio Shack)
*Eugene Roosa, Stone Ridge, NY
614,450
337,990
John Denn, Hobart, IN
286,570
Timothy Bishop, Jacksonville, FL
268,350
Marc Plouffe, Williston, VT
258,400
Alfredo, New York, NY
DOWNLAND (Radio Shack)
20,900,400
*Adam Petersen, Portland, OR
68,345
Alain Cyr, Valcourt, Quebec
67,456
Chris Mitchell, Byron , GA
67,141
Cliff Farmer, McGregor, TX
66,145
Jeanine Mccuen, Rutland, MA
49,110
Martin Culver, San Francisco, CA
23,881
Edward Westcott, Sandy Hook, CT
'DRACONIAN (Torn Mix)
628,470
*Jeff Coladonato, Roslyn, PA
398,890
Steven Coladonato, Roslyn, PA
358,550
Jamie Spreng, Dartmouth,
Nova Scotia
241,290
Kristopher Staller, Ft. Wayne, IN
206,240
Joe Nauman, Sacramento, CA
172,640
Matt Mendez, Baltimore, MD
DUNKEY-MUNKEY (lntsllectronlcs)
11,000
*Mariano Frausto, Blue Island, IL
FOODWAR (Arcade Animation)
*Chris Cope, Central, SC
165,960
74,120
Jim Partridge, Clinton, CT
FROGGER (Cornsoft)
15,860
*Erik Huffman, Delran, NJ
12,000
Nicole Freedman , Wellesley, MA
GALAGON (Spectral Associates)
*Jackie Maddox, Iron Station, NC
1,306,640
219,670
Brian Wagner, Lawrence, KS
214,920
Tony Smith, Gig Harbor, WA
204,820
Arnold Snitser, Los Angeles, CA
144,710
Brendan Smith, Coral Springs, FL
GLAXXONS (Mark Data)
19,146
*Terry Moore, St. Catherines, Ontario
GOLD RUNNER (NOVASOFT)
*Chris Cope, Central, SC
149,450
65,800
Dan Bouges, Niantic, CT
65,800
Sean Colsen, East Lyme, CT
GUARDIAN (Quasar Animations)
4,350
*Jason Forbes, Mexico, NY
ICEll/IASTER (Arcada Animation)
14,525
*Jean-Pierre Boisclair, Asbestos,
Quebec
THE INTERPLANETARY FRUIT FLY (THE RAINBOW)
37,000
*Scott Perkins, Port Orange, FL
29,500
Andrew Bartels, Sll1phur, OK
27,500
Les Dorn, Eau Claire, WI
26,000
Eric Foss, Cochrane, Alberta
25,500
Michele Gaboriault, Foxboro, MA
20,500
Steven Bullard, Allen , OK
13,500
Richard Hoey, Rome, NY

THE JUNGLE (THE RAINBOW)
668,690,000
*Jeff Lawrence, Cambridge, Ontario
459,351,041
Denise Morin, Hudson, MA
4,560,144
Jon Hobson , Plainfield, WI
4, 134,000
Brandon Duncan, Benton, KS
1,659,162
Jay Andraschko, Yuma, AZ
JUNKFOOD (THE RAINBOW) . .
1,187,520
*Larry Thomson, Menominee, Ml
1,079,600
Jean-Francois Morin, Loretteville,
Quebec
338,930
Jon Hobson, Plainfield, WI
309,460
Shirley Black, Quinton, AL
206,940
Rhett Bagnall, Saskatoon,
Saskatchewan
KATERPILLAR ti (Tom Mix)
156,317
*Uwe Steingens, Essen ,
West Germany
135,467
Thomas Tlggelbeck, Essen,
West Germany
97,735
Sabine Bergholz, Essen,
West Germany
KEY BOMBER (THE RAINBOW)
29,052
*Tony Boring, Armagh, PA
THE KING (Tom Mix)
1,670,900
*Yolanda Farr, Sayre, PA
1,003.400
Tim Rueb, Atlanta, GA
543,400
Doug Tower, Colonial Heights, VA
337,800
Kirk Carter, Cooper City, FL
301 ,700
Jennifer Richardson, New South
Wales, Australia
Ken Dewitt, Blue Island, IL
14,500
KING TUT (Tom Mix)
138,500
*Martin Culver, San Francisco, CA
KRON (Oregon Color Computers)
33,000
*Chris Cope, Central, SC
LASERWORM & FIREFLY (THE RAINBOW)
38,380
*Brian Voges, Jasper, IN
34,636
Brad Bauer, Proctorville, OH
25,776
Jason Forbes, Mexico, NY
19,780
Jim Partridge, Clinton, CT
13,834
Dean McWhorter, Argyle, NY
LUNAR-ROVER PATROL (Spectral Associates)
*Lori D'ay, Arlington, TX
136,700
MADNESS & THE MINOTAUR (Radio Shack)
240
*Chris Mitchell, Byron, GA
215
Jay Aust, Marlborough, CT
MARATHON (THE RAINBOW)
307,790
•James Sheedy Ill , Tonawanda, NY
189,683
Eric Gadlage, Jasper, IN
MAZELAND (Chromasstts)
*Todd Knapp, Prairie du Chien, WI
21,060
8,550
Brian Cook, Dixon, IL
MEGA-BUG (Radio Shack)
10,661
*Blain Jamieson, Kingston, Ontario
7,930
Ron Haines, Nepean, Ontario
Christopher Romance, Massapequa
3,998
Park, NY
3,693
Jim Partridge, Clinton, CT
1,250
Jay Aust, Marlborough , CT
MICROBES (Radio Shack)
491, 100
*David & Alan Heckler, Hartselle, AL
237,560
Todd Bartels, Coal Valley, IL
178,550
Apollo Latham, Rich Square, NC
144,350
Theodore Latham Jr., Rich Square,
NC
128,680
Ralph Hurst, Lake City, FL
MISSILE BARRAGE (THE RAINBOW)
2-1
*Joe Calcaterra, Ridgewood, NY
MOON HOPPER (Computsrwars)
*Eric Gadlage, Jasper, IN
73,550
60,280
Rodney Mullineaux, Gig Harbor, WA
MR. DIG (Computsrwars)
·
3,259,750
*Ellen Ballinger, Uxbridge, Ontario
3, 100,650
Biagio Di Lorenzo, Montreal, Quebec
3,001.100
Ross & Daniel Mehlman, Todd
Boehm, Nashville, TN

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THE RAINBOW

September 1985


Scoreboard Pointers

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

COMPELLED BY CURiosity

Scoreboard:
Curiosity has moved me to write in regard to the "Rainbow Scoreboard." Just how long will a score be published? If you keep every score that has been sent in from the start of the "Scoreboard" to now, you would have an awfully long list!

Andrew Bartels
Sulphur, OK

Editor's Note: First of all, each and every score that is sent in is published (at least for one month). In order to keep the "Scoreboard" at a minimum, two steps are taken. Approximately once every three months, those games that are inactive are deleted (meaning no scores have been submitted). Each month, for those games with new scores sent in, only the top five are kept (including previous ones and those submitted throughout a one month period of time). Any new scores not included in the top five are then added.

ADVENTURE CLUB

Scoreboard:
This letter is directed towards any Adventure fans.

Adventures are the best games and the experience can be more fun if you share solving them with someone else.

I would like to start a club of Adventure gamers. I will send you a list of all the addresses I receive so you can write to whomever you want. You can get opinions on games, and even clues and solutions.

I will send letters from time to time with new members, ideas and whatever information I can get on new Adventures, etc.

Please write to me. The more letters I receive, the better this will work. You can reach me at 1933 W. 36th St., 52806.

Scott Bellman
Davenport, IA

THE 113 BARRIER BROKEN

Scoreboard:
I have finally done it! I broke the 113 barrier for the number of moves in Pyramid with a full 220 out of 220 points in 112 moves.

I feel I know practically everything about the game Pyramid. If you need a step-by-step solution and a map, or just some advice before they haul you away in a "funny suit," send a SASE or $1 to cover expenses. My address is 1703 Marlock Lane, 77502.

I thank the RAINBOW for having the "Scoreboard" and "Pointers" sections. If it were not for pointers I received for Pyramid, I never would have come up with the "112 Solution."

I will pass on this tip: 130 moves is the least number of moves you can make in Pyramid without your hands leaving the keyboard.

Byll Adams
Pasadena, TX

DEFEATING THE ROBOTS

Scoreboard:
I hope I can help those "Scoreboarders" needing a gentle push with the game Major Iscar from Computerware. Can't get past the robot arcade segment? They don't descend randomly, so wait for the group of three to come down. As soon as this begins, go to the right and up the first hole.

Wait to the right of this until the second robot descends through your hole. Immediately, race up through the next hole in the middle. Wait to the right of this hole for the left robot to descend and then move to the left of the hole for the right one to descend. Quickly race up the right hole and then to the top and you've made it!

Also, when you get to the poster of Mr. Dig, carry the mirror and enter the poster.

For those of you past these points, how do I make a radiation vaccine? What use is the air helmet? How do I put it on? Any help will be appreciated. Write to the "Scoreboard" or to me at 1157 Hampstead, 48732.

Steve Horstman
Essexville, MI

FOLLOW UP

Scoreboard:
Chuck Alvey [July 1985] had a good idea.

I also have the 551 Mustang Attack Flight Simulator and enjoy playing it. If you would like to play, call me at 314-378-6336. I will be more than willing to call others, also. I don't mind playing after 11 p.m. when the rates are cheaper, or on Saturday or Sunday afternoon.

Maybe one day we can even have a tournament of some sort! I love the game, so call and let's fight.

Steve Hewitt
Versailles, MO

HACK THE HAIR

Scoreboard:
For those of you having problems with Mark Data's Black Sanctum, you can write to me and I will give you all the information you desire. A hint: To get the old caretaker to let you take the tools, you have to throw the jug. Use the garden shears to cut the woman's hair and then get it; after that woman is of no use.

I have a serious problem with Syzygy. How can I beat Darth Vader in the light sabers battle? In Trekboer, how can I have any light in the south region, what is the blue button in the communications room for, how can I get the robot to do anything and how can I find the key needed to open the communication panel? My address is 825 Des jardins C.P.1234, JOL. 1JO.

Stephane Lacoste
Marievillle, Quebec

SEASTALKER

Scoreboard:
I recently received Seastalker, an excellent Infocom Adventure for the Color Computer 2. This is the first that I have heard of any type of their Adventure games available for the Color Computer.

Does anyone know how to get other Infocom Adventure games for the CoCo? I wrote to Tandy Home Education Systems, but they said the only available game is Seastalker and they sent me the address of the people I could contact to get it.
If you would like to get Seastalker for the CoCo, the address to write to for information is Tandy Home Education Systems, 1301 W. 22nd St., Suite 400, Oakbrook, IL 60521, or you can call them at 312-325-6150.

If you do find that you can get other Infocom games besides Seastalker, please contact me at 804 Broce Drive, 24060.

Also, I am willing to give advice on the Adventure games I have solved. They are Shenanigans, Calixto Island, Sands of Egypt, Black Sanctum, To Preserve Quandic and Pyramid 2000. Just send me a SASE.

Jeff Hillson
Blacksburg, VA

---

**LOST IN WONDERLAND**

Scoreboard:
I am desperately in need of help with the Adventure game Adventure in Wonderland. Send any hints to me at Box 2777, 09021-5369.

Sue Richter
APO, NY

---

**A ONE-WEEK SOLUTION**

Scoreboard:
I have solved Sands of Egypt in one week. If anyone needs help on it, feel free to contact me at 2164 Townline Rd., 44057, or call 216-259-2326.

Also, I need help on Raaka-Tu.

Jeff Hingey
Madison, OH

Scoreboard:
I need help with Sands of Egypt. When you go down the drain after draining the pool, what do you do? Whenever you type something in, it responds with "not in the dark!" Is the treasure under the pool or in the pyramid? If anyone can help me, please write to P.O. Box 234, 62257.

Becky Baker
Marissa, IL

---

**MISSING TREASURE**

Scoreboard:
Would some nice CoCo owner who plays Pyramid please send me a list of all the treasures you must have to get 220 points? I can only get 200 points and I don't know which treasure I'm missing! Any help would be greatly appreciated.

I could also use some help on Raaka-Tu. I can't kill the gargoyles with the candle. My address is Route 1, Box 358, 32776.

Dawn McDonald
Sorrento, FL

---

**SOUND TROUBLES**

Scoreboard:
I recently purchased a Radio Shack Color Computer 2, 64K ECB, and when I play Dungeons of Daggorath I get different tones of sound than I get when I play it on my Color Computer 1, 16K ECB. Why is this so? Write to me at P.O. Box 271, 11720.

Kenneth Hulse
Centerreach, NY

Editor's Note: This problem may be caused by an incorrect clock trimmer setting, Kenneth, but a more likely answer lies in the fact that the new Color Basic 1.2 and 1.3 ROMs perform many tasks much faster than the older versions. Try the program on another CoCo 2, if you can, and see what happens.

---

**NOTHING TO DO**

Scoreboard:
I'm having problems with an Adventure called Salvage Island from Adventure International. I'm stuck because I can't find anything to do. The Adventure comes in two parts and has something to do with an island and spaceships. I pride myself on being a great Adventure solver, but this one puts me to shame. Write to 1225 Lake Circle Dr., 47711.

Dale Lehmann
Evansville, IN

---

**INVISIBLE KEY**

Scoreboard:
I need some help with the Adventure Bedlam. Everytime I play I find a secret door, but I can't seem to get it opened. Also, everytime I try to get the green key the screen says "OK," but when I take inventory it isn't there! I also get stuck inside a shack after I poison the dog.

If there is anyone who can help, please contact me at 2110 Harland, 77055.

Brian Tritico
Houston, TX

---

**September 1985 THE RAINBOW 161**
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Want to try 10-meter platform diving?

TAKE THE PLUNGE WITH COCO

By Timmy Jones

While watching the diving competition during the 1984 Olympics, I developed the idea for 10-Meter Platform Diving.

To play the game choose forward or reverse dives, then press the down-arrow key to begin the dive and the space bar to finish the dive. You will have five dives to reach the highest possible score. Each dive is randomly scored (from one to 60) based on the difficulty of the dive. With a little practice, you will be doing dives even Greg Louganis would envy.

For harder-to-hit, perfect dives, insert a PURE 65495.0 in the beginning of the program.

As a bonus, a similar program, Springboard Diving, will be included on this month's RAINBOW ON TAPE.

(Timmy Jones is 16 years old and a junior in high school. He enjoys helping his classmates to do programming on the school's computers. His hobbies include swimming, boating and working with his CoCo.)
The listing: PFRMDIVE

1 '****************************
2 '** 10 METER PLATFORM **
3 '** DIVING **
4 '**
5 '** BY TIMMY JONES **
6 '** P.O. BOX 7938 **
7 '** CLINTON, LA 70722 **
8 '****************************
9 10 CLEAR 100
10 20 CLS: PRINT @ 132,"10 METER PLATFORM DIVING";
11 PRINT @ 172, "D IVING";
12 PRINT @ 360,"BY TIMMY JO 
13 NES";
14 P MODE 3,1:PCLS: SCREEN,0,
15 FOR LL=1 TO 60:X=RND(56)+1+00: 
16 Y=RND(10)+140:PSET(X,Y,3):NEXT L
17 L
18 SP$="BM 100,150C3E2F2E2F2E2F2F2F2F2
19 END

<table>
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<th>Y</th>
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<td>80</td>
<td>149</td>
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<tr>
<td>290</td>
<td>118</td>
</tr>
<tr>
<td>530</td>
<td>239</td>
</tr>
<tr>
<td>750</td>
<td>114</td>
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<tr>
<td>1000</td>
<td>21</td>
</tr>
<tr>
<td>1210</td>
<td>251</td>
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<td>1380</td>
<td>44</td>
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E2F2E2F2E2F2E2F2E2F2E2F2E2F2E2F2
E2F2E2F2E2F2E2F2;BU4BL2JL1BL4L1B
L4L1BL4L1L
60 CD$="BM100,90C2L3D3R1C3U2R2D2L1U1D3L1D2C4L1D5R1U5R1D5R1U5R2C3R4L5C4D5R1C3R3D2F1D1R2"  
70 S1$="C3F2D8C4L1D5R1U5R1D5R1U5L1D4C3D16U16L1D8L1U2D3C2R2C3R1C2U3"
80 LF$="BM100,20S4C2L3D3R1C3U2R2D2H1D3H1D2C4L1D5R1D4L1D4R4D1D4R4L2C3D8F1"  
90 T1$="C2R4D3L1C3U2L1D2L1U2L2D1R2L3C4D1U3L5D1R4G1L3D1R4C3U1L1R1D3L4D2U3R3"  
100 MS$="BM200,47 C2L3D3R1C3U2R2D2D1L2D2C2D4R1D5L3U5R1D6C3D6R3L2U7C4U5R2C3R4"  
110 DRAW"BM14,100:A0;XT1$;"  
120 DRAW"BM14,129:A1;XT1$;"  
130 DRAW"BM10,30:A3;XT1$;"  
140 DRAW"BM16,60:A2;XT1$;"  
150 DRAW"BM50,30:A0;XT1$;"  
160 DRAW MS$  
170 DRAW CD$  
180 DRAW SP$  
190 DRAW LF$  
200 DRAW"BM 50,80:A1;XT1$;"  
210 DRAW"BM 50,120:A3;XT1$;"  
220 FOR Y=56 TO 60:PSET(5,Y,2):NEXT
230 FOR Y=26 TO 30:PSET(8,Y,2):NEXT
240 DIM CD(18),BS(22),SS(18),AA(18),AB(149),AC(40),S1(30),S2(40),S3(30),S4(26),Q(30),T1(18),T2(18),T3(20),T4(20),MS(28),Z(28)  
250 GET(92,88)-(114,188),CD,G  
260 GET(46,14)-(60,60),S1,G  
270 GET(100,130)-(140,150),BS,G  
280 GET(110,140)-(140,150),SS,G  
290 GET(14,64)-(58,86),S2,G  
300 GET(46,100)-(86,120),S3,G  
310 GET(90,4)-(108,42),S4,G  
320 GET(190,40)-(210,66),MS,G  
330 GET(190,10)-(250,30),AC,G  
340 GET(200,100)-(220,124),Q,G  
350 GET(200,10)-(210,46),AA,G  
360 GET(190,42)-(210,68),Z,G  
370 GET(0,12)-(22,42),T4,G  
380 GET(0,38)-(22,68),T3,G  
390 GET(8,84)-(22,114),T1,G  
400 GET(0,108)-(22,138),T2,G  
410 PCLS  
420 FOR X=144TO218 STEP36  
430 CIRCLE(X,30),20  
440 CIRCLE(X,31),21  
450 NEXTX  
460 FORX=162TO250 STEP36

---

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THE RAINBOW September 1985

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---
50 IF LL$="Y" THEN 520 ELSE 540
510 CLS:PRINT:PRINT"INSTRUCTIONS: YOU WILL HAVE FIVE DIVES TO SCORE AS HIGH AS POSSIBLE. EACH DIVE IS SCORED ON A SCALE FROM 1 TO 6. CHOOSE FORWARD OR REVERSE DIVES, THEN PRESS (DOWN ARROW) TO BEGIN DIVEPRESS THE SPACE BAR TO FINISH THE DIVE.
520 I$=INKEY$:IF I$= 1111 THEN 530
530 NEXT X
540 GOTO 1500
550 DRAW"C3":FORX=0 TO3:Y=3:LINE (X,Y)-(X+3,Y+1),PSET,B:Y=Y+1:NEXT X
560 DRAW"C3":LINE(30,170)-(255,191),PSET,B:PAINT(2,172),2,2
570 DRAW"C2":LINE(0,40)-(30,191),PSET,B:PAINT(2,172),2,2
580 GET (50,170)-(250,190),AB,G
590 SCREEN1,0
600 A$=INKEY$:IF A$=CHR$(10) THEN ENO TO 620
610 IF ZX=2 THEN 1270
620 Y=Y+F:X=X+1
630 FOR P=1 TO 4
640 Y=Y+F:X=X+1
650 T1=PSET,0
660 FOR 0=1 TO9:NEXTO
670 A$=INKEY$:IF A$=" THEN 920
680 Y=Y+F:X=X+1
690 T2=PSET,0
700 FOR O=1 TO9:NEXTO
710 A$=INKEY$:IF A$=" THEN 1070
720 Y=Y+F:X=X+1
730 T3=PSET,0
740 FOR O=1 TO9:NEXTO
750 A$=INKEY$:IF A$=" THEN 1020
760 Y=Y+F:X=X+1
770 T4=PSET,0
780 IF P=4 THEN 870
790 FOR O=1 TO9:NEXTO
800 A$=INKEY$:IF A$=" THEN 1170
810 Y=Y+F:X=X+1
820 T5=PSET,0
830 FOR O=1 TO9:NEXTO
840 A$=INKEY$:IF A$=" THEN 1120
850 NEXT P
860 REM BAD DIVE
870 PUT(X,150)-(X+40,170),BS,PSET
880 PUT(X-10,150)-(X+50,170),AC,PSET
90° PUT(50,170)-(250,190),AB,PSET
90° PLAY"T2AD":SD=RND(9)+10:GOTO 121°
91° REM ********** S1 **********
92° X=X+6:Y=Y+2
93° PUT(X,Y)-(X+14,Y+46),S1,PSET
94° IF Y+42=>170 THEN 112°
95° X=X+30:Y=Y+10:GOTO 930
96° REM********** S2 ********
97° X=X+4:Y=Y+6
98° PUT(X,Y)-(X+44,Y+32),S2,PSET
99° IF Y+30=>170 THEN 86°
100° X=X+9:Y=Y+10:GOTO 98°
101° REM ********** S3 ********
102° X=X+4:Y=Y+2
103° PUT(X,Y)-(X+40,Y+20),S3,PSET
104° IF Y+20=>170 THEN 86°
105° X=X+30:Y=Y+10:GOTO 103°
106° REM ********** S4 ********
107° X=X+4:Y=Y+2
108° PUT(X,Y)-(X+18,Y+38),S4,PSET
109° IF Y+38=>170 THEN 87°
110° X=X+30:Y=Y+10:GOTO 108°
111° REM ******** GOOD DIVE ******
112° REM
113° PUT(X,Y)-(X+22,Y+22),AA,PSET
114° PUT(X-100,160)-(X+200,170),SS,PS ET
115° PUT(X-100,150)-(X+200,170),AC
,PSET
116° IF P=1 THEN SD=RND(9)+10:GOTO 121°
117° IF P=2 THEN SD=RND(9)+20:GOTO 121°
118° IF P=3 THEN SD=RND(9)+30:GOTO 121°
119° IF P=4 THEN SD=RND(20)+40:GOTO 121°
120° REM TOTAL SCORE IS ":;SC:PRINT:
121° PRINT"DO YOU WANT TO PLAY AGAIN( Y/N)":Q$:IF Q"=""Y""THEN END ELSE RUN
122° FOR G=1 TO 100:GOTO NEXT G
123° GOTO1500
124° Y=100:X=72:F=2:PUT(58,13)-(78,39),Q,PSET:PUT(X,Y)-(X+22,Y+22)
,CD,PSET
125° FL=FL+1:PRINT" DIVE ":;FL
126° PRINT" SCORE LAST DIV E":;SD
127° SC=SC+SD
128° IF FL=5 THEN PRINT"
129° Y=Y-2
130° FOR P=1 TO 4
131° F=F+F:IF F=>14 THEN F=14
132° PUT(X,Y)-(X+22,Y+32),T3,PSET
133° FOR O=1 TO 9:NEXT O
134° A$=INKEY$:IF A$=""""THEN X=X-2:GOTO 92°
135° Y=Y+F:X=X+1
136° PUT(X,Y)-(X+22,Y+32),T2,PSET
137° FOR O=1 TO 9:NEXT O
138° A$=INKEY$:IF A$=""""THEN LØ2
139° Y=Y+F:X=X+1
140° PUT(X,Y)-(X+22,Y+32),T1,PSET
141° IF P=4 THEN 87°
142° FOR O=1 TO 9:NEXT O
143° A$=INKEY$:IF A$=""""THEN LØ7
144° Y=Y+F:X=X+1
145° PUT(X,Y)-(X+22,Y+32),T4,PSET
146° FOR O=1 TO 9:NEXT O
147° A$=INKEY$:IF A$=""""THEN 97°
148° NEXT P
149° GOTO 87°
150° CLS:PRINT" TYPE OF DIVE":PRINT"PRINT"
151° IF A$="1" THEN 153° ELSE IF A$="2" THEN 154°
152° PRINT" (1-2)
153° IF A$="1" THEN ZX=1 ELSE IF A$="2" THEN ZX=2
154° CLS:GOTO 55°

Hint . . .

A Quick Fix For RFI

If you’re having trouble with RF interference when using the CoCo with color TV, take a look at the back of the set. Many color TVs (particularly later models) have a screw-on coaxial connector that’s used for cable TV or master antenna systems and for some antennas.

You can use an adapter such as Radio Shack’s 278-255 that screws onto the coaxial ‘F’ connector to plug your CoCo’s TV cable directly into the TV without using the switch box; this often cuts RFI way down. Check the set’s instruction manual (or label that may be on the back) to find out how to switch to the coaxial input; there’s usually a jumper or switch near the connector.
The only problem developing Red-Green Game was deciding what scenario could be used to fit the game's action. Should the player be neutralizing unstable radioactive isotopes, defusing time bombs, or perhaps flushing full septic tanks? At this point I asked why a game had to be based on some real situation. Red-Green Game involves the player and computer each turning squares different colors. The player is turning them red and the computer changes them to green; it is a battle of player against machine.

Red-Green Game starts with a screen filled with rows and columns of red squares. Three squares turn green. The large white rectangle at the top left of the screen is moved with the arrow keys. As the white block moves over a green square, the square changes back to red. While you are doing this, the computer changes the red squares to green. You lose when the total of green squares on the screen equals 10.

If you “clear” the screen of the green squares, the game continues to a more difficult level where greens appear at a faster rate. I don’t believe anyone could get through difficulty level nine — this is a challenge to game players everywhere! Scores are figured on difficulty level and time to clear the screen, not on how many greens are changed to red.

Program Summary
Lines 30-70 create the graphics. Line 80 places three beginning green squares. Line 90 sets the starting position of the white rectangle. Line 100 determines if the white block lands on a green square. The white block is printed by Line 110. Line 120 prints the number of green squares in the lower left corner. Line 130 determines if you have cleared the screen of all greens or if you have lost. Lines 140-150 pick a location to change to green and make sure that position is not presently green.

The DL in Line 150 refers to difficulty level. As the game progresses, the value of DL decreases, thus placing greens at a faster rate on the screen. Lines 160-190 control the white block’s movement and erase its previous position. Line 210 calculates and prints the score at the end of each screen.

Instructions are included in lines 230-290 (I believe in having directions within a program). They are much easier to find than instructions that are only in a magazine somewhere.

(For those having questions about Red-Green Game, you may contact Mr. Wood at 424 N. Missouri, Atwood, IL 61913. Please include a SASE.)
The listing: REDGREEN

10 CLS: PRINT: PRINT" RED-GREEN GAME.": PRINT" INSTRUCTIONS? (Y/N)? 
" 
20 A$=INKEY$: IF A$="" THEN 20 ELSE IF A$="N" THEN 30 ELSE IF A$="Y" THEN 1B,0 ELSE 20 
30 CLS: W$=CHR$(207): C$=CHR$(191): BL$=CHR$(128): 
40 A$=CHR$(128)+C$: D$=CHR$(128): E$=CHR$(128) 
+ C$ +CHR$(128): 
50 Wl$=CHR$(207)+CHR$(207)+CHR$(207): W2$=W$+C$+W$: 
DL=9 
60 FOR A=1 TO 15: B$=B$+A$: NEXT A 
70 TIMER=0: CLS: FOR A=32 TO 416 STEP 64: PRINT@A,B$;: NEXT A 
80 FOR A=1 TO 3: R=RND(1)*2-1+RND(7)*64-32: POKE1024+R,143: NEXT A: NG=3 
90 P=0 
100 IF PEEK(P+33+1,024)=143 THEN NG=NG-1: SOUND1,0,1 
110 IF PEEK(341)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
120 IF PEEK(342)=247 AND P<349 THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64,D$;: P=P+2: POKE344,255: GOT01,0,0 
130 IF PEEK(343)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64,D$;: P=P+2: POKE344,255: GOT01,0,0 
140 IF PEEK(344)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64,D$;: P=P+2: POKE344,255: GOT01,0,0 
150 IF PEEK(341)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
160 IF PEEK(343)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
170 IF PEEK(344)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
180 IF PEEK(341)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
190 IF PEEK(342)=247 AND P<349 THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
200 IF PEEK(343)=247 AND P/64<>INT(P/64) THEN PRINT@P,D$;: PRINT@P+32,BL$;: PRINT@P+34,BL$;: PRINT@P+64, 
D$;:P=P+2: POKE344,255: GOT01,0,0 
210 SC=SC+(1,0-DL)*INT(1,0,0,0,0/TIMER) : DL=DL-1: IF DL=1 THEN PRINT: PRINT"DIFFICULTY LEVEL";1 
220 IF PEEK(298)=298 THEN PRINT: PRINT"SCORE"; SC;: FORT =1T0800:NEXTT:GOT070 
230 CLS: PRINT"FINAL SCORE"; SC 
240 IF INKEY$="Y" THEN PRINT: PRINT"PLAY AGAIN (Y/N)? " 
250 IF PEEK(298)=298 THEN PRINT: PRINT"SCORE"; SC;: FORT =1T0800:NEXTT:GOT070 
260 REM JAMES W. WOOD, 424 N. MISSOURI, ATWOOD, IL, 61913 
270 CLS: PRINT"USE THE ARROW KEYS TO GUIDE THE WHITE BOX. AS THE BOX MOVES": PRINT"ONTO A GREEN SQUARE, IT TURNS": PRINT"RED . AT THE SAME TIME, THE" 
280 PRINT"COMPUTER IS CHANGING THE RED": PRINT"SQUARES BACK TO GREEN. CAN YOU": PRINT"CHANGE THEM ALL TO RED BEFORE": PRINT"THE COMPUTER GETS TEN GREENS?" 
290 PRINT"IF YOU CAN, THE NEXT LEVEL OF": PRINT"PLAY BECOMES FASTER"; PRINT"GOOD LUCK!": PRINT"PRESS (S) TO START THE GAME." 
300 IF INKEY$="S" THEN 310,0 

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110 PRINT@P,W1$: :PRINT@P+32,W2$: :PRINT@P+64,W1$: 
120 PRINT@480,NG: 
130 IF NG=0 THEN 210 ELSE IF NG=10 THEN 220 
140 R=RND(15)*2-1+RND(7)*64-32 
150 IF RND(DL)=DL THEN PEEK(E+R+1 
204)<=143 THEN NGOs=NG+1: POKE1024+R, 
143: SOUND1,0,1 
160 IF PEEK(341)=247 AND P>63 THEN PRINT@P,D$: :PRINT@P+32,BL$: :PRINT@P+64,D$: :P=P 
64: POKE341,255: GOTO100 
170 IF PEEK(342)=247 AND P<349 THEN PRINT@P,D$: :PRINT@P+32,BL$: :PRINT@P+64,D$: :P=P 
64: POKE342,255: GOTO100 
180 IF PEEK(343)=247 AND P/64<INT 
T(P/64) THEN PRINT@P,D$: :PRINT@P+3 
2,BL$: :PRINT@P+34,BL$: :PRINT@P+6 
4,D$: :P=P-2: POKE343,255: GOTO100 
190 IF PEEK(344)=247 AND (P+36)/64 < INT((P+36)/64) THEN PRINT@P,D$: :PRINT@P+32,BL$: :PRINT@P+34,BL$: :PRINT@P+64,D$: :P=P+2: POKE344,25 
5: GOTO100 
200 GOTO120 
210 SC=SC+(10-DL)*INT(100000/TIME) : DL=DL-1: IF DL=1 THEN PRINT: PRINT"DIFFICULTY LEVEL":1 
0-DL: :PRINT@298,"SCORE": SC;: FORT =1T0800:NEXTT:GOT070 
220 CLS: PRINT"FINAL SCORE": SC 
230 PRINT"PRINT"PLAY AGAIN (Y/N)? " 
240 IF INKEY$="Y" THEN PRINT: PRINT"YOU DID THE IMPOSSIBLE." :PRINT"YOU CLEARED THE SCREEN AT": PRINT"DIFFICULTY LEVEL 9": FORT=1T02000:NEXTT:GOT020 
260 REM JAMES W. WOOD, 424 N. MISSOURI, ATWOOD, IL, 61913 
270 CLS: PRINT"USE THE ARROW KEYS TO GUIDE THE": PRINT"WHITE BOX. AS THE BOX MOVES": PRINT"ONTO A GREEN SQUARE, IT TURNS": PRINT"RED . AT THE SAME TIME, THE" 
280 PRINT"COMPUTER IS CHANGING THE RED": PRINT"SQUARES BACK TO GREEN. CAN YOU": PRINT"CHANGE THEM ALL TO RED BEFORE": PRINT"THE COMPUTER GETS TEN GREENS?" 
290 PRINT"IF YOU CAN, THE NEXT LEVEL OF": PRINT"PLAY BECOMES FASTER": PRINT"GOOD LUCK!": PRINT"PRESS (S) TO START THE GAME." 
300 IF INKEY$="S" THEN 310,0
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:

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‘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.

‘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.

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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.

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ONLY $19.95

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

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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.

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:

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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 unrivalled 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.

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 3-½ 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 ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ¼ 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.

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 30 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 limitation 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 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. 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-

COLORWARE

Colorware Inc.
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N.Y. RESIDENTS MUST ADD SALES TAX.
British mathematician and logician George Boole will always be remembered for his style of symbolic logic, which is the foundation of Boolean algebra

Bit Banging With Boole

Many of you seem to appreciate the column's strategy of sticking to the assembly language basics and not leaving beginners behind, so I appreciate your phone calls and letters letting me know this.

What is really great to hear, and what seems to confirm the validity of this approach, is that many of you have progressed past the beginners stages and are striking out on your own. In fact, some who started with my first column are far beyond my own expertise and are asking questions I can't answer. I have always believed if this column gets you over the first hurdles of assembly language programming, you can easily pick up more advanced programming from other articles and books.

While there is a lot of good information out there in the world, there seems to be a real lack of solid, basic information. Once you know what bits and bytes are, what Boolean logic is all about, how to read source code, etc., there are books full of information to take you to whatever programming heights you wish to go.

Dedicated to Boole

With this in mind, I am dedicating this column to George Boole, the British mathematician, logician and author who developed the logic system called Boolean algebra — a prime ingredient of any computer programming language. The dictionary says that Boolean algebra is: "Any of various algebraic systems based on mathematical forms and relationships borrowed from the symbolic logic of George Boole."

If that tells you anything you wanted to know about Boolean logic, you have a much better understanding than I. It is enough, however, to get us started. You might recall I told you about the workings of the XOR-type Boolean logic in a past column. I used the logic to reverse characters displayed on the screen.

There are several other logic processes used in assembly language and each has its own use. Often the logic is made to look much more difficult than it is. I remember that my first introductions to Boolean logic left my head swimming. I hope this column demonstrates how simple (logical) Boolean logic is.

The concepts for discussion are AND, NOT, OR, NOR and XOR.

AND

Basically, AND says, "If all items of a comparison are true, the result is true." Although "true" can be expressed in more than one way, in this article I consider a value of one to be true and a value of zero to be not true. This approach is most commonly used and helps to keep the confusion to a minimum for now.

Because we are dealing with computer logic, the Boolean logic we are discussing is based on binary numbers, where one and zero are the only values possible for a single digit. This is probably a good place to stop for a definition; many people have trouble with the term "base" when referring to numbering systems: A numbering system's base is the maximum number of unique digits in the numbering system.

For example, our most common numbering system, base 10, has the digits '0' through '9' for a total of 10 digits. The binary numbering system, on the other hand, has the digits '0' and '1' for a total of two digits, thus it is called a "base 2" system.
Now, what does it mean when you compare two base 2, or binary, numbers using **AND** logic? It means you compare the two numbers, digit by digit or bit by bit, to see if one digit AND the other digit are both true (both have values of one). Let’s try two numbers, 1 and 1.

1 **TRUE**

AND 1 **TRUE**

1 **TRUE**

Under the Boolean rules for **AND**, if both values in a comparison are "**TRUE**," then the result is true and the result of 1 AND 1 is also **TRUE**.

Let’s try **AND** when the numbers are 1 and 0:

1 **TRUE**

AND 0 **FALSE**

0 **FALSE**

Only one of the two digits are true, thus the result is zero or **FALSE**.

Now let’s try the numbers 0 and 0:

0 **FALSE**

AND 0 **FALSE**

0 **FALSE**

Let’s carry the concept to larger numbers, 5 and 6. In binary, this is 1001 and 1010. When you **AND** 5 and 6, the result is:

1001 5

AND 1010 6

1000 4

The result of 5 **AND** 6 is 4. That doesn’t seem to have any real use in the world, right? Well, that’s what I thought at first, but I was wrong. **AND** logic has useful applications.

For instance, you can “mask” the value of any bit in a number using **AND**. Mask means you can cause the value of the selected bit to be either one or zero, regardless of its original value. For instance, to mask the number two bit of a four-bit number so it is always zero, **AND** the number with 1011 (remember the bits are numbered from the right, with the right-most bit being zero). The result:

<table>
<thead>
<tr>
<th>1101</th>
<th>1001</th>
<th>1111</th>
</tr>
</thead>
<tbody>
<tr>
<td>AND 1011</td>
<td>AND 1011</td>
<td>AND 1011</td>
</tr>
<tr>
<td>1001</td>
<td>1001</td>
<td>1111</td>
</tr>
</tbody>
</table>

As you can see, no matter what value the number two bit begins with, once it is **AND**ed with 1011, the result always leaves the bit with a value of zero.

You can also use **AND** to determine the setting of any bit in a number. For instance, to determine the set values of bits zero and one in Register A, you could issue the command:

**AND**

The result is the value of the last two bits in Register A. If the Register A value is 1011, then the result is:

1101

AND 0011

0001

The last two bits are 0 and 1 as shown.

**OR**

Comparing two numbers using **OR** is done in the same manner, only the logic is slightly different. In this case we are comparing to see if one number **OR** the other number is true. For instance, 1 **OR** 0 equals 1 (or **TRUE**):

<table>
<thead>
<tr>
<th>1</th>
<th><strong>TRUE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 0</td>
<td><strong>FALSE</strong></td>
</tr>
</tbody>
</table>

Trying the numbers 1 and 1, the result is:

<table>
<thead>
<tr>
<th>1</th>
<th><strong>TRUE</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 1</td>
<td><strong>TRUE</strong></td>
</tr>
</tbody>
</table>

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Tired of the same old screens? In **TIME BANDIT**, you pick from more than TWENTY places with over 15 levels in each place. That’s over 300 screens! Visit FANTASY WORLD, WESTERN WORLD, & SPACE WORLD. Fight the Evil Guardians: Killer Smurphs, the Looking Lurker, Angry Elmo and more! Find the Keys and collect the treasures of time! Crisp Supergraphics, colorful SCROLLING landscapes, full animation, and over THREE HUNDRED SCREENS! The conquest of time and space awaits you!

**32K Tape $27.95/Disk $29.95**

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Explosive color, fast-moving animation and amazing sound make this non-violent game a classic! Different levels and more than FORTY screens offer as much challenge & good clean fun as you can take! Play solo or enjoy the challenge of two-player simultaneous competition. Scramble to get the loot first, but be careful: the KATS are prowling and your opponent is tossing eggs!

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THE SAILOR MAN
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NEW! DRAGON SLAYER
Save the villagers of Pendor! They live in fear of Icarus, the blood thirsty dragon. The dragon lives in a cave way up in the mountains. The cave is a treasure chest, full of gems and cashbags. The trail to the cave is as menacing as Icarus himself. You will have to secure the necessary equipment to climb the rocks and cross the rivers and chasms along the way. Be on the lookout for enemies and barriers at all times.

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SPACE SHUTTLE
Tape $28.95  Disk $31.95

NEW! UTILITIES
NOW! You can own the tools we've used to create “Donkey King”, “Sailor Man”, and others.

We are proud to announce our new utilities for the 64K Disk Color Computer, featuring:

• Full use of 64K RAM
• Parameters easily changeable in basic loader
• No ROM calls
• “Cold start” exit to basic
• Easy-to-read, informative documentation
• Keyklik
• Selectable drive stepping rate
• Support 1:1 drives
• Easy to use, with menu selected functions

To make life with your disks easier, may we suggest:

UTILITIES

1. Definitions of terms and review of finding equivalent fractions.
2. Practice of finding the GCF of pairs of numbers.
3. Practice finding sets of equivalent fractions. (Mixed to improper & improper to mixed)
4. Practice converting mixed numerals and improper fractions.
5. Review converting mixed numerals to mixed numerals. (Used in regrouping in substraction).
6. Practice converting mixed numerals to mixed numerals.

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 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:

• Information about students may be numerical or text.
• Records may be sorted by various criteria.
• A full statistical analysis of scores may be done and sent to the printer.
• Student test scores may be weighted, averaged, changed to a percentage or changed to a letter grade.
• Individual student progress reports and class gradebook sheets may be printed.
• Three methods of data entry sped the task of typing in student grades and test results.
• The program may be easily customized to work with any printer.
• Student seating charts may be created and printed.
• Graphs of student test results may be created using the computer's high resolution graphic screen.
• Grade distribution can be displayed numerically or as a histogram.

Requires 32K Ext. Basic
TAPE $39.95  DISK $42.95

FRACTIONS - A Three Program Package
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 substraction).
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENC
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.

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.

32K EXT BASIC
TAPE $30.95  DISK $35.95

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 score 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.

32K EXT. BASIC
TAPE $24.95  DISK $29.95

FACTPACK
FACTPACK is a set of 3 programs designed for home or school use. The programs provide drill and practice with basic addition, subtraction, multiplication and division facts and are appropriate in grades 1-6. Each program requires a 32K Extended BASIC Color Computer. Disk drive and printer are optional.

Requires 32 K Ext. Basic
TAPE $24.95  DISK $29.95

TEACHER'S DATABASE II
Teachers' Database (TDB) is a program designed to allow a teacher to keep a computerized file of information about his/her students.

The program requires a 64K Color Computer and at least one disk drive. This completely revised program includes all of the capabilities of the original TDB plus many new features.

• 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 has many easy to follow menus.
• Records may be easily changed, deleted, or combined.
• Information about students may be numerical or text.
• Records may be sorted by various criteria.
• A full statistical analysis of scores may be done and sent to the printer.
• Student test scores may be weighted, averaged, changed to a percentage or changed to a letter grade.
• Individual student progress reports and class gradebook sheets may be printed.
• Three methods of data entry sped the task of typing in student grades and test results.
• The program may be easily customized to work with any printer.
• Student seating charts may be created and printed.
• Graphs of student test results may be created using the computer's high resolution graphic screen.
• Grade distribution can be displayed numerically or as a histogram.

Requires 32K Ext. Basic
TAPE $39.95  DISK $42.95

THE FIRST SCREEN OBJECTIVE IS TO CATCH ENOUGH ELIIS' KISSES (THOSE RED HEART-SHAPED THINGS) TO FILL THE SQUARE ON THE SAILOR'S NOSE. IF YOU CAN GET YOUR "PUNCH" (THE LARGE ROCK YOU THROW) TO HITT...
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Finally, the numbers 0 and 0 yield:

\[
\begin{array}{cc}
0 & \text{FALSE} \\
\text{OR} & 0 \text{ FALSE} \\
\hline
0 & \text{FALSE}
\end{array}
\]

As you can see, this is all pretty easy to follow. I think there is a worldwide conspiracy among technically minded people to keep the rest of us confused. To follow the OR logic into larger numbers, let's try 15 and 10:

\[
\begin{array}{cc}
1111 & 15 \\
\text{OR} & 1010 \ 10 \\
\hline
1111 & 15
\end{array}
\]

Notice that 15 OR 10 is 15. What about another number? How about 15 OR 8?

\[
\begin{array}{cc}
1111 & 15 \\
\text{OR} & 1000 \ 8 \\
\hline
1111 & 15
\end{array}
\]

Hmmm, 15 OR 8 is still 15. In fact, 15 OR any number that isn't greater than 15 is 15. Now what could be the use of that? This ability to set a selected bit in a number is what makes OR useful. For instance, if you wished to set the first bit in an eight-bit number, use OR, with the value of 10000000, or 128 decimal as in the following:

\[
\begin{array}{cc}
01001111 & 11111111 \\
\text{OR} & 10000000 \text{ OR} 10000000 \\
\hline
11001111 & 11111111
\end{array}
\]

The most significant bit of the result is always set. If you wanted to use OR to set the most significant bit of the value in Register A, use the command line:

ORA #128

EOR

Exclusive OR logic is OR logic with a condition. The condition is that either of the two numbers under comparison can be true, but not both, in order for the result to be true. Thus, an exclusive OR of the numbers 1 and 0 is:

\[
\begin{array}{cc}
1 & \text{TRUE} \\
\text{EOR} & 0 \text{ FALSE} \\
\hline
1 & \text{TRUE}
\end{array}
\]

If both numbers are 1, however, the result is:

\[
\begin{array}{cc}
1 & \text{TRUE} \\
\text{EOR} & 1 \text{ TRUE} \\
\hline
0 & \text{FALSE}
\end{array}
\]

You have already seen the EOR logic in another column. In that instance we caused characters on the screen to toggle between upper- and lowercase by exclusive ORing their values with 64. Once a value is EORed with another value, you can regain the original value by repeating the process. For instance:

\[
\begin{array}{cc}
0100001 & \text{decimal} \ 65 \\
\text{EOR} & 0100000 \text{ decimal} \ 64 \\
\hline
0000001 & \text{decimal} \ 1 \\
\text{EOR} & 0100000 \text{ decimal} \ 64 \\
\hline
0100001 & \text{decimal} \ 65
\end{array}
\]

This example uses EOR to toggle between 65 and 1. No matter how many times you used EOR, the result would continually toggle between 65 and 1.

Thus, to determine the sign of a signed-bit number, EOR it with a value of 10000000. If the result is greater than 127 then the number must have been positive. If the result is less than 128, the original number was negative.

AND a Bit More

OR and AND can also be used to set or reset Condition Code bits. This information is for those of you who have gone on to learn about the condition code. The order of the bits in the condition code is:

- Bit 0 = Carry Code
- Bit 1 = Overflow Code
- Bit 2 = Zero Code
- Bit 3 = Negative Code
- Bit 4 = IRQ Interrupt
- Bit 5 = Half Carry
- Bit 6 = Fast Interrupt
- Bit 7 = State on Stack

To set the fast interrupt bit, use the command:

ORCC #64
To set the zero code and the carry code bits, use:

ORCC#S

If you are not into manipulating the Condition Code yet, store in your mind the fact that it can be manipulated in this way. You will find it useful in the future.

Beyond EDTASM+

The logic given thus far covers the options available through EDTASM+. You really don't need any more, but I will mention some of the others so you can be familiar with the logic should you run across it in other languages.

NOR

NOR logic is OR logic that is reversed in the final stage. In other words, if the result of an OR operation is false, the same operation would give a result of true using NOR. For example:

<table>
<thead>
<tr>
<th>1 True</th>
<th>0 False</th>
<th>NOR</th>
<th>0 False</th>
<th>NOR</th>
<th>0 False</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 False</td>
<td>1 True</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NAND

NAND has the same relationship to AND logic that NOR has to OR logic. It reverses the normal result. The following examples show this:

<table>
<thead>
<tr>
<th>1 True</th>
<th>0 True</th>
<th>NAND</th>
<th>1 True</th>
<th>NAND</th>
<th>1 False</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 False</td>
<td>1 True</td>
<td></td>
<td>0 False</td>
<td>1 True</td>
<td></td>
</tr>
</tbody>
</table>

NOT

NOT can be used in any logic operation to reverse the result of that operation. Whatever the normal result of the operation would be, NOT reverses it.

Truth Tables

Truth tables often accompany Boolean logic examples. A truth table is a chart showing all the possible results of the specified logic. For instance, a truth table for AND might look like this:

<table>
<thead>
<tr>
<th>AND</th>
<th>Bit 1</th>
<th>Bit 2</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

For OR, the table might look like this:

<table>
<thead>
<tr>
<th>OR</th>
<th>Bit 1</th>
<th>Bit 2</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

The End of the Mystery

I hope this has cleared any confusion about Boolean logic; it is simple and easy to use. When you see it in programs, you can easily calculate what it is doing by converting the values to binary and performing the operation yourself. When you run across truth tables, you will be able to see what they are about at a glance.

Go ahead, experiment! Put Boolean logic to work and see what George Boole has done for you.
Chris Ahrendt
Japan
Chris lives in Waldorf, Md., and used Graphicom I and II to give the Gallery this tranquil, pastoral view of the homeland of the folks who gave us Godzilla.

Charlie Fulp
Dragon
Charlie lives in South Boston, Va., and used CoCo Max and artifact colors to send the Gallery this dramatic dragon-on-the-wing reminiscent of Quetzalcoatl.
R.G. Wright  
Puff  
Drawn with Graphicom and painted with Graphicom II, R.G.'s dragon displays the whimsical side of these mythical creatures. R.G. lives in Atwater, Calif.

Be sure to send a cover letter with your name, address and phone number detailing how you created your picture (what programs you used, etc.), how to display it and a few facts about yourself.

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David Mattoon  
D & D  
David lives in Dannemora, N.Y., and used CoCo Max for this quintessential dungeon and dragon to round out the Gallery's pride of dragons.
Contest Check List

By Howard Lee Ball

Speaking of contests, you can adjust this program to tally the totals for your own competition.

One of my favorite tasks during the past several years has been judging the local Optimist Club Oratorical Contest. I have always enjoyed listening to the young speakers as they extol the virtues of youth, of our country, of education or all three.

It is not easy to judge such a contest, but I think the Optimist Club has come up with a very fair rating system. My only problem with the whole process is the wait between judging and announcing the winners. The local club has bridged that gap by having a coffee break.

(Howard Ball is an editor of a twice-weekly newspaper and a licensed minister. He is a frequent contributor to RAINBOW.)
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The Source has returned! Can you get the seed and survive?? GOOD LUCK!
while the judges compile their data into a winning profile. I thought the CoCo could do the job — the result is Oratory. Using the Optimist Club judging system as a guide, the program compiles point and place totals, and prints them out in a report. Using this information, the winners can then be determined.

Using CoCo, the process takes no more than a few minutes, then the judges can also get in on the coffee break! I have run the most recent contest scores through Oratory and it takes less than five minutes to input the data.

I built a few stops and checks into the program so you don't get ahead of yourself and input the wrong numbers. It is a very straightforward program and will operate on a small system.

It is printer-oriented, but you can change the PRINT statements if you wish. I used the DMP-200 as the design model. You can change whatever you wish to suit your own particular configuration. Oratory can be adapted to almost any contest. You can add penalties if you wish or change the number of judges. I originally designed the program with the ability to choose the number of judges, but since the normal number in an Optimist contest is three, I saved aggravation and set the number at three.

After you type in the program and save it to tape or disk, simply run and you are on the way to the tally — good luck, and enjoy your coffee break.

(If you do not subscribe to RAINBOW ON TAPE, I would be happy to make you a copy on tape for $5, or send a disk and I will copy onto it for $5. My address is 130 Romain Avenue, Pompton Lakes, NJ 07442.)

The listing: ORATORY

```
10 CLS
20 PRINT@ 231, "ORATORICAL CONTEST"
30 PRINT@ 266, "JUDGES' TALLY"
40 PRINT@ 296, "BY HOWARD L. BALLENGER"
50 PRINT@ 423, "COPYRIGHT (C) 1985"
85
60 FOR X = 1 TO 1200
70 NEXT X
80 CLS
90 INPUT "NUMBER OF SPEAKERS" ; P
100 FOR C = 1 TO P
110 PRINT "NAME OF SPEAKER" ; C
120 INPUT A$(C)
130 NEXT C
140 FOR J = 1 TO 3
150 FOR C = 1 TO P
160 CLS: PRINT "JUDGE" ; J ; " SCORE FOR CONTESTANT" ; C
170 INPUT "PERSONAL QUALITIES (20 POSSIBLE)" ; PQ(C, J)
180 IF PQ(C, J) > 20 GOSUB 600 ELSE
```

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182 THE RAINBOW September 1985
GOTO 200
190 GOTO 170
200 INPUT "MATERIAL ORGANIZATION (POSSIBLE 3)";MO(C,J)
210 IF MO(C,J)>3 GOSUB 600 ELSE GOTO 230
220 GOTO 200
230 INPUT "DELIVERY AND PRESENTATION (3 POSSIBLE)";DP(C,J)
240 IF DP(C,J)>3 GOSUB 600 ELSE GOTO 260
250 GOTO 230
260 INPUT "OVERALL EFFECTIVENESS (2 POSSIBLE)";OE(C,J)
270 IF OE(C,J)>2 GOSUB 600 ELSE GOTO 280
280 INPUT "ARE SCORES CORRECT";A$1
290 IF A$="N" THEN 160 ELSE CLS:GOTO 300
300 INPUT "ARE THERE ANY PENALTIES";A$
310 IF A$="Y" THEN 320 ELSE 320
320 INPUT "PENALTY FOR USE OF PROPS ETC";PP(C,J)
330 INPUT "PENALTY FOR SELF-IDENTIFICATION";SI(C,J)
340 INPUT "SECONDS OVER OR UNDER OFFICIAL LIMIT";OT(C,J)
350 INPUT "FAILURE TO ANNOUNCE SUBJECT (3 POINTS)";FA(C,J)
360 INPUT "ARE PENALTIES CORRECT";A$
370 IF A$="Y" THEN 330 ELSE 330
380 OX(C,J)=INT(OT(C,J)/15)
390 PY(C,J)=OX(C,J)+PP(C,J)+SI(C,J)+FA(C,J)
400 TP(C,J)=PP(C,J)+MO(C,J)+DP(C,J)+OE(C,J)-PY(C,J)
410 INPUT "JUDGE PLACED CANDIDATE";PL(C,J)
420 FP(C)=PL(C,1)+PL(C,2)+PL(C,3)
430 IF C=P THEN 450
440 NEXT C
450 IF J=3 THEN GOTO 480
460 NEXT J
470 PRINT J;TAB(4);A(J)
480 PRINT #2,CHR$(27)CHR$(14) "ORATORICAL CONTEST COMPUTER REPORT";CHR$(27)CHR$(15)
490 PRINT #2,STRINGS$(8,61)
500 PRINT #2,TAB(4) "CONTESTANTS:"
510 PRINT #2,TAB(18) "FIRST JUDGE";TAB(31) "SECOND JUDGE";TAB(46) "THIRD JUDGE"
520 PRINT #2,TAB(60) "TOTAL";TAB(67) "TOTAL"
530 PRINT #2,TAB(18) "POINT";TAB(31) "POINT";TAB(46) "POINT";TAB(60) "POINT";TAB(67) "OF"
540 PRINT #2,TAB(18) "GRADE";TAB(26) "RANK";TAB(32) "GRADE";TAB(39) "RANK";TAB(47) "GRADE";TAB(54) "RANK";TAB(61) "GRADES";TAB(68) "RANK";TAB(76) "PLACE"
550 NEXT C
560 PRINT #2,STRINGS$(8,42)
570 PRINT #2,"WINNER IS DETERMINED BY LOWEST TOTAL RANK FIRST. IF THERE IS A TIE THERE THEN THE WINNER IS DETERMINED BY THE HIGHEST TOTAL POINT GRADE. NO TIES ARE PERMITTED"
580 INPUT "ANOTHER COPY <Y> OR <N>";Y$
590 IF Y$="Y" THEN 480 ELSE END
600 PRINT "SCORE TOO HIGH ENTER AGAIN"
610 RETURN

---

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Prices apply at Radio Shack Computer Centers and at participating Radio Shack stores and dealers. Multiplan™ Microsoft Corp.
Little Letters, a 32K ECB education program requiring a disk drive. Designed to assist preschoolers in distinguishing lowercase letters from uppercase with use of medium resolution graphics. Bob's Software, P.O. Box 391, Cleveland, OH 44107, disk no charge with self-addressed, stamped mailer

Master Disk, a 32K Disk BASIC utility to make a directory program which will accept up to 250 filenames or the directories of up to 18 disks. The program then sorts the filenames in alphabetical order and will save them in a disk file and/or display them on screen. Bob's Software, P.O. Box 391, Cleveland, OH 44107, disk no charge with self-addressed, stamped mailer

SKANCE, a 16K ECB disk dice game for up to four players. Solo players are pitted against CoCo (which can be beaten). CoCo scores and tracks all players as you test your skill and try your luck. Bob's Software, P.O. Box 391, Cleveland, OH 44107, disk no charge with self-addressed, stamped mailer

ChesSD, a 64K chess game requiring a disk drive utilizing a Hi-Res mode graphics to accurately depict the board. Players can set or change the look-ahead level at any point during play, from novice to advanced levels. Built-in time control allows true tournament play modes. Computer Systems Distributors, P.O. Box 9769, Anaheim, CA 92802, disk $49.95 plus $2 S/H

Microartist, a 32K ECB graphics utility requiring a joystick or mouse featuring: load/save files, zoom/mode textures, copy, printout and 100 color combinations. Prickly-Pear Software, 2640 N. Conestoga Avenue, Tucson AZ 85749, cassette $24.95, disk $29.95

Cash Prophet, a 16K ECB budget utility able to make week-by-week forecasts for one checking account and two savings accounts through input of current balances, interest rates and schedule of projected income and expenses transactions. Everyone's Computer Co., P.O. Box 771-R, Chesterfield, MO 63017, cassette $39.95

NAUGUS 2.0, a 16K arcade Adventure wherein you, as Byron Axehead, former captain of the King's Border Legion, must find the magic scepter to extricate yourself from a death sentence. The scepter is hidden in a magic forest populated by foul monsters who serve the dreaded Naugus. Freebooter Software, P.O. Box 59537, Pittsburgh, PA 15210, cassette $17.95

Model CC-150 Experiment Component Package for the TRS-80 Color Computer Interface Board, includes 16 ICs, a peripheral interface adapter, one D/A converter and one A/D converter, a binary switch and assorted resistors, capacitors and connectors. With the CC-Interface Board, hackers can do the experiments in Andrew C. Staugard's book TRS-80 Color Computer Interfacing, With Experiments. Group Technology, P.O. Box 87, Route 1, Box 83, Check, VA 24072, Component package $89.95 plus $2.50 S/H, Interface Board $51.25 plus $2.50 S/H

Submarine Subtraction, a 32K ECB education tutorial designed to aid elementary grade students in the use of subtraction. Consisting of 10 levels of difficulty from one digit to four digits, the player is asked to solve the problem within a given time frame thereby firing a torpedo at a battleship. Incorrect answers or going over the time frame result in the battleship dropping a depth charge. M.E.S.A., Middletown High School, Valley Road, Middletown, RI 02840, cassette $24, disk $26 plus $2.50 S/H

The Wizard's Math Board, a 32K ECB educational game for one to four players. Each player can choose his or her own level of play. The object of the game is to move around the board earning money by solving word problems or operational problems. Players earn money to buy three keys and the...
opportunity to try and solve the wizard's final riddle. M.E.S.A., Middletown High School, Valley Road, Middletown, RI 02840, cassette $20, disk $22 plus $2.50 S/H

**Young Writer's Notepad**, a 32K EBC word processing program to acquaint young writers with the computer keyboard. Possible are single key selections for any one of three colors and printouts in any one of three styles. Advanced writers can access a function menu to save and load documents from disk or tape. Features include an upper- and lowercase character set and special characters, full cursor control and insert and delete functions. M.E.S.A., Middletown High School, Valley Road, Middletown, RI 02840, cassette $20, disk $22 plus $2.50 S/H

MORE KEYS, a numeric keypad for CoCo with 15 keys that plugs into the computer for rapid numeric data entry. Dimensions: 6½-inch length, four-inch width and three-inch height. You must specify computer model when ordering. Comes with cable and connector. Moreton Bay, 316 Castillo Street, Santa Barbara, CA 93101, $69.95 plus $2 S/H

**LABEL 64**, a 64K utility to produce and maintain a name and address file. Records are stored on tape with options to add, delete, modify, search, list to screen, sort and/or print as desired. Users can print lists or labels in a choice of one, two or three wide. Owls Nest Software, P.O. Box 579, Ooltewah, TN 37363, cassette $24.95

**Property Management and Report System**, a 32K real estate utility program requiring a disk drive and printer. Reports possible include: income and expenses by unit, tenant or property, rent and mortgage schedules, tenant and property profiles and any combination of single and multiple units. A function for printing mailing labels is also included. Polygon Co., 1316 Wilshire Blvd., Suite 206, Los Angeles, CA 90017, disk $99.50

**City War**, a 16K strategy game wherein the player must eliminate the leader of the opposing country by reducing the population of the leader’s city to zero. Commands are accessed by a single keystroke. There are access codes to keep information: “Top-Secret: Your Eyes Only.” Prickly-Pear Software, 2640 N. Conestoga Avenue, Tucson, AZ 85749, cassette $24.95, disk $29.95 plus $1.50 S/H

**Protector**, a write-protect program to make almost any program safe from unwanted examination. Racine, 5220 S. Birmingham, Tacoma, WA 98409, cassette $25

**SDBASIC Compiler**, a 64K utility requiring a disk drive with full-featured language, fast execution, automatic runtime integer, floating point optimization and device-independent ASCII and binary file I/O to the byte. Computer Systems Distributors, P.O. Box 9769, Anaheim, CA 92802, disk $49.95 plus $2 S/H

**WINCO Board**, a cassette utility hardware kit that uses LED monitors for tape head realignment for facilitating CLRDs with reluctant cassettes. Possible are saving and load simultaneously, audible signal while saving or loading and finding optimum tape volume for loading. Russell Electronics, RDI, Box 539, Centre Hall, PA 16828, Unit assembled $24.95, build it yourself kit $20.95, earphone $1

**Blackjack Dealer and Feeler Dealer**, a 32K EBC blackjack game wherein you play against CoCo, the dealer. With Feeler Dealer you have a chance to hone your skill and test strategies by playing the desired number of hands using various techniques. Saguaro Software, 7331 E. Beverly, Tucson, AZ 85710, cassette $24.95, disk $29.95 plus $1 S/H

**GoldKeys**, a 64K ECB keyboard enhancement. Features included a nondestructive cursor, input editing, key klick, key repeat, predefined and user-definable function keys, typeahead keyboard buffer, and BREAK and Reset controls. VIDTRON, 4418 E. Chapman Ave., Suite 284, Orange, CA 92669, cassette $20, disk $22 plus $2 S/H

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

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

— Monica Dorth
**WORD PROCESSOR**

*Editor:*

My thanks to Michael Hunt for the excellent review of *Word Processor* (May 1985, Page 202). I appreciate his fairness to smaller companies as well as large ones. I would also like to attempt to explain or defend some negative points he mentioned.

I admit the edit mode in this program is somewhat slow in scrolling through a file. Since this is a BASIC program, I'm not sure if it can be sped up very much, but I'll try. On the slow formatting of text, this was sped up about 20 percent in late 1984 (after *Word Processor* was sent in for certification).

Of the tape filename and motor control problems you mentioned, only one of these really needs to be fixed. The program can easily be changed to allow input of your own filename (I will have this done before this letter is published). As for the motor (and audio) of the tape being turned on before cassette input/output, this is to allow the user a way to find his or her program before cassette input/output, this is to allow the user a way to find his or her program on tape before pressing ENTER. The reason behind this stems from *EDTASM+*, which does the exact opposite. After a user request to save, load, etc., to tape, *EDTASM+* prints "READY CASSETTE" and waits for the ENTER key. However, it doesn't turn the motor or audio on, so there is no way to "ready cassette!" I thought this might be useful.

The 5,000 character file limit has also been raised. Thanks again for the great review and my chance to respond to it.

Andre' Needham
Drayon Software

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**TO PRESERVE QUANDIC**

*Editor:*

Thank you for the review of *To Preserve Quandic* published in the July 1985 issue of THE RAINBOW (Page 223). Mr. Shell's review was fair and I appreciate his error trapping, but I would like to expand on a few statements that he made.

In previous reviews, I had noticed the reviewers would contact the author of the program and tell him of any obvious errors that had been found. If Mr. Shell had contacted me, I would have been more than happy to correct any of those errors. The program as Mr. Shell writes, is over 70K long and the data (text, not pictures) occupy another 30K of the disk. This results in a little over 100K of Adventure which I had to check over. I knew I missed some errors and I invite everyone who owns the Adventure to inform me of them. (My address is 1809 Dexter, Austin, TX 78704.)

Secondly, I would like to write about his "most critical point." Mr. Shell writes, "... you must fight or kill something and the winning or losing of these fights is random." This is true if the player cannot find certain objects or solve certain puzzles. If the player can do these specific tasks, he can pass the object he "must kill or fight" without killing or fighting.

Besides the things that Mr. Shell mentioned, there is the look and the feel of the Adventure. The screen is composed of five elements: 1) a timer which shows elapsed time, 2) a window for graphics, 3) a title for the graphics window, 4) an inventory window and 5) an interactive text window. Also, there are the settings of the Adventure. They are a mansion which you are temporarily trapped in, a cave, a forest that you must find your way out of, and an old abandoned castle (not necessarily in that order).

In conclusion, I would like to thank THE RAINBOW for its service to the Color Computer users. Initially, in 1983, I benefited from the programs and that is where I learned BASIC. Later, the articles on assembly language became more important. I am using that knowledge to write my next Adventure entirely in assembly language with a full sentence parser.

David Karam
Prickly-Pear Software

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**SS-1 ELECTRA-GUARD**

*Editor:*

[It was a] very nice review regarding our surge suppressor (June 1985, Page 210). Gabe Weaver will be pleased to know it is both UL and CSA listed. Cassette-based Color Computers don't really mind surges and spikes on the line. But, once a disk is added, that same interference is magnified many fold and causes lost data, disk crashes, ruined directories and hung-up computers.

Adding the SS-1 to the circuit (the power doesn't have to flow through it, just being in parallel does the trick) reduces the garbage that causes these problems. Maybe the easiest way to "see" this is to use it in the same circuit as your TV, then turn on a hair dryer. Normally you would see the interference on the TV — but not with the SS-1 in place.

Ross Litton
Howard Medical Company

---

**LEDGER ONE**

*Editor:*

I have received a courtesy copy of Dan Smith's review of our Color Computer program, *Ledger One*. Mr. Smith has made a fair and thorough analysis and review of *Ledger One*, offering a number of useful suggestions for improving the program.

All of his suggestions were found good and valued, so now have been made part of the newly modified program. The program instructions also are being rewritten.

Thank you for having an accountant review this accounting program, giving all of us the advantage of his knowledge and experience.

Thank you, RAINBOW Magazine, for the service you are giving to your readers.

Charles E. Brown, Jr.
West Bay Company
COLOR TERM + Plus +

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• BAUD 1-6 change the BAUD rate.
• TRACK 35, 36, 40, 80 change number of tracks.
• DOUBLE enable the double sided option.
• PDIR print your directory to printer.
• DUMP ON/OFF send programs without a terminal program.
• RATE 6,35 change the head stepping rate.
• VIDEO ON/OFF reverse video without a hardware mod.
• SCROLL 1-255 change your screen scrolling speed.
• COMMAND will list all new commands.
• DUPE 0, 1, 2 will allow copy & backup from one side of a drive to another!
• DATE you can enter the month, day and year as an extension to your programs when they are displayed during a DIR command.

We guarantee that this program will work using the above commands, with all types of 35, 40 or 80 track drives!

PRICE: $29.95 (DISK ONLY) 64K required
**Testmaker Lets You Compose Your Own Tests**

*Testmaker* is one of those “good news/bad news” situations: you are tempted with praise for the program (“Just what I’m looking for”), then exposed to the harsh realities (“You mean it doesn’t do . . .”). First, the good news.

*Testmaker* does just what it purports to do — create either true/false or multiple-choice tests of any number of questions, and either print them out or display them on-screen. If the test is printed out, a master (key) or a student version can be chosen. If the test is to be given by the computer on-screen, the test is scored by the computer and the results are displayed at the end, with the number correct, number wrong and the percentage of correct answers given.

A nice feature is the scrambling of the multiple-choice answers each time a test is run by the computer or printed out. The questions will appear in the same order each time, but choices will always be in different order. This allows a test to be used more than once with the same student, or for multiple versions of the same test to obviate cheating.

The program works smoothly, is supported by clear documentation and even has audible warnings when you near the end of the allowable length of questions (160 characters) or answers (29 characters). It works with either single or multiple drives, and follows good programming practices by always putting data files on a different disk than that which holds the program.

On single drive systems, this requires some disk swapping, but you are always reminded of this on-screen, and it doesn’t happen too often. On multiple drive systems, you may specify which drive (other than the one holding the program disk) will hold the data disk. The program is not copy-protected, so backup copies are not a problem.

Now for the bad news. This program is cumbersome to work with in several ways. Once a file of questions is created, you cannot add to or delete from it. If you forget a question that really needs to be included, you must type the entire test again as a new file. Likewise, if you prepare a test in advance and later need to delete something you didn’t get to in class, you must type the entire test again as a new file. You cannot merge two files to create a longer test, nor can you specify selected questions to be printed to create a shorter test.

Another problem is confined to the on-screen version of the tests created by this program. The test questions remain on the screen for six seconds, then are replaced by the answer choices. There is no way to see the question again. This can be very frustrating to a slow reader. This problem generated the most negative comments from students and adults looking at this program in action. (Of course, this can be corrected easily by someone with minimal programming skills, but you don’t buy programs to create more work for yourself.) These are the most serious shortcomings of *Testmaker*.

The other problems are more on the order of annoyances than flaws, but they occur whenever the program is used. You can edit an error while you are on that line, but once you leave the line, you cannot edit until you finish the entire test. You then reload the file, read through each question, indicate if you wish to edit it, go on to the next question and so on through the entire file. You then go back and work with the questions you marked for editing. It would be much simpler if the user was able to edit each question as it scrolled through the file, instead of a two-step process.

Another problem is that when you are editing a question or answer, the incorrect entry disappears as soon as you type the first letter of the corrected answer. You are then asked “Is this correct?” but you can only see the last part of what you typed. It would be better, in view of the cumbersome editing technique, if everything you typed stayed on the screen until you pressed the ENTER key.

Although each question can be up to 160 characters long, each line can only be 32 characters long. You must use the down-arrow key to go to the next line on the screen. If you don’t, the beginning of the the line you are on is lost. It is much more natural to type until you finish the question, but if you do, you will have only the last 32 characters you typed. Those audible warnings mentioned earlier are very useful here, but pressing the down-arrow every 32 characters can break your rhythm if you compose at the keyboard.

A related problem is the length of allowable answer. This is 29 characters. For some applications, such as names or dates, this will be adequate, but for others (alternate descriptions of a character in a novel, for example) it imposes a severe restriction. Of course, in the true/false option, this is not a problem.

None of these problems prevent the program from working, but they make the use of *Testmaker* less pleasant than it could be. There are other test-making programs on the market that do the job in a more flexible and efficient manner. *Testmaker* could be used in a home situation (where its inconveniences would not be too bothersome), but I would think twice before recommending it to a teacher for class use.

(Saguaro Software, 7331 E. Beverly, Tucson, AZ 85710 disk only, $29.95)

— Mark Williams

**Hint . . .**

**Junk Eraser**

Here’s an easy way to prevent many cassette I/O errors. Position the tape at the point where the program is to be saved, and press the Record and Play keys. Estimate the length of the save, then enter MOTOR ON to start the tape and MOTOR OFF a few seconds after you expect the save to end. Rewind the tape to the desired position and CSAVE as usual.

This will erase any unwanted junk on the tape, making I/O errors less likely to occur.

Dan Rowe
Harrah, WA
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- Un-DISK should be in the library of every serious CoCo user even if you own a disk says Frank J. Esser, independent reviewer for RAINBOW Magazine!

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Cookbook Takes The Cake
With Its Menu Planning

From the moment I got my review package of Radio Shack's program Cookbook, I have been eager to tell you it is menu oriented — in more ways than one. It operates from a menu to make a menu.

Typical of other Radio Shack programs, Cookbook does not take some of the CoCo's real strengths into consideration, but it is very good in spite of a couple of shortcomings. If you have any knowledge of programming you can make up for some of the loss. For instance, you can break the program at one point and POKE 150 to change the Baud rate for printing.

The package is slick! The very nice documentation is nested in a plastic folder with the two disks provided. One of the disks is the program and the other the data disk. You are better off with two drives for this program, but you can do with one if that is all you have. You can get along without a printer, but it will help to have one.

Let's take a look at how the program works. It starts with the usual billboards, disclaimers and then the question of how many drives you have. From there the program goes to the main menu which gives you the option of Menu Planner or Recipe Index.

Here is one of the very special features of this program. The selection in the menu is made by using the space bar; operating the program is accomplished by keying ENTER. These things are presented in very nice graphics, including a spiffy-looking chef.

To get down to business, I pushed the Create a Meal selection that produced a questionnaire. From this you can make a selection to produce four menus from which you can prepare meals. I chose Informal Lunch with an emphasis on meat dishes. The meal was to be light and the cost inexpensive.

On my 64K CoCo the disks started to whirl and clank and the message file search in progress came upon the screen. I timed the procedure and found the search took two minutes 50 seconds to discover 170 recipes. For the next two minutes, the program sorted the recipes and came up with four menus as follows: Carrot Soup, Omelet Fine Herbs, Spinach Souffle, Avocado and Tomato Salad; Golden Mushroom Soup, Barbecued Chicken, Corn Souffle, Goat Cheese Salad; Velvet Consomme, Chicken and Walnut Salad, Peas Francaise, Tomatoes Dijon Vinaigrette; and Tomato Madiera Soup, Chicken Cordon Bleu, Potato and Spinach Puree, Greek Salad. (Not exactly a hamburger with onion and an order of french fries!)

I then went back to the main menu to access the Recipe Index. I chose the retrieve selection. I was greeted by splendid graphics which asked what recipe I needed. I input the words "Chicken Cordon Bleu." About 15 seconds later the recipe was put together and I was able to scroll through in less than a minute.

After the recipe scrolled through, graphics came on the screen and the legend said "the chef will be back." When he came back it was in the form of a menu which gave the options of Scroll through the recipe, Print out the recipe,
Create a shopping list, Scale the recipe up or down, or Return to retrieve Recipe Index menu.

It was here I wondered why the author had chosen not to include the printing option in the menu planning section of the program as well as in the recipe section. It would surely be convenient to have a hard copy of the menus. Of course, you write them down, but a printer would be better.

The folks at Tandy should be made to write the word "category" 500 times on the blackboard. They have it misspelled in the program at this point.

As you recall we asked for inexpensive meals and I noted the choice of Velvet Consomme, which is under the expensive banner. This also took place on several other selections.

There are other interesting functions of this program. You can select a beverage or create a new dish. You can browse through the recipe file of about 320 recipes and get a printed copy if you wish. There is a very handy timer built into the program that you can use and still browse through a recipe. That would be handy while you are cooking. There is a glossary of culinary terms which could be very handy in some gourmet recipes. These are nice additions to the program and enhance its value.

There is a provision for filing your own recipes. They are not included in the main program file and are not privy to some of the options. There is provision for preparing a shopping list for any recipe you retrieve and another option with which you can scale a recipe up or down.

The select beverage portion is nice and offers a good selection of nonalcoholic beverages as well as wines and the like. "Create a new dish" simply takes various kinds of meats and suggests you use a variety of sauces to perk up the meal.

Cookbook does not get a five-star rating, but it surely rates high. In spite of one bad spelling and a missing printing routine, this is almost culinary magic. The recipes are good, too. I've taken a shot at a couple of them and they work. Now perhaps my children will do a review of my cooking!

(Radio Shack stores nationwide, disk $39.95)

— Howard Lee Ball

**Screen Inverter Lets You Easily Switch Screen Colors**

Oh, programmers of little faith! The first two sentences on the printed sheet which comes with this program are as follows: "This program is sold on an as is basis. We guarantee only that it will load."

That is not a message designed to inspire confidence. However, I found that Screen Inverter not only loaded without a hitch, but also worked without any problems at all.

The purpose of Screen Inverter is to increase accuracy in "keyboarding" a long and complicated program. Have you ever gotten down to about the 990th line in a program and found that everything just seems to run together on the monitor? Time to take a break for a cup of coffee and rest the eyes! Screen Inverter permits you to toggle between a green background with black letters and a black background and green letters. In either case, the letters are crisp and sharp and easy to read.

The program is in machine language and takes up little room in memory (119 bytes). This program comes in two versions, INVERTLO and INVERTHI. INVERTLO will CLDADM into the first graphics page; INVERTHI will CLDADM into the top of your 32K RAM. Of course this means you must use INVERTLO if you have only 16K.

Screen Inverter does just what it is supposed to do without problem or fanfare. I believe it would be very helpful when keying in long programs. I can recommend it as a useful addition to your CoCo library.

(Tothian Software, P.O. Box 663, Rimmersburg, PA 16248, cassette $9.95)

— Charles L. Redman, Jr.
The OS-9 Solution Helps Simplify OS-9

By John Curl

With the introduction of the OS-9 Solution, Spectrum Projects has entered the wonderful world of OS-9. This utility program is in keeping with Spectrum’s tradition of offering outstanding software for the CoCo.

The OS-9 Solution is a menu-driven utility program designed to make OS-9 an easier to use disk operating system. It is a command file, belonging in your execution directory of your OS-9 disk, which incorporates all of the most useful OS-9 commands (including Copy, Del, Xmode, etc.), and also adds several useful commands that should have been included in OS-9. It is written so both the novice and the experienced OS-9 user will be able to benefit from its power.

The OS-9 Solution requires a 64K Color Computer and Level 1 OS-9 Version 01.01.00 or better. You can use any available input or output devices, however, the output devices must support the standard OS-9 cursor positioning control codes. The user must also have a general understanding of OS-9. If you’ve read the Getting Started with OS-9 manual and understand it, you should have no problem in using this program. The most important thing to understand is how OS-9 organizes files and directories.

Installing the OS-9 Solution is very simple. All you have to do is turn on the computer and boot up OS-9; at the OS9: prompt insert the OS-9 Solution diskette, type /DO/INSTALL and press ENTER. After this you will be instructed to insert an OS-9 system disk in drive /D0 and supply the filename of your disk format command (this is done in case you have a customized disk format), then you are told to insert the diskette on which you wish to install the OS-9 Solution and press the letter ‘I’. It’s that simple!

Operating the OS-9 Solution is almost as simple. The program is called SOLUTION in the CMD (commands) directory and shows up the same if you load it into memory.

To execute the program just type SOLUTION and press ENTER. Optional parameters include directory name (default directory to startup in), -s (single drive option) and #20K (defines the size of the forced buffer you want; in this case it defines a 20K buffer).

The available commands are contained in two menus. You can switch between the two by pressing either the ‘1’ or ‘2’ key. One note: You can still invoke any of the commands regardless of which menu is currently displayed.

(*An asterisk after the command name indicates it is an added command never available on OS-9 before. You can see that the OS-9 Solution adds several needed and beneficial commands.)

The commands are:

- **Alphabetize Directory** — This command is self-explanatory. It puts all of the filenames in the current directory in alphabetical order.

- **Backup Diskette** — Does a backup of a diskette onto another formatted diskette.

- **Copy File** — Copies the current file to a destination. You have the option of specifying the destination path.

- **Delete Directory or File** — Deletes the current filename or directory. If it’s a file, the program will ask you to verify if you wish to delete it. If it’s a directory file, the program first checks to make sure you have emptied the directory and then, if you have, it deletes it.

- **Examine File** — This command asks you to select the device to which you want to dump the current file. It should display everything you have hooked up to your CoCo that OS-9 can handle. Use the up and down arrows to select the device. It then produces a formatted hexadecimal and ASCII dump of the current file on the device. This is similar to the OS-9 DUMP command.

- **Format Diskette** — Formats a diskette for OS-9. If you are using a customized format command, make sure it is on your system disk when you install the OS-9 Solution.

- **Goto Directory** — This command moves the current directory one level deeper (into the current file to be exact). If the current file is not a directory file you will be told and returned to the same current directory as before.

- **Help Screens** — Brings up a few screens of run-time instructions that are geared to answer your less complicated questions. It is also a supplement to the main menu commands list.

- **Information on File** — Displays all available information about a module file. It combines the OS-9 Directory and IDENT commands.

- **Jumble Filenames** — This command lets you manually move the filenames of the current directory around. You can place the filenames in any order you like.

- **Kompares Files** — This command compares files. Similar to the CMP command in OS-9.

- **Load in a File to the Module Directory** — Loads the current file into memory and links it into the module directory.

- **Make a New Directory** — Make a new directory inside the current directory. You input the name of the new directory. It is good practice to use all uppercase names for directories.

- **New Diskette** — This command must be used every time you take the disk out of the drive and replace it with another disk (except during single-drive command operations). If you don’t use this command, the disk could be destroyed.

- **Output File** — Outputs the ASCII contents of the current file to an output device. Similar to the OS-9 LIST command.

- **Put File Together** — This command merges two files together. Similar to the OS-9 Merge command.

- **Quit The OS-9 Solution and Exit to OS-9** — This command simply exits the OS-9 Solution.

- **Rename Current Filename** — Allows you to rename the current filename. This command has its own line editing features.

- **Set Directories** — Used to set the current and destination directories.

- **Time and Date Set** — Sets the system clock to the correct time and date.

- **Up One Directory Level** — Takes the current directory, goes up to its parent directory and makes it the current directory.

- **Verify File** — Opens up the current file and verifies if the modules contained in that file are correct. If the current file is not a module, or it is a directory, an error will be returned.
Work Multiple Files* — This is the biggest and possibly most powerful command in the program. This command has its own set of subcommands (Copy, Delete, Examine, Kompare, Load, Output and Verify) all geared to the handling of multiple files. This saves a great deal of time.

Xmode Parameters* — This powerful command lets you examine and/or change any of the Xmode parameters of any SCF devices.

Y = Display Free Sectors* — Displays the free sectors on the current directory and the destination directory alike. Also displays the names and creation dates of the disks the directories are on.

Z = Execute SHELL Command — Lets you use the SHELL command as a subcommand. You may type in one command line.

Using the OS-9 Solution is very easy. The program worked flawlessly the first time I installed it. All of the commands worked as described. Whenever you invoke a command that needs filenames, a very nice directory window is displayed. By using the arrow keys you can scroll up and down the current directory. For rapid movement, the SHIFT and CLEAR keys can be used in addition to the arrow keys.

If you are a single-drive user, remember to include the single-drive parameter when you invoke the program. Also, if at any time you wish to abort an operation, just press the BREAK key. The OS-9 Solution will work with any Hi-Res screen utility; just make sure it supports the standard OS-9 screen codes.

The biggest advantage to using this program is its simplicity and speed in invoking commands. OS-9's confusing command syntax was very complicated and time-consuming. That was my major problem with OS-9 in the past. Now that the OS-9 Solution is here, I'll probably lose more sleep staying up nights using my CoCo and OS-9.

I could find no shortcomings with this program. As a utility it is superb. I just wonder why the commands were not included in OS-9 to begin with. It would have made adjusting to OS-9 a lot simpler and faster.

Nine pages of instructions come with the program. Aside from a few typing errors, the manual is outstanding. It doesn't teach you OS-9, but it tells you everything you need to know about the program.

The OS-9 Solution should answer several experienced users' needs, as well as lure more people into the growing world of pleased OS-9 users.

(Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $39.95 plus $3 S/H)

Dallas Quest Takes You On A Multimillion Dollar Search

Dallas Quest is Datasoft's newest graphics Adventure which is distributed by Radio Shack. It is based on the popular television show Dallas and requires 64K and a disk drive.

In this scenario, you have been hired by Sue Ellen and your role as one of the world's greatest detectives is to uncover a missing map revealing the location of a multimillion dollar South American oil field. You must find your way off of Southfork and into the jungles of South America. You will be either helped or hindered by J.R., Lucy, Ray Krebbs or other members of the Ewing clan.

This was my first experience with an Adventure game, so my Adventure-loving husband watched over me as I rambled through the jungle. The level of difficulty can be chosen by the Adventurer. There are many clues, and the more advanced Adventurer will probably want to see how few clues they can take.

One good feature is the ability to save and name seven games in progress. This is good to use when you are not sure what is going to happen next. If you get trampled by elephants or killed by natives, you don't have to start all the way back at Southfork again. Just when you think the end is near, a turn of events reveals there is much more to the Adventure.

The only disappointing part is when I finally did get to the end, I had enjoyed it so much that I wanted it to keep going. Speaking of the end, I don't want to give it away, and my husband agreed, it is a very unique ending.

The graphics are excellent. They are colorful and very detailed. I have watched my husband play other graphics Adventures and the graphics in Dallas Quest are the best I have seen.

I really enjoyed playing this game and my family enjoyed watching me struggle. I now understand how people get hooked on Adventure games. If Dallas Quest is an example of the types of Adventure games Datasoft produces, I hope to see more programs from them.

(Radio Shack stores nationwide, disk $29.95)

— Jeanne Shell

Software Review

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The Software Connection of Fort Lauderdale is your one stop source for your Color Computer Software: Peripherals, Books, Magazines & Repairs

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Book Review:

Guide to Super Software for the TRS-80 Color Computer
Answers Your Questions

By C. L. Pilipauskas

Have you ever wanted to know everything about every piece of applications software ever written for the CoCo? How about a comparison of nine different word processors, six spelling checkers, 16 database managers, seven spreadsheet calculators, and 186-page tome relates Mr. Norman's experiences with and contemplation of the purchase of one, knows that this machine should be taken seriously. It is not relegated to just playing multiplication tables.

Scott L. Norman has just written a book called Guide to Super Software for the TRS-80 Color Computer. This 186-page tome relates Mr. Norman's experiences with and his personal opinions about the above described software. He feels that Radio Shack has been selling the CoCo short and wants to let everyone who owns a CoCo or is contemplating the purchase of one, know that this machine should be taken seriously. It is not relegated to just playing shoot-'em-up games or teaching Johnny or Jane the multiplication tables.

The book is divided into seven chapters which will supposedly answer the question “What can the CoCo do today?” Chapter 1 deals in general interest items about the CoCo, such as a short history of the different models, some definitions of computer terms, alternate memory maps, alternate operating system, and “How to Use This Book.”

Each subsequent chapter deals with the applications programs themselves. Chapter 2 starts with a brief description of what word processors are and what Scott has used them for. He also describes the problem with the limited display capability of the CoCo and some possible remedies. He goes on to describe the details of each word processor. Most of the chapters start with the least powerful program and work up to the most powerful.

Chapter 3 is more like an adjunct to Chapter 2, since it deals mainly with spelling checkers that verify the spelling of the output of a word processor. The last programs discussed are the so-called mail merge programs. These are the programs that make customized form letters.

The next chapter deals with database managers. These are the programs everyone uses to justify the purchase of the home computer — keeping track of facts and figures. But as Scott said, “If you are a fundamentally disorganized person, the computer is unlikely to help!” After a brief description of what a database manager is and some necessary definitions for the newcomer, we're off to 41 pages of details, examples, shortcomings, etc. Scott also describes, where applicable, programs that run under FLEX and OS-9. These tend to be the most advanced and expensive programs and usually the most powerful.

The fifth chapter deals with the fascinating world of spreadsheet calculators. You know, those things that allow you to do interesting things with numbers.

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one to do "what ifs" in the world of business and management. Again, the author describes the general features of these types of programs and how they're used before going into detail of the various offerings. This chapter includes a lot of specific examples of how these programs handle the information put into them.

The second to the last chapter deals with the areas of business and personal finance. This is the other reason you justified the purchase of your computer — keeping track of the checkbook! Though this chapter includes the kinds of programs you and I would use at home, most of the programs described are for the person with a small- or medium-sized business. Some of these packages are integrated systems — the output of one is used for the input of another and, from the descriptions, sound like they could almost control the holdings of the Howard Hughes estate.

The last chapter the author uses for some speculation on the future of application programs and some possible enhancements for the CoCo to make it even more impressive as a business machine.

The author has no prejudices against cassette-based programs and mentions them only when they could limit the usefulness of a given program. In fact, he mentions that tape is great for archival backups and how a disk drive can use some of the limited RAM space available for the program's use.

The two appendices list the vendors of the products (hardware) and software mentioned in the text. The book also includes an index, making it easy to find that section you may want to reread.

A book like this can't possibly cover every piece of software that has ever been written for the CoCo, and with the long lead time to publish a book, it is quite possible enhanced versions and completely new packages may be on the market. Scott realized all this and still published the book in hopes of generating interest in the serious use of our favorite computer. Besides, most of the programs described in the book are probably still on the market.

As far as readability is concerned, I would strongly advise you to have a dictionary handy, as the author does have a flair for using $50 words. This makes reading a bit slow when you have to stop and use the dictionary. I found several typos and sentences which made no sense (words omitted, I believe) and one glaring mistake — that the other two operating systems he describes (OS-9 and FLEX) parcel out disk space 256 bits at a time (I believe that's bytes). Though some effort is made to define buzz words used by the different programs, if you're a neophyte concerning application programs, you won't learn a lot since the book wasn't intended to be a tutorial.

In all fairness to this book, even though I have a very limited knowledge in application programs and an even smaller interest, I did learn a good deal about them and can appreciate their ability to help make large jobs a little more manageable. I just wish Guide to Super Software for the TRS-80 Color Computer had been a little easier to read.

(Scott L. Norman, Scott, Foresman and Company, Professional Publishing Group, 1900 East Lake Ave., Glenview, IL 60025, $18.95)

Software Review

Graphics And Text Have Pizazz With ViziDraw

By Jeffrey S. Parker

ViziDraw 1.0 is a new program from Arizin, distributed by GRAFX, that lets you create highly intricate Hi-Res drawings and text on your screen, then dump them to a printer.

ViziDraw is a very sophisticated program. With no additional expenses to incur by having to buy a multipack or even a mouse, this program on a stand-alone basis compares very favorably with other higher priced software packages for the CoCo. It even has some features that MacPaint doesn't have!

What makes ViziDraw special is that it is almost entirely joystick or mouse oriented. Upon start-up, the user is presented with a blank worksheet surrounded on four sides by icons, which are accessed by means of a joystick or mouse. Arizin recommends, and I found it true, that a mouse is easier and faster to use than a joystick. I found that using a mouse for large movements in the right joystick port, and a non-centering joystick in the left joystick port, allowed the easiest mobility around the screen and the most refined control for those intricate little touches.

ViziDraw comes with the system diskette and a diskette of optional character type fonts not included on the system diskette. When the program is first started and run, some "custom tailoring" is required by the user: You must configure the program to the printer you have. I found that a dump to a Radio Shack DMP-105 was extremely quick and efficient when run at 9600 Baud from the parallel port. Just enable or deactivate a high speed poke and poke a printer baud rate. These steps are easy, well-defined in the manual, and only require a one-time expenditure of five minutes or so to complete. Once the modifications are made, the user saves the tailored version back to disk (or tape) and off you go.

ViziDraw is almost all menu and icon oriented. It is possible to access nearly every feature of the program with only a mouse or joystick. The few exceptions are resetting coordinates on the worksheet, accessing type font styles (such as bold and double-size characters) and, of course, text entry. Other than that, whether one wants to paint, fill, magnify, rotate, create a tilted mirror image, or another graphics display, you just click and go!

ViziDraw comes with a 35-page manual which outlines in well-ordered sections all the features of the program and how to use them. The reading is a bit rigorous and tends to bog down in places where a simple example would have sufficed. Nevertheless, inside of an hour or so, even the users out there who have always been afraid to draw (myself included) can be clicking away with amazing results in less than an hour!

ViziDraw has the capability to mix graphics text characters and graphics characters in any combination on the screen. The screen is divided into six sections, two sections across and three sections down. One can use only a corner of the drawing worksheet or all of it, and display the progress of the whole design at any time. This may seem confusing at first, but if you think of the worksheet...
as a window onto a larger space, after a short time moving about by arrow icons seems quite natural.

I was surprised by the power and versatility of ViziDraw. Each time I thought I had stumped the program, I would find my answers somewhere in the documentation. For instance, I discovered that a directory for any drive can be done without leaving the program, and that options such as bit spacing and bit thickness are easily selectable. I found that several types of formats for locating, loading and saving files are recognized by the system.

Perhaps most importantly, I found a real excellence in error handling with ViziDraw. Some programs can crash suddenly; not so with ViziDraw. It has a built-in command loop which automatically reroutes the program back to the worksheet buffer on error detect. This is true even if you accidentally break out of the program or reset the computer. As long as the computer is left running, no matter what happens you can get back to your work in progress. What a relief!

Powerful routines have been worked into ViziDraw, like the GET and PUT commands that allow you to cut a window out of a picture and put it somewhere else, either on the drawing or entirely removed from the current drawing by means of putting it in a "Library" buffer. The Library buffer will take a current worksheet and dump it into high RAM where it is saved online. Video pages can be swapped into and out of the Library to make use of several different sections of several different graphics designs.

The UNDO command is also powerful. When you have just painted in an entire screen by accident, one touch of

the UNDO command erases all. Changed your mind? Undo the UNDO!

ViziDraw is crammed with more powerful features than there is room to list here. The program is written in BASIC and is therefore "user transparent"; it can be changed to suit you.

It comes with drivers to support a wide band of popular printers. Dumping to a printer requires the click of a button, the punch of a key for verification and, in a very short time, there's the image on paper. The bit scale is movable so you can have the scale on screen equal, greater or less than the bit scale of the printer (i.e., one pixel equals one printer dot, five printer dots, one mile, three liters, etc.).

In conclusion, ViziDraw is an extremely powerful graphics utility for the Color Computer, with highly sophisticated features and abilities. It is easy to use and runs quickly and smoothly. ViziDraw will dump to a printer reliably and efficiently, and allow the user to stop print at any time. ViziDraw, with its sophisticated routines for rotation, mirroring, alteration, text and many different type fonts may not be the "max," but at $49.95 for disk or tape, it sure comes close!

(Arizin, distributed by GRAFX, P.O. Box 254, West Mifflin, PA 15122, tape or disk $49.95, requires 64K and joystick or mouse [mouse and joystick combination suggested].)
Fast-Food Fun
With Franchise!

The bank finally approved your loan, and you purchased your first fast-food restaurant. "Frank’s" fast-food chain, once a dream of yours, is now on its way to becoming a reality. Your dream is to open 15 restaurants and then retire to a plush mansion overlooking the ocean. Only you can determine how successful the chain will become. Careful weekly planning and "fast and friendly service" (along with a lot of beef in your burgers) will help you realize this dream.

Have you ever wondered what it would be like to own your own fast-food chain? Well, now Computerware gives you the chance to experience being an entrepreneur with its new Simulation game called Franchise!

Franchise! is a fun game to play. It is completely joystick controlled, so you don’t even have to touch the keyboard. All you do is point arrows at your choice and push the button. To me this is a plus because I don’t have to remember a whole new set of commands just to play a game.

Franchise! requires 64K to operate. Very few software producers offer games that can be used only in 64K machines. It was well worth the effort and risk to put out a 64K-only game because the game could not possibly be the same in a 16K or 32K version.

You run your restaurants on a weekly basis. Every week you order food, buy advertising, pay your employees, sell franchises and open new, self-owned restaurants. For those of you who think that is too much to do, you don’t have to reset these every month, you can just keep last week’s values.

It takes $100,000 to open a new, self-owned restaurant, so you have to wait awhile before you have an entire chain. Or you could sell franchises and collect $20,000 plus a percentage of their profits in fees every month. To win, you have to establish seven self-owned restaurants and eight franchises or vice versa, but you only have three years to do it in, so you can’t waste any time!

During your activities for the week, you can also check competitor’s chains to see how well they are doing. This can help you decide what to do, and it will also tell you how the general economy is doing. A random effect in the economy is present in every game to make each game a challenge. You can also close down self-owned restaurants if they are not doing well.

Some of you are thinking you won’t like this game because there is no real action to it, but about once every four weeks you visit one of your restaurants and have to run around filling orders. Each person will only wait so long before becoming upset, and if you get too many people walking out of the restaurant your sales will begin to decline. The food they order is not always ready and the only thing you can do is to tear your hair out while waiting for a drink to come out.

All in all, Franchise! is a very good game. Not only is it fun to play, but it relieves the boredom of always playing arcade games, doing word processing, business or whatever. I strongly recommend Franchise! for anyone looking for some enjoyment. I certainly enjoyed playing it for this review.

(Computerware, 4403 Manchester Ave., Suite 102, Box 668, Encinitas, CA 92024, requires 64K, tape $24.95, disk $27.95)

— Andy Dater

One-Liner Contest Winner...

This one-liner draws a face on the screen.

The listing:

1 PMODE 3,1:SCREEN 1,0:PCLS:CIRCLE(126,96),69,4:LINE(89,191)-(110,146),PSET:LINE(159,191)-(141,146),PSET:CIRCLE(106,86),9,3:LINE(106,116)-(146,116),PSET:CIRCLE(146,86),9,3:PAINT(126,186),3,4:FOR X=1 TO 10000:NEXT X

Steve Jones
Cherryville, NC

(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.)
MEDIEVAL ADVENTURE

Use Your Weapons and Your Wits! Fight Off The Evil That Lurks In The Dark And See If You Can Escape From The Multi-Levelled Dungeon Of DENNA!

After capturing the Castle of Denna, you and your trusted followers are given to wine and song and celebration. So much celebration that you deplete the overthrown king's ale and must rummage the castle for more. You soon discover a small strongbox covered with strange, indecipherable writings. You bring it back to your comrades where you discover inside a rusted metal staff on which similar writings are recorded. Convinced it is a powerful magic wand, you become the focus of jokes and chiding. One of your friends playfully touches the staff to your shoulder while scoffing at your belief in magic. Their boisterous laughter is quickly replaced with open-mouthed astonishment as you vanish in a blinding flash of light. You find yourself in a dark, damp and stinking dungeon deep within the bowels of the castle. Armed with nothing more than your good sense and survival skills, you must avoid being killed by the many monsters and pitfalls inhabiting these depths. You must ESCAPE FROM DENNA.

DENNA is a graphic adventure game requiring 32K and Extended Basic. Player picks his character along with strength, agility, physique and alertness. He must maneuver through a multi-tiered dungeon whose play and characteristics are different every game. Player collects items, inventories, checks status and any of 7 other options. Combat with all sorts of monsters. Lots of fun. Cassette $25.95 and disk $28.95. Versions are different.

RIVER CROSSING A Company Commander game module. (Player must have CIC to play.) Involves a host of new functions including Situation Map, new terrain features, minefields, spotters, late arrivals, flamethrowers and renovated operation of direct fire, weapon malfunction, artillery, enemy armor operations, terrain modifiers and a more precise victory objective as player takes on Russian, Japanese or German opponent in any of 12 scenarios including Borisov, New Guinea, Guadalcanal, Pont l'Abbe, Kursk (where you command an armored squad of Panther tanks), Peleliu, Remagen, Sicily and others. $19.00 tape or disk.

OTHER ARK ROYAL GAMES...

Some at reduced prices!

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** Denotes Rainbow Review Month.
* Special: Start your war games collection with this for $10.00.

WRITE FOR FREE CATALOGUE.
Solar Explorer Takes You On A Factual Trip To The Planets

Did you know that the planet Pluto has one moon? Well, when I was younger, I thought I was pretty smart about astronomy, but Pluto’s moon was one fact I missed. Solar Explorer is a new program from Radio Shack that can be used as an introductory course in astronomy. With this program, a person becomes an explorer traveling through the solar system and collecting facts about the planets and Earth’s moon.

Solar Explorer is designed for use with a 32K cassette or a disk system with ECB. The package comes with one cassette and one disk. The manual tells you to back up the disk first thing. A TRS-80 Electronic Book is also required. The Electronic Book plugs into the right joystick port. The software comes with pages that go into the Electronic Book and the user presses points on the pages for his selections and responses.

The first page used is the “Solar System” activity page. Some general facts about the planets and the moon can be obtained using this page. To get more information, you must make an exploratory trip to the planet or the moon. You can do this using the “Launch Control” and “Probe Control” activity pages. You must pick a destination and launch your spaceship to the desired planet or moon. Once there, you must establish an orbit and send down a robot probe.

The probe can collect a lot of data if you do not take too much time. This information includes density, temperatures, number of moons, diameter, gravity, mass and atmosphere. You can even compare the distance a rock could be thrown on the planet as compared to a rock thrown with the same force on Earth. You can get the information if done quickly. You can only stay in orbit for a certain amount of time. You must have enough fuel to return to Earth or you will run out of gas on the way back and float forever in space. You will get a “Low Fuel” warning when it is getting close to time to return to Earth.

The last activity of the program is a review of the information obtained on your space flights. The “Master Data” activity checks your knowledge of the planets or the moon. It awards Solar Credits according to the information you remember.

When I first got the program I thought it would be good for junior high school, but my 12-year-old enjoyed the space flights and he learned some things about astronomy without realizing it. To my greater surprise, my 8-year-old enjoyed the program, too. While my first impression was the program would be good in a school environment, I believe it really belongs in the home (just don’t tell your children that it is an educational program). Radio Shack has brought out some outstanding educational programs and this has to be counted as another one.

My only complaint about the program is it requires the Electronic Book which cost another $19.95. There is more software out that uses the E.B. and if even more programs come out, it may not be such a bad investment to get one. I believe it is utilized very well in conjunction with this software. I can recommend Solar Explorer, but you have to have the Electronic Book to use it.

(Radio Shack stores nationwide, disk and cassette, $19.95, requires 32K ECB and Electronic Book, $19.95)

— Dale Shell

Submitting Material To 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. Generally, 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, The Falsoft Building, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.
Full Character Set Board Gives Precision Lowercase Letters

One of the criticisms of the CoCo since the beginning has been its lack of lowercase letters on the screen. Instead, it shows us letters in inverse video. This can be a problem when one is using a modem or OS-9, and the inverse letters are just not pleasing to the eye. Enter the Full Character Set Board from CoCo Devices to add lowercase and make our screen more aesthetically pleasing.

This add-in PC board gives a new character set to your CoCo so you can have ASCII characters 97-122 as actual lowercase letters with true descenders. As a matter of fact, this board gives a true representation of all 96 characters of the ASCII set. In addition, you get a slashed numeral zero (0) to help tell it from a 'D' or an 'O.' The board also has a place where a switch can be installed to switch between the new character set and the CoCo standard set. Another switch option that can be added lets you switch between inverse and normal video.

The instructions say you can also switch to an inverse set of uppercase letters with software, but then doesn't explain how to do this. I found that you can use POKES to screen memory, starting with ASCII 34 as inverse 'A' to get uppercase inverse letters.

The installation itself was fairly routine. First, you remove your CoCo's case. (Wait until after the 90-day warranty has expired to start working on your CoCo.) After opening the CoCo's case, locate the MC6847 chip and remove it. The instructions say to “Note the location of pin 1,” then put the MC6847 in open socket on the PC board. The instructions again say “Note the position of pin 1.” (I didn't know which was pin 1 on an IC. I looked it up and found that pin 1 is the one next to the small round indentation on the top of the chip.) The MC6847 gets installed in the PC board such that pin 1 faces the same direction in the PC board as it did in the CoCo. Since the board will only fit in your CoCo one way, this is a fairly safe way to install the MC6847 into the PC board.

Perhaps CoCo Devices could revise their instructions to make it easy for someone without knowledge of ICs to install the board. Some pictures or diagrams would be nice.

After this, plug the PC board into the socket left vacant when you took out the MC6847, then just put your CoCo's case back on and turn it on. If you had installed the switches for inverse video or for normal CoCo character sets, you would need to install them on the outside of your CoCo's case before you closed it up.

Once you turn CoCo back on, you have a new character set all ready to go. The characters themselves are beautiful. They are even better looking than some of the other lowercase kits on the market. The slashed zero is also a sight to behold. The lowercase descenders are full and well-shaped.

The real wonder of this product comes when you boot up another DOS besides Disk BASIC. No more inverse this or that under OS-9 to represent characters the CoCo doesn't have. Instead, you have all the special characters so important to OS-9 and C programming on the screen as they actually are.

Seeing and being able to type filenames and commands in lowercase is a treat. The same is true under ADOS, another alternative to Disk BASIC. ADOS will recognize commands in lowercase and uses lowercase in its error messages. Being able to feel at home with the lowercase made ADOS much more useful to me.

Communications over the modem is also enhanced by this product. Many BBSs use lowercase extensively. I was surprised by how much easier my online time went just by not having to see those inverse letters.

Dr. Megabyte prescribes this product very highly to anyone who uses OS-9, programs in C or both. The Doc asks CoCo Devices to rewrite their installation instructions to make them a little clearer. This small problem aside, the Full Character Set Board is a good product at a reasonable price. If you have never had a complaint about your inverse letters, then you may never need this product. However, if you want lowercase letters as well as true representation of special characters for your CoCo, then you should highly consider this product as an addition to your CoCo.

Last year, I installed the Full Character Set Board in my CoCo and found that I was actually able to use lowercase in my disk files. Since then, I've been using lowercase extensively.

(CoCo Devices, P.O. Box 677, Seabrook, TX 77586, $38 plus $2 S/H)

— Mark E. Sunderlin

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TOTHIAN SOFTWARE

TEACHER PAK Four 16K Ext. BASIC programs. Make out grades (with or without weighting), statistical analysis of grades, alphabetize name lists, create seating charts. On tape but works with disk. 80-column printer helpful. $34.95

TEACHER PAK PLUS Like Teacher Pak but includes CoCo Testem described below. $47.95

COCO TESTEM Create multiple choice, completion, short answer, true/false, and matching tests. On tape but works with disk. Requires 32K Extended BASIC and 80-column printer with underline ability like DMP-110, LP-VIII. $19.95

SCHOOL DAYS Hilarious but quite realistic be-a-teacher game. 32K Extended BASIC. $19.95

LISSAJOUS ART Create and print artistic, intricate Lissajous figures. Requires 16K Extended BASIC and dot matrix printer with graphic ability like DMP-110, LP-VIII. $19.95

SOUND GENERATOR Draw sound waves and hear them. Make machine language sounds that can be EXECuted by BASIC. 16K Extended BASIC. $19.95

GRAPHIC PHYSICS Some of the most fascinating concepts in physics. 16K Ext. BASIC. $19.95

COCO-LIFE The classic game of living, growing, reproducing patterns. Printer optional. 16K Extended BASIC. $19.95

All programs sold on tape. Send check or money order (no cash - Pa. residents add 6%) to:

Tothian Software
Box 663
Rimersburg, Pa. 16248

All of these programs carry the Rainbow Seal.

September 1985 THE RAINBOW 205
Fast Food Math: A Catchy Idea With Real Educational Value

Do you like hamburgers, cheeseburgers, french fries and milk shakes? Do you like to eat at McDonald's? Do you like computer programs that make use of real life situations with real life problems? Being a junk food lover myself and the father of a "McDonald-holic," I feel qualified to evaluate this program (hoping I will not gain weight as with real life problems? Being a junk food lover myself student at a time, but it really shines when you have a

Fast Food Math is another program from the Middletown Educational Software Association. This organization is a group of high school students and their teachers who are not only programming but marketing their programs. Fast Food Math is one of eight programs they currently market. This program requires 32K Extended Color BASIC. You can purchase the program on tape or disk, but it will only work with one disk drive. If you have two drives though, don't worry, just don't turn on the second drive.

Fast Food Math is a program designed to aid students in grades two through eight in learning to handle money, both coins and bills. You can use the program with one student at a time, but it really shines when you have a group of students working together pricing hamburgers and milk shakes, keeping track of inventory and handling play money in their transactions.

The manual is very thorough in explaining how to start up and run the program, and in giving prerequisite skills needed to use all the features of the program. Students need to know where the ENTER key is and where the numbers are on the keyboard. They also need to know that when they type in money amounts they should not include the dollar sign ($). After making a backup copy of the program (you are licensed to make two backup copies when you buy the program), you either RUN "MATH" or LOAD "MATH" and then RUN it.

Following the copyright screen and title screen, students have the choice to change any of the original material. This includes the prices on the food and the tax rate. The manual gives a very good description of how to do this but, because of the on-screen instructions, it is also very easy to do if you do not read the manual. Students are then asked if they would like to keep a cash drawer. Here they can use play money to simulate a "real" McDonald's.

After this, they are asked if they would like to keep an inventory. If they know what an inventory is and want to keep it, the number of each food item in stock can be created, after which the computer will keep track of how much of each item is sold. If more of an item is sold than is in stock, a negative inventory count will occur. After the inventory choice, students choose on what level they want to work.

There are four levels in this program: 1) Part Timer, 2) Counter Person, 3) Cashier and 4) Manager. In level one, food items, food prices and total cost are displayed. Students then enter the amount that is received from the customer (this cannot be greater than $20). If the amount is not enough, a new figure is requested. When the amount is enough, the computer will display the correct amount of change due, then there is another screen where the change is calculated. The monetary values from $10 through $.01 are displayed on the left side of the screen and they enter the number of pieces of each type of currency that is needed when the cursor is to the right of that value. If they want to skip a value, just press ENTER. If the amount of change is incorrect, a buzz will sound and they will get another chance; if the amount is correct they will go to the ending screen where there is a choice given to continue or end.

Level two is like level one except students have to subtract the purchase from the amount received to get the amount of change needed. In Level three the order is displayed and they have to add up the total cost of the items purchased in addition to doing the subtracting to find the change. The final level incorporates the increasing difficulty of the preceding levels and, in addition, students have to calculate and add the correct sales tax to the purchase.

Included in the manual are some suggested activities that you could try and some technical notes on running the program. There is also an evaluation form to be sent back to MESA and an order form for their other programs.

As a sixth grade teacher who has a second job working in a retail store, I think this program has tremendous potential. It is nice to have a program that does not monopolize one computer for one student, but is designed to include groups of students or even a whole class. I like this program because students can learn about pricing, making change, sales tax and inventory on a computer — computers are being used to do that very thing, as well as many other things, in the "real world."

Finally, I think the use of a fast-food restaurant like McDonald's is a catchy idea that will hold the attention of students. My 9-year-old enjoyed this program and my 2-year-old just loved it; even though she cannot do math, she thinks McDonald's is the best place on earth.

(MESA, Middletown High School, Valley Road, Middle­town, RI 02840, tape $24, disk $26)

— Thomas E. Nedreberg

Hint...

Telewriter-64 ASCII File Problems

When you try to load ASCII files generated by some other programs into Telewriter-64 (VIP Terminal is one example), the program will often display an OK prompt instead of returning to the editor. This is because Telewriter-64 doesn't recognize the end of file marker. When this happens, key in the following lines:

450 END ENTER
EN=214 ENTER
GOTO 45B ENTER
RUN ENTER

You will then have the ASCII disk I/O menu; press 'E' to return to the editor.

Abbey Strauss
New York, NY
Software Review

Account For Yourself
With Ledger One

By Dan Smith

Being an accountant for the past 10 years and currently the controller of a national nonprofit organization, I have seen numerous computerized accounting systems in operation. It was a pleasant surprise to receive the opportunity to review this software genre for the Color Computer.

Ledger One is a single-entry bookkeeping program that requires a 32K or 64K CoCo with Extended BASIC, one disk drive and a printer. The program is available on either tape or disk, however, data is savable only to disk. Since you cannot change the number of accounts once a file is created, you should consider having more accounts available than you need to facilitate potential expansion in the future. You are then asked the number of income accounts you desire; the difference is automatically calculated to be the number of expense accounts. You then assign each account number with a two-character code and an account title. I found that, contrary to the instructions, a three-character code could be input.

The main menu then comes into view. The bottom section lists the number of income and expense accounts, the total number of transactions available (over 200), the number of transactions used, the available string space and the difference.

The first character of the account number is the expense code and the second character is the income code. To facilitate potential expansion in the future, you are then asked the number of accounts once a file is created, you should consider having more accounts available than you need for future transactions.

To create a new file or load an existing one, just type (YYMMDD), Paid To or Received From, the account number in its name.

I had to run this preloader twice to enter the main program. On the first run, I kept getting an “SN Error in 4.” Upon LISTing this line, I could not detect any errors. Once into the main program of Ledger One, I immediately received another SN Error; this time in Line 510. In LISTing this line, I found the second parenthesis for a PEEK missing. After inserting this character, the program ran with no problem at all.

Ledger One initially lists all the files on the disk directory. To create a new file or load an existing one, just type in its name.

If it is a new file, you must establish the chart of accounts. Up to 50 accounts may be utilized. Since you cannot change the number of accounts once a file is created, you should consider having more accounts available than you need to facilitate potential expansion in the future. You are then asked the number of income accounts you desire; the difference is automatically calculated to be the number of expense accounts. You then assign each account number with a two-character code and an account title. I found that, contrary to the instructions, a three-character code could be input.

The main menu then comes into view. The bottom section lists the number of income and expense accounts, the total number of transactions available (over 200), the number of transactions used, the available string space and the remaining memory. The top section has 11 options which are relatively self-explanatory.

Add Data records the actual transactions by date (YMMDD), Paid To or Received From, the account number and runs the main program of Ledger One. The PCLEAR 0 is necessary because all of the transactions reside in memory until you decide to save them to disk.

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Add Data records the actual transactions by date (YMMDD), Paid To or Received From, the account
distribution and the dollar amount. If the date or Paid To/Received From data is identical for the next transaction, you can just type 'S' to duplicate that data.

Edit Data enables editing any portion of a transaction on a given date.

View Data permits examining the transactions of a specific account or the entire file on the video screen.

Print File is similar to the View Data function except it produces a hard copy and a screen display. The hard copy has a default of 45 transactions per page, but you can vary the actual number.

Data Save saves the data in memory to disk. The program also permits you to make a backup. You should seriously consider saving data often to prevent the loss of the data in memory.

Report (Fin) prints an income and expense statement. Sort by Date sorts all of the transactions by date. Since a file can be expansive, it is recommended to perform sorts frequently to save time in the long run.

Change Accounts permits changing the report's title, the number of income accounts (and automatically refigures the number of expense accounts) and the account titles.

Find/Search is a global search by a key word. For instance, I input "Smith" and eight entries were listed on the screen. These entries not only included transactions with Smith in them, but those with "Goldsmith" and "Locksmith" as well.

Test for Errors is used primarily for detecting errors if you have changed the account codes, account titles or the number of each.

'H' represents Help, which is a brief synopsis of the functions of the program. The manual mentions that this function can be deleted in order to increase transaction capacity by approximately 70 entries. However, it was already deleted from the disk version preventing me from testing its intended function as well as verifying the increased capacity.

All menu items are listed numerically (except Help) and you type in the appropriate number to access that particular function. Not mentioned in the manual is the fact that you can also input the first letter of the function to also access it. For example, 'A' accesses Add Data or 'S' accesses Sort by Date.

To thoroughly test Ledger One, I keyed in all of my personal transactions for the previous two months and tested every option. The program's financial operations performed flawlessly. I compared transactions and summaries with another accounting program I use and found no discrepancies whatsoever.

The problem areas I did experience were minor. For instance, on the Income and Expense Statement, every income amount had a dollar sign in front of it, but there were none for the net income amount. Also, the underscores for the totals were off by one print position.

Another minor point is that there is no error trapping for erroneous dates. I used 999999 as the date for a transaction and it was dutifully accepted.

Even though there are a few rough edges that need to be smoothed out by the author, this is a good bookkeeping program for non-accountants. Ledger One is not a full-blown accounting package, but everything the program intends to do, it does very well. It should be a welcomed addition for clubs and personal use since it does much more than those typical "balance your checkbook" programs, and just imagine your CPA's face the next time you turn in your financial information on an attractive computer printout instead of in the traditional shoe box!

(1-504-774-9236)

One-Liner Contest Winner . . .

This one-liner, which requires a printer, figures straight-time wages and tax deductions. Simply make the printer ready and enter the pay rate, hours worked and the tax rate. (The tax rate should be the sum of all federal, state and local deductions.)

The listing:

```
0 INPUT"PAYRATE";A:INPUT"HOURS";
B:=A*B:PRINT:INPUT"TAX";D:=C*
D:PRINTD:PRINT"PAYRATE"=;A:PRINT
"HOURS"=:B:PRINT"GROSS"=:C:PRINT
"TAX"=;D:PRINT"NET"=;C-D
```

Charles Hager
Colorado Springs, CO

(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.)
256K Becomes A Reality With Thunder RAM

By Dan Downard

"How much RAM do you have in your CoCo?" How many times have you answered that question? What expression would you expect if you answered, "256K!"

It's a reality with Thunder RAM from Spectrum projects and Chris Erving. What makes it different from the 128K upgrade kits? You not only get the RAM chips, but a complete hardware and software package that works. All for a reasonable price, too! The only pitfall is that presently Thunder RAM is only available for 'D', 'E' and 'F' boards due to hardware restrictions. It's possible to use Thunder RAM in an all-tape system, but the software is designed for use with a CoCo with at least one disk drive.

The Hardware

Thunder RAM consists of eight 256K RAM chips and a controller board. Adequate instructions are given regarding installation, but it is our understanding the installation section of the manual has been completely rewritten since our preliminary version was received. The new manual includes a check list instead of a broad description of the hardware installation — a definite improvement.

I have an 'E' board CoCo; it took about 10 minutes to install the Thunder RAM. A few capacitors and a jumper had to be removed. The 6809E is removed from its socket and the Thunder RAM controller board is plugged into the empty socket. The 6809E then plugs into the controller board. The SAM chip has to be removed in order to bend Pin 11 out for one of two clip-on connections to the controller board, then the existing RAM chips are removed and the 256K chips are inserted.

Sound easy? Well, you be the judge. With step-by-step instructions, I wouldn't be afraid to recommend it to an average computer enthusiast. After all, there is no soldering required. To equate this to other hardware projects, it's about the same as doing a 64K upgrade.

The Software

I have seen many other upgrade kits; we even printed one in THE RAINBOW, but, to be quite honest about it, memory is not worth a dime if you don't have adequate software. After all, Disk BASIC can still access only 32K.

What Chris Erving, the developer, has done is put a 2K EPROM on the controller board with built-in software called TDOS. TDOS is enabled by a single line BASIC command: POKE&HFFFF,4:EXEC&HFF00. After this direct command line, you are greeted with the TDOS menu. TDOS has all the software required in a ROM to use the Thunder RAM as a RAM disk and a print spooler. (For those of you who are not familiar with a RAM disk, it is a disk drive that uses RAM chips instead of a floppy. Super fast, to say the least.)

When TDOS is initialized, it defaults to a 160K CoCo disk, a 20K print spooler and, of course, still has 64K available for your "working bank" of RAM.

As previously mentioned, a 20K print spooler is enabled from the TDOS menu. A print spooler is a program that allows a large amount of memory to act as a buffer between your computer and your printer. By using a spooler, you can send data to the printer as a background task, while running another program. A good example would be composing another letter on your word processor while printing the one you just finished.

There is a restriction on the use of the spooler: the Baud rate of your printer must be set on, or above, 1200 Baud. Speeds slower than 1200 Baud make the use of a spooler impractical due to the amount of overhead used to send the individual characters.

The RAM Disk is the real heart of the package. I have two disk drives. Upon power-up of the computer I activate the TDOS ROM, and after initialization of the Thunder RAM as Drive 2, I just use the command BRICK&H01E and everything in Drive 0 is copied to the RAM Disk. With all of my favorite programs on the RAM Disk, I have instant recall of programs. A 32K ML game will load in less than a second.

Even though I didn't try it, I think the real advantage of a RAM Disk is in recall of data, either for databases or for graphics screens. This is where speed is important.

The TDOS ROM actually patches BASIC's DSKCON routine to allow complete compatibility with existing Disk BASIC programs. As far as my CoCo knows, there is a third disk drive online.

All of the TDOS routines are available from BASIC or machine language, with the assumption that the only
This manual contains all of the technical information pertaining to programming with TDOS along with complete source codes for the TDOS routines.

I was particularly interested in the assembly language programming techniques available. The following calls can be made to the extended address space by the use of TDOS vectors:

- `JMP [Y]`
- `JMP [Y, Y]`
- `JMP [A, Y]`
- `JMP [A, Y]`

These commands literally allow a 256K machine language program to be written.

An example of this technique is:

- `LBD #3 Use bank 3`
- `LDR #403C Jump address`
- `JMP [$F030] TDOS vector address`

Ample information is also given on passing variables and graphics information from bank to bank in BASIC.

Other routines are available for loading and saving one, two or four bytes from, or to, one of the three memory banks.

As I have previously stated, I think the Thunder RAM package is great, but there is one drawback. The RAM banks are switched in 64K modules. The TDOS ROM has a control register that is accessed by writing to address $FFFF. The register looks like this:

- `D0 CPU Bank LSB`
- `D1 CPU Bank MSB`
- `D2 TDOS ROM Flag`
- `D3 Video Bank LSB`
- `D4 Video Bank MSB`
- `D5 Not used`
- `D6 32K Page`
- `D7 32K Mode Flag (1=32K)`

Bits D6 and D7 are for software control only. Otherwise, you actually switch the RAM banks by setting bits D0 and D1. This makes the use of 32K bank switching difficult, to say the least. Why worry? Well, I see a great need for more memory in OS-9 systems, and as far as I can tell, 32K banks are necessary for RAM Disk operation with OS-9.

Several common programs using their own DOS will not work with the Thunder RAM, the main example being Telewriter-64. It will still work, but you can’t take advantage of the RAM disk.

I think Thunder RAM is one of the most innovative products for the CoCo to come along lately. Bob Rosen of Spectrum Projects has obtained the agreement of several major software authors to support the system, so the minor problems mentioned above will disappear shortly. I don’t know what I did before without Thunder RAM. Cris Eving is to be congratulated on a job well-done.

(Spectrum Projects, P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, 64K Disk, $119.95 plus $3 S/H)
**Magic Lessons Shows You The Trick Behind Those Tricks**

I'm sure I wouldn't have looked at this package twice if RAINBOW hadn't asked me to review it, but I'm glad they did! I wouldn't have looked because I have a personal aversion to "magical" things. Also, because everyone knows doing magic tricks requires lots of reading to learn how they're done, special equipment and some smooth talk. That seems like a real commitment in time and money.

But Magic Lessons gives you illustrated, step-by-step instructions, the special equipment you need and even a script of suggested patter to get you going. Each disk gives you three different tricks.

The documentation is all on disk. The printed cover sheet just explains start-up. It tells you to RUN "MAGIC". (My CoCo gave me an error message: SN Error at 50, but just type RUN and ENTER and the Merlin Software full-screen logo comes up.)

Merlin Software gets an A+ for customer service. A letter to them generated a prompt long distance phone reply from the owner/programmer, magician Jeff White. The syntax error is apparently caused by that old PCLEAR glitch in the CoCo ROM. The PCLEAR is being moved so no one should have a problem with that.

The logo is followed by a menu where you choose which of the three tricks you want explained. You are taken through each step with easy-to-follow instructions and pictures. The instructions and diagrams are clear and easy to read, even on my TV screen.

After completing all three tricks (no cheating now), the cover sheet says to press number four of the main menu if you have a printer. This prints out a nifty certificate of graduation and a discount coupon for future purchases. Pressing number five will give you a larger version of the graduation certificate for your wall.

Disk number one has lessons one through three which are card tricks. Three envelopes contain the cards you need for each trick. Lessons four through six are coin tricks. Again, everything needed for each trick is neatly packed for you. These are available only on disk right now, but the author tells me tape versions are being worked on.

I'm not selling tickets for my act yet, but I did go from ho-hum to being enthusiastically interested. You might want to give Magic Lessons a try, too.

(Merlin's Software, 11515 Casey Road, Tampa, FL 33624,
Magic Lessons 1-3, disk $19.95, Magic Lessons 4-6, disk $19.95, requires 32K ECB, printer optional.)

— Bob Dooman

**Graphic Physics — An Illustrated Explanation Of Physics Concepts**

*Graphic Physics* is a 16K Extended Color BASIC program allowing the exploration of some concepts in physics. When the program is run you are greeted with a menu with eight options for doppler effects, orbits, superposition of two waves, two-dimensional and three-dimensional Lissajous figures, pitch sounds, relativity and quitting. (If you don't know what a Lissajous figure is, don't worry, all the instructions are in the program and they also explain about Lissajous figures.)

When one of the options one through seven is picked, you are prompted whether or not you wish to receive instructions. In most instances the instructions explain what is going to happen and what is being illustrated. Most of the time the explanations are fairly clear, but I believe the program would be best utilized in a classroom. It provides some good graphics examples and a physics instructor could incorporate this program very well into his lecture.

I can give a brief description of the different options on the menu. The doppler option illustrates how sound waves bunch up in front of an object flying through the air. The orbit option allows you to enter different speeds, altitudes and gravitational accelerations to determine if an object would orbit a planet. Superposition shows what happens when two waves interact. This program gives a tone and you have to tell what frequency it is (it is a multiple-choice question). The relativity option gives examples of how length, mass and time are distorted as something approaches the speed of light. The Lissajous figures are displayed on the screen after you input the initial conditions. I think some of these concepts would have been easier to grasp if I could have had these examples when the concepts were first introduced to me.

*Graphic Physics* came on cassette with a page of sample input values for examples. The program was easily saved to disk and ran fine from disk. Very little documentation came with the cassette, but most of the information is included in the program; just CLOAD the program and experiment!

(Tothian Software, P.O. Box 663, Rimersburg, PA 16248, cassette $19.95)

— Dale Shell

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**See You At RAINBOWfest Princeton October 11-13**
Getting Your 'Back To Basics' With The Spine Align Cushion

Nothing can affect personal productivity worse than an aching back, especially if you spend hours in front of a computer terminal.

There are various remedies available to help alleviate some of the discomfort, as evidenced by the number and variety of products that line the medicine cabinet shelves of back sufferers.

Maybe you’ve resorted to one of those Oriental back massagers — the wooden balls you pull across your back. You’ve probably used an electric vibrator, maybe even one of those special Balans chairs that have become so popular with computer users. Most of us will try just about anything to ease the pain.

That’s why I welcomed the opportunity to review the new Spine Align Cushion which the manufacturer says is “designed to relieve back pain and prevent future back pain.” The cushion is gray, approximately 12-by-12 inches square, two inches thick and is specially contoured to tilt the pelvis forward far enough to straighten your lower back, but not far enough to be uncomfortable.

Now I am one of those persons who either slopes forward or sits back too far while computing, which causes a great many of my problems, no doubt. The Spine Align Cushion, however, forces you into the correct sitting posture. Try any of your old tricks and you will be extremely uncomfortable.

The cushion is not unattractive; if you have a lot of cushions in your family room, it will probably fit right in.

It comes with an attractive brochure that describes in detail how to position the cushion in your chair, along with directions on adjusting the chair for the best fit. Also included are a lot of facts and figures on how back pain affects the work force.

The cushion is quite comfortable, but I never noticed any “overnight” cures after using it for several days. As you know, back pains tend to come and go. I did feel better about my posture, though. And if the Spine Align Cushion helps me to be more aware of the importance of good posture, the investment may well be worth it. Over several months you probably would be able to feel the difference.

(Spine Align, 345 S. McDowell Blvd., Suite 209, Petaluma, CA 94952, $39.95 plus $2.50 S/H)

— Charles Springer
Software Review

Doomsday at 2100 Offers New Challenge For The Adventurer

Adventure games are usually best played on rainy and/or winter days because they are such time burners. Hours fly by as you pit your mental skills against the game (or actually the author of the game), gaining points, finding treasures and occasionally, when the forces of evil gain the upper hand, dying in the process. Fortunately, you are given the opportunity to instantly reincarnate and try again, hopefully gaining from your mistakes.

My first exposure to an Adventure game was a kid's Adventure found in Chromasette electronic magazine called Old House. Since it was written in BASIC to be used on 16K CoCos, it was a relatively simple kids' Adventure game. You went from room to room looking for things: keys, boxes, closets, etc., which would allow you to get to the treasure and escape the house alive. Although I'm not a kid, it was fun and I was hooked.

Evidently a lot of you are also hooked, as there is sufficient demand to create an expanded offering of not only more difficult Adventures, but Adventures with more features to make the game more enjoyable.

Disk graphics Adventures were released to graphically and colorfully show your present situation on the screen instead of using just text. These graphics Adventures later evolved to allow non-disk users to also have Hi-Res colorful Adventures.

Talking Adventures were introduced which allowed the characters in the Adventures to give you messages or warnings as the games progressed. Programs were even introduced which allowed the non-programmer to "write" Adventures for their friends or for sale using familiar places and objects. One such home-brewed Adventure, Murder at Longmont High, has kept many a student busy in the computer lab trying to figure a way out of the school while they discover their teachers dispatched to their final rewards.

Unfortunately, this Adventure does not use all of the capabilities of the Color Computer. No graphics, no sound, no speech, and for me, not too much fun.

Pal Creations has released an Adventure program to satisfy the hunger of Adventurists for new challenges to master. Called Doomsday at 2100, this one is a toughie—not for the beginner.

The premise of this Adventure is that you are a spy with a vital mission. There is a "Middle East Madman" who has developed a germ that, when exposed to the skin, will kill in seconds. He plans to launch a missile carrying that germ at 2100 hours. Scientists have determined that it will take only five days for the world to be wiped out. Your mission: Destroy the missile before 2100 hours. In order to be successful, one has to infiltrate the missile complex, decipher a cryptic message, gain access to high security areas, work with explosives and make your escape.

You went from room to room looking for things: keys, game, boxes, closets, etc., which would allow you to get to the treasure and escape the house alive. Although I'm not a kid, it was fun and I was hooked.

The listing:

```plaintext
{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.}

Dave Clouse
Temperance, MI
```

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Q.D.S. A/B-4 Is An Outstanding Disk Drive System

Quattro Data Systems brings an outstanding 5½-inch disk drive system into the Color Computer market. The system consists of a Hard Drive Specialist (HDS) floppy drive controller and two double-sided, double-density Remex RFD480 disk drives. If you are a tape user planning to upgrade to disk, then you should definitely look at this system.

Among the HDS controller’s high quality features are gold-plated edge connectors, absence of potentiometers and dual selectable ROM sockets. The gold edge connectors reduce I/O errors common to boards that are not gold-plated. The absence of pots eliminates the need for user adjustments of the controller. The dual selectable ROM sockets are perhaps the best advantage of this board. You can have a standard Radio Shack ROM in one socket for 100 percent software compatibility and a customized ROM in the other for enhanced operating systems (supporting six ms track-to-track disk speed, for example).

Most enhanced DOSs have a compatibility problem with software written using undocumented Radio Shack disk ROM calls. This board eliminates that problem, because you can now have two ROMs in one controller. There is no external jumper (switch) to select a ROM. However, there is an internal jumper to select which ROM you want. This is for the users who use only one ROM. This also eliminates the possible damage to your computer by accidentally hitting the switch.

If you do not wish to have to open the controller, you can install an external SPDT (single-pull double-throw) switch in about four minutes. Just make sure you only switch ROMs when the computer is off and that you mount the switch on the controller in a place where it cannot be accidentally switched. I liked this controller so much that I purchased one at the RAIN-BOWfest in Chicago and installed my own switch. This controller also comes a 120 day warranty from HDS.

The dual Remex RFD480s are high quality drives. They are double-sided, double-density 40-track drives. They can also run at up to five ms track-to-track disk speed. The feature that makes this particular system so outstanding is not the drives themselves, but the special circuit Quattro Data Systems has installed on the drive board. This circuit intercepts the drive select signal from the controller and changes it so the double-sided drives act like four separate single-sided drives. In other words, the left side drive operates as both Drive 0 and 1, while the right side drive operates as both Drive 2 and 3.

This happens no matter what disk ROM you have in the controller which means you don’t have to have a DOS that supports double-sided drives in order to use both sides of the drive. You could have plain Radio Shack DCB 1.1 ROM and still access both sides. Quattro Data Systems warrants the drives for a period of 90 days after purchase.

People who already own disk systems and want two disk ROMs may wish to purchase the HDS controller. People who are planning to upgrade to disk may want to look at the entire package, because they can access both sides of the double-sided drive and still have software compatibility.

Quattro Data Systems also has a trade-in plan for people who have single-sided drives and wish to upgrade to double-sided systems. They have telephone hours for people who work during the day. If you have any questions or would like more information about the system, please call (512) 331-7940 after 8 p.m. Eastern time, 7 p.m. Central time.

I was very impressed by the quality of the system and would recommend it to anyone interested in buying a controller, a pair of disk drives or a complete system. I ran this system for about four months and did not experience any problem with either the controller or the drives. I installed a second ROM in the controller and the drives operated fine, and the matter of no external switch is an easy matter to fix if you so prefer.

(Quattro Data Systems, P.O. Box 180071, Austin, TX 78718-0071, $120 for controller, $375 for dual drives)

— John Curl
Software Review

Dudul Makes Graphics Doodling 'State Of The Art'

In today's software market there is an abundance of graphics drawing programs available. Dudul, by Doug Dugan, is one of the newest entries in the field, and although it is similar in many respects to the others, it has definite characteristics that make it stand out as a very well-done, state of the art program.

Dudul is written in Extended BASIC with machine language subroutines, requires a 64K CoCo equipped with a cassette and/or disk and one joystick or mouse. The program is shipped on cassette but will load itself to disk if available. It contains complete I/O routines for both cassette and disk, and the only limitation I found was that it was not JDOS compatible. Last, but by no means least, Dudul comes with one of the nicest, most clearly written, illustrated, 44-page user guides I have ever seen.

Dudul, as suggested by its name, is a graphics doodling program. This means that while you can create some pretty sophisticated drawings, they will tend to be less detailed and more coarse, overall, than a drawing created by a program such as Graphicom or CoCo Max. This, I must point out, is not a problem or limitation; it is just the approach Mr. Dugan has chosen to follow. This results in a relatively easy-to-use, but extremely powerful program for CoCo owners of all ages with or without any inherent artistic skills.

Dudul follows the current state of the art conventions by using icons, drop down menus and a point and click method for all its options. If you are unfamiliar with these terms, an icon is a small drawing used to visually represent a program option. Drop down menus consist of a more detailed list of options that appear, temporarily, over your drawing in response to choosing one of the main menu options. And finally, point and click refers to moving the cursor, a small arrow, to the option desired and pressing the joystick or mouse firebutton to make your choice.

The keyboard is used only in the TEXT option, which I will cover later. To better visualize all of this, you might examine the advertisements in this issue of RAINBOW for similar programs.

All drawing is done in PMODE 3 in either Color Set 0 (green, yellow, blue and red) or Color Set 1 (buff, cyan, magenta and orange). The various drawing options include lines, boxes, circles and parallelograms, each with its own particular characteristics. You can also paint in solid colors as well as any kind of pattern you can possibly dream up.

The 64K requirement is to allow you to save a copy of your current drawing to the upper 32K, restore it to your work area, or exchange the saved copy with your working drawing. It also provides the means of implementing an UNDO option to restore your drawing should you make a mistake. This allows for a lot of experimental drawing without fear of destroying your creation.

To give you an idea of the depth of this program and its many options, I'll describe the LINE option in more detail. Once you select the option, you are greeted with a drop down menu containing six additional options associated with line drawing. The basic line option allows you to pick a spot on the screen for one end of the line, move the arrow to another spot and press the firebutton to draw the line.

If it's not quite what you had in mind, simply move the arrow over a bit and press the button again. This erases the first line and draws a new line. In fact, by holding the joystick button down, you can achieve "rubber band graphics." Within this and other options you can choose the "reset mode," which allows you to draw multiple lines without returning to the menu each time to reselect the option.

Other line options include drawing several lines from a single point, drawing V-shaped lines, creating many parallel lines and just plain scribbling. In many cases the options may be combined to create even more unusual effects.

In addition to this, the TEXT option allows you to label your graphics with uppercase letters, numbers and a few special characters. Each of the other main options, such as parallelograms, have similar, expanded secondary options.

The paint option allows you to paint in solid colors and also create your own patterns. You are given a 5-by-5 square in which to create the basis of your pattern. Each of the 25 points may then be set to a different color. Furthermore, you may elect to have the pattern painted in any one of five different sizes. Believe me, the effects are quite amazing.

A few final comments are in order before I end this review. First, although no screen dumps to printer are included in the program, detailed information on interfacing such a program is provided. Also, Dudul uses a file condensing technique to conserve space in memory, on cassette and on disk. While this is a good idea, it does present a problem in accessing Dudul creations by programs other than Dudul.

Mr. Dugan has also provided program listings in the manual for displaying all the pictures stored on a cassette or disk. While the listings are very nice, especially for a programmer, I would have liked to have the programs included on the cassette with the Dudul program.

In conclusion, with the care that obviously went into the creation of this well-done program and its remarkable user guide, it would be difficult to find any reason not to recommend it, especially to the casual artist or person who likes to "doodle."

(Doug Dugan, 4514 Wichita, St. Louis, MO 63310, cassette $22 plus $2 S/H)

— Ken Boyle

Hint . . .

Formatting Diskettes

Some CoCo users have reported problems with formatting more than one disk in succession. The CoCo uses a technique called "write precompensation" on the more critical inner tracks of a disk; for some reason, Disk BASIC doesn't turn off the feature after a DSKINT is completed. If you need to format more than one disk at a time, enter DIOKE 113,0 and press the Reset button after each disk.

September 1985 THE RAINBOW 215
Software Review

**Battle for Tunis: Perfect For The War Game Beginner**

If you have never war-gamed, I would suggest *Battle for Tunis* as your first venture into this game genre. However, if you have any aspirations to design your own games some day, take *Battle for Tunis* home and study it!

The program includes a "help" screen of command summaries. It includes an ability to ask for "Close Air Support." It loads rapidly and runs with no problems in both disk and cassette systems. In an unusual move for a 32K war game, it has no game save feature. That is an advantage to the war game newcomer. *Battle for Tunis* plays fully in an hour or less and thus is a good introduction to the sport. (More complex war games often exceed eight hours in length.)

However, to a war gamer, *Battle for Tunis* is contradictory. It appears to be the war gamer's favorite attributes, including accuracy, fidelity, instructional ability and authenticity, and it combines all these with some computer tricks that should give the hacker an excuse to buy it even if he never plays games. The first time I played it, I was impressed with the slick tricks, but I was bored silly; it seemed to lack challenge. Later, I would revise that assessment.

By the third time I had played it, I noticed my CoCo was consistent in beating me, and that a listing of the combat units on both sides (called an "Order of Battle List") showed me to have a ground combat strength advantage of over 15 percent. As the CoCo lacked air support but I had the Luftwaffe, I should outgun him by about 30 percent, at least. Two days later when I finally won, I had learned quite a lot about the battle for Tunis in 1943.

In this game, you are Rommel and the CoCo is Patton, unless, of course, you can find another human player. In that case, the CoCo allows you two choices. That trick alone is worth the price; relatively few computer war games allow two opposing human players.

The game is played with the ground combat units which took part in the 1943 battle in North Africa, and your screen is a semi-graphics terrain map of northern Tunisia. Actually, it is two such maps. *Battle for Tunis* is unique among games of this type in being able to teach the difference between "strategy" and "tactics" very clearly.

One map covers the entire country with minimal terrain features and each unit only a pinhead of color — the color denoting nationality. This map is excellent in showing you where the main enemy thrust might come and what parts of your army need reinforcement. The other map provides more terrain and unit detail, providing both the playing board and the local tactical situation. You will find that your strategic and tactical objectives are frequently different; swapping from one map to the other takes one keystroke and is something you will do often.

Another excellent feature is two separate Intelligence Reports. One provides only your own Order of Battle for all your forces; the other provides Order of Battle information on units of both sides, but only over a limited area. Just finding out why these two reports are available and how to use them took me some time. An explanation would require 300 to 400 words, and still would not do the subject as much justice as getting clobbered by your CoCo would. The answer is related to the conflict of strategy and tactics already mentioned.

The instructions, while very brief, are more adequate than most war game instructions. To round out the list of nice touches in *Battle for Tunis*, it even blows a bugle call to announce certain victories.

(Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, requires 32K, tape $24.95, disk $27.95)

— H. Larry Elman

**One-Liner Contest Winner . . .**

This one-liner deals with one of the major problems of life — mowing the lawn.

The listing:

```
2 PMODE2: DRAW"D3@R5U3@L5D15L2@U7
D14": DIMV(28,34), W(28,34): GET(10,7,95)-(135,128), V,G: GET(10,10)-(38,44), W,G: SCREEN1,: LINE(10,10)-(256,192), PSET, BF: FONR=1T07: FORX=1T023: PUT(A,B)-(-A+28, B+34), V, PSE
T: PUT(A,B)-(-A+28, B+34), W, PSET= A+10: NEXT: A=0: B=B+30: NEXT
```

Jobe Allen
Stinnett, TX

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.)
232 RemotePlus Adds A Big Plus To Your Communications System

232 RemotePlus by EDC Industries is designed as a multi-purpose host communications tool. It may be utilized as a stand-alone host routine or operated as a terminal driver for a BBS system. The bulletin board software may be written in either BASIC or machine language. 232 RemotePlus operates efficiently in either mode.

Additional hardware is recommended for the operation of this program. The user needs to purchase some type of expansion hardware for the option port on the computer. Also, a 64K computer with Extended BASIC is necessary.

232 RemotePlus has incorporated many features that make this a very desirable program for communications. Error trapping is very functional and is useful for system testing and debugging. System timeout is also a nice feature. This allows for system hang-up if the line does not have any activity for two minutes. This time period is user definable and may be changed. 232 RemotePlus contains an on-board routine for a mini-terminal program, plus a conversational mode for speaking to system users.

Some of the more specific command include:

ETRAP — Primary error trapping command
Clock Commands — Controls software system clock
PRIV ON — Disables timeouts
CONV — Turns on conservational mode
TERM — Controls mini-terminal mode

I found 232 RemotePlus to operate efficiently and error free. The user guide contains many development hints and tips to use this program as a bulletin board program. The user guide did not contain any loading instructions for the program. I assume this was an oversight and will be corrected in future editions. 232 RemotePlus receives a big plus from me.

(EDC Industries, P.O. Box 42718, Los Angeles, CA 90050, $24.95 plus $2.50 S/H)

—— Rick Cobello

One-Liner Contest Winner . . .

Just as the baseball season is heating up, here’s a one-liner that plays the song “Take Me Out to the Ball Game.”

The listing:

1 CLS: PRINT@235, "BASEBALL!": PLAY"T03C04C03AGEL2GL3DL4C04C03AGEL2GL4AA-AEFGL5AL4FL2DL4AA-ABO4C0D3BAGEDV2FC04C03AGFL2GL4DCDEFGL2

AL4AB04V25CCC03BAGG-GL2AB04C"

Joel Lombardi
Newark, DE

(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.)

Super Voice Really Is Super Sounding

By Bruce Rothermel

When my Color Computer was very young, its vocabulary consisted only of “boops” and “beeps” generated by using the BASIC SOUND commands. Later, upon learning the intricacies of the PLAY command, it would occasionally play a song.

As it grew up, its first words were spoken using an SC-01 Votrax Speech Pak. Now it can talk and even sing, because it has obtained one of the new Speech Systems Super Voice speech paks which uses the new “third generation” SSI-263 Phonetic Speech Synthesizer.

For those of you who haven’t been reading the ads and reviews in THE RAINBOW, yes, your Color Computer can talk! Using a speech synthesizer chip contained in a ROM pack, working in conjunction with a text-to-speech conversion software program, your computer can talk through the television speaker.

What the computer says is controlled either by direct keyboard input or by data embedded in a BASIC or machine language program. Examples of how to easily make your computer talk are given in the well-detailed, 24-page user’s guide.

This process has been simplified by the addition of the word “SAY” to the computer’s BASIC vocabulary. 10 SAY HELLO , HOW ARE YOU is a valid BASIC statement which results in the computer enunciating, “Hello (pause) how are you?” It’s that easy to add speech to a BASIC program. A more complex, but versatile way is to use the USR command. Using USR, you can have the computer speak a variable contained in a program.

To get your computer talking for the first time, a BASIC program, SPEAK, included with the voice pak, is run. This automatically loads the text-to-speech processor along with a dictionary which is a powerful part of the speech algorithm.

Your first experiments with speech will be using the keyboard direct input mode. Here you type in a word or phrase, hit ENTER and listen to what your computer has to say. You can spend many an hour in this mode trying to see how accurate its pronunciation is.

Other options include:

Direct speech with phonemes printed — After the phrase is spoken, the phonemes that were used for pronunciation are displayed on the screen or printer. Phonemes are the little chunks of sound which we and the computer actually use when we speak. When we say the word “time,” our gray matter churns for a few nanoseconds and the word “time” rolls out. When the computer says time, what it is saying is T,AHI,EH,Y,M. These are the phonemes which create the word time. All you do is type the word and it says it using the rules of pronunciation in the text-to-speech converter. You have the opportunity to try different spellings to get a better pronunciation. You can then add the correct pronunciation to the dictionary. More about this later.
Build text from the keyboard — Allows you to save long messages on disk or tape for later recall and pronounciation.

Speak text from a file — Recites back the text previously created.

Screen Echo — In this mode, each alphanumeric character that is printed on the screen can also be spoken. This allows sight-impaired persons to hear the keyboard as they are using the computer. Also in this mode, any program that prints to the screen can now talk (e.g., Adventures, databases, check balancing, etc.).

The program recognizes special characters and numbers. For example, if you put a `$` in front of a numerical string, it assumes you are talking about money; $123.45 will be spoken as “one hundred twenty-three dollars forty-five cents.” In larger numbers, it recognizes and speaks out the trillions, billions, millions, thousands, hundreds, etc., contained in numbers as large as 999,999,999,999,999.999. For educational math program applications, 100 * 3 = 300 will be spoken out as “one hundred times three equals three hundred.”

The new SSI-263 chip, again combined with a speech-to-text processor, does everything the old SC-01 voice pak does and allows even more control over your computer’s articulation. The differences between the SC-01 and the Super Voice are easy to hear, but difficult to explain. With the SC-01, you had four inflection levels which changed immediately when an embedded command was “read” by the translation program. With the SSI-263, there are 4,096 pitch variations (32 levels with eight inflection speeds). You have the capabilities of using these pitch variations to make the computer voice sound more natural.

The ultimate demonstration of these pitch capabilities is having the computer sing. A demo file with Super Voice singing “The Star-Spangled Banner” is included.

The good news is the additional articulation capabilities of the SSI-263. The great news is that Super Voice is compatible with all the programs which have been written for the older SC-01 Votrax Paks and there are quite a few excellent programs: talking Adventures, educational math and spelling programs for kids, even talking smart terminal programs.

Frank De Largy, who wrote the original text-to-speech TRANSLATE program for the SC-01, has also written the program for Super Voice. Actually, two text-to-speech programs are included. TRANSLATE allows you to use the older programs written for the SC-01s. SUPERTOK allows you to use the full capabilities of the new speech synthesizer.

Some of the credit for the words being spoken so clearly must go to the dictionary file. The dictionary has a list of words which do not follow the rules of ordinary pronunciation. Before translating the text-to-speech using the defaults, the dictionary is scanned. If the word is in the exception dictionary, the pronunciation in the dictionary overrides the defaults. The word “one” would be pronounced as “une” if it were not in the dictionary. The completeness of this dictionary is amazing; however, to meet your specific needs, words can be added to the dictionary.

Frank has done some work on TRANSLATE since its original release. The default pronunciations now work very nicely on many of the words, where I had to correct the phonemes before. One particularly nice change is the pronunciation of my daughter’s name, Bonnie. Instead of “Bone-E,” it actually says “Bonnie.”

While it is impossible to describe the tonal quality of the computer’s speech, the older SC-01, to my ears, sounds like a Swedish immigrant who has lived in New York for the last 10 years. I refer to my older computer voice as “Sven.” The newer SSI-263 has much more of an electronic twang. If you’ve seen a rerun of the old Battlestar Galactica series, the voice is reminiscent of the Cylon mechanical bad guys who are always trying to vaporize Lorne Greene and his band of too beautiful people. Both speech paks are very understandable, just different sounding.

If you haven’t heard a CoCo talk, attend a RAINBOWfest for a demonstration — but bring money because once you see and hear what a voice pak can add to the capabilities of your Color Computer, you won’t leave without one.

(Speech Systems, 38W255 Deepth Road, Batavia, IL 60510, requires 32K minimum, $79.95)
CoCo's Best & Fastest Spreadsheet System

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- Two-way communications with PRO-COLOR-FILE ★ Enhanced ★
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- Summation, Mean, and Standard Deviation Functions
- Logical Functions with String & Numeric Comparison
- String locate command to navigate large worksheets
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Price US$99.95
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PRO-COLOR-FILE is a trademark of Derringer Software
Telewriter-64 is a trademark of Cognitec
VisiCalc is a trademark of VisiCorp.
The Ultimate Color Computer Reference Guide and ToolKit: The Ultimate CoCo Reference

Book Review

The Ultimate Color Computer Reference Guide and ToolKit — that’s one long title for a very useful compilation of BASIC program development information on the CoCo. This packaging of information is put together in a 395-page manual. The manual is broken down into five sections: “BASIC Command Reference,” “Program Optimization Techniques,” “BASIC Subroutines,” “Machine Language Subroutines” and “Reference Tables.” A companion to this is The Software Kit for the Ultimate Color Computer Reference Guide and Toolkit. This is a tape or diskette which contains all of the subroutines listed in the manual.

The “BASIC Command Reference” section (206 pages) is a comprehensive reference to all the commands and functions in Color BASIC, Extended Color BASIC and Disk BASIC. The reference manual is not designed to teach BASIC, but as a tool to make it easier to use BASIC.

Each command and function is described with six topics: syntax, purpose, arguments, potential errors, examples and notes/suggestions. The command syntax shows the format of the command, which arguments are required and which are optional. The purpose section describes what the command will do. The arguments section defines each argument of the command. This includes the type of argument, variable, constant, etc., the range of the argument and whether it is required or optional. The topic on potential errors is just that: a short description of possible errors that may be encountered when using the command. The examples section gives several examples of the use of the command. The section on notes/suggestions gives some useful hints on how to use the command.

The next section is “Program Optimization Techniques.” This section explains several methods you can use to make your BASIC programs run faster and use less memory. Some of the techniques which are covered include subroutines and subroutine placement, use of machine language subroutines, multiple statement lines and variable placement. This section is very useful for anyone who is concerned about the performance of their BASIC programs.

The third section, “BASIC Subroutines,” contains 29 general purpose BASIC subroutines. There is a complete explanation and listing for each of the subroutines. The explanation describes what the routine does, the required input variables and the output variables. There are subroutines to disable the BREAK key, change the printer Baud rate, input the joystick values, do double PEEKs and POKEs, input a line of data and many other useful functions.

The section on “Machine Language Subroutines” contains 13 programs which include a timer function, a clock routine and a search routine. The description of each subroutine is the same as in the BASIC subroutine section.

The section on “Reference Tables” has tables for BASIC key words by function, BASIC error codes and their meaning, and several other useful tables.

The Software Kit, besides containing the BASIC and machine language subroutines, contains several useful utilities. There are utilities to count the occurrences of variables, produce a cross reference of variables, remove comments and produce formatted listings of BASIC programs.

The only problem I found was with a BASIC subroutine to display a number on the high resolution screen. I could not get it to work, even using the example in the manual.

The BASIC and machine language subroutines can be used with Color BASIC, Extended Color BASIC or Disk BASIC and a tape system as well as a disk system. You need to have at least 16K of memory.

I found the “BASIC Command Reference” section extremely useful as a quick guide to BASIC. The subroutines included with the toolkit are practical, useful and timesaving when developing BASIC programs. I would recommend this product to anyone who is serious about writing BASIC programs.
MORE KEYS Gives Your Keyboard Added Convenience

One of the features missing on CoCo is a numeric keypad allowing rapid entry of numbers with electronic spreadsheet programs. If you've been in the CoCo Community for a while, you know you just have to wait a couple of months for someone to supply the innovation you've been needing.

Such is the case with MORE KEYS, a numeric keypad manufactured by Moreton Bay Software with 15 keys that plugs inside your CoCo, giving you the convenience of far more expensive computers.

The additional keys are gray on black, matching perfectly the colors of existing keyboards on the older and newer computers. The keys are raised, giving you the feel of the newer CoCo 2 keyboard. The device also aligns nicely with the slope of the keyboard so it fits right in with the decor of your workstation.

I found installation of MORE KEYS to be fairly easy, requiring less than 20 minutes for the average do-it-yourselfer. It comes with a two-page set of instructions, complete with illustrations for the 'D,' 'E,' 'F' and CoCo 2 boards.

I own a TDP 100 which uses the 'F' board. In my case, I was instructed to remove the PIA chip which is labeled U17 on the board, making location simple. I added the socket pins from the MORE KEYS connection into that location, then inserted the PIA chip pins on top of the new element, replaced the computer cover to its rightful place and I was in business.

The keys on MORE KEYS are located in the same positions as they are on standard numeric keypads, so I had little difficulty in using them with spreadsheet programs featured in past issues of THE RAINBOW. Even if you're a fairly proficient typist, you know how tedious it is to enter numbers from the regular positions on CoCo's keyboard.

I have no reservations about recommending MORE KEYS for CoCo users who need a good numeric keypad to help improve business productivity.

(Moreton Bay Software, 316 Castillo Street, Santa Barbara, CA 93101, $69.95)

— Charles Springer

Learn Valuable 'Teaching' Lessons With School Days

A student draws a switch-blade the superintendent drops in unexpectedly Johnny asks to go to the bathroom for the fourth period in a row.

Who said teaching would be easy? From the dramatic to the annoying, such incidents are the daily fare of the classroom teacher. You can test your coping skills by playing School Days by Tothian Software. You (and up to five other players) must start out as a student teacher and try to advance by becoming first a "regular teacher," then a "master teacher." You win the game by being promoted to "administrator."

In each turn, you must cope with a realistic school incident by selecting one of three suggested actions. Each decision has three consequences: your peace of mind or "tranquility rating," your standing with the school administration and your impact and relationship with students will either increase or decrease.

Occasionally, your day is further disrupted with unexpected visits by the principal, the superintendent and members of the school board. As in real life, the consequences of decisions made in the presence of these notaries are multiplied many times over!

This is a simple game, simply done with enough sound effects and variety of text presentations to add interest. The documentation is brief but adequate; the on-screen instructions are all that is required.

The play value comes from the realism of the concept. Many of the situations in School Days have actually happened to me — and most likely to every teacher reading this review. Since the situations, responses and consequence values are stored in DATA statements, it is easy to add or alter from your own experience and expand or modify the game.

I did not always agree with the given solutions, but they are common teacher responses. What I disliked was that an action which is best for students (in the game) is worst for your tranquility rating. I felt this was unrealistic because knowing I've helped a student usually makes me feel good. However, teaching is a high-stress profession and the game accurately reflects this.

The game may even have some value in training student teachers. Certainly non-teachers who played it took significantly longer to progress through the game than did teachers. (The game is best played by one or two; more than this takes a long time.)

School Days will be a genuine hit at your next faculty meeting. It would be a good public relations move at a P.T.A. meeting. Play it with your spouse or close friends so they can better understand the demands of your job, but whatever you do, don't show it to your students — there are too many ideas for pranks to pull on the teacher!

(Tothian Software, P.O. Box 663, Rimersburg, PA 16248, 32K ECB required, cassette $19.95)

— T. Gray

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WARP FACTOR X
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WARP FACTOR X was written by an engineer for the Kennedy Space Center and has been three years in the making. You will appreciate the attention to detail and complex inner workings of the program. The program is supported by eight pages of documentation important to the success of your mission. Your progress through the eighteen sectors of the galaxy will be recorded and saved for your next adventure into space.

WARP FACTOR X includes versions for 32K, 64K, and COCO 2. It requires one disk drive and comes packaged in a vinyl library case. $34.95

PRICKLY-PEAR MAILLIST
You won’t find a mailing list program anywhere that will out-perform our new PRICKLY-PEAR MAILLIST. It is a dedicated data base, to be used for mailing lists and/or labels. This program has seven fields for name, option, address, city and state, zip code and code. With the fastest sort around you will be able to sort alphabetically by last name (even if you type first name first). MAILLIST will sort 500 files in about 6 minutes on a one disk drive or 1000 files in about 25 minutes on two disk drives. Sort by zip code. Search on any field. Add, delete or edit entries. Choose the fields you want to print. Print any entry — or all entries — or all entries meeting your search criteria. Print your labels either one or two across the page. You can even print a phone number list. Put up to 1200 records on a disk. All screen display is in full upper and lowercase with no adaptors needed. We have even included tape to disk and disk to tape options to help you protect those important files. The documentation will answer your every question and even help you customize MAILLIST to fit your special needs. It is truly a “user friendly” program. Requires 32K and one disk drive. $29.95

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CORRECTIONS

“Animatic: Automatic Animation” (June 1985, Page 58): There has been some confusion about the Rocket and Promenade programs. These programs (and any other BASIC programs that use the new ANIM command) should always be saved in ASCII; for example, you can use the command CSAVE "ROCKET", A.

If you have saved programs in normal BASIC format (or are using the Rocket and Promenade files from the June 1985 Rainbow on Tape), load the program, save it in ASCII and use the ASCII copy from now on.

Rita Sabo also tells us that a bug in the main program has been called to her attention. If you typed the Animatic program (Listing 4) in by hand, insert a new Line 1551 as follows and reassemble the program.

1551  JSR $A976

If you don’t have the source code on tape or disk, BASIC programs can be patched by inserting an EXEC $A976 in a part of the program that comes before any ANIM programs. These programs (and any other BASIC programs that use the new ANIM command) should always be saved in ASCII; for example, you can use the command CSAVE "ROCKET", A.

1 510  IF FL=1 THEN EXEC $A976: GOTO 40

There has been some confusion about the ';' character. I suggest to your readers to do a GO SUB 6080.

If you typed the program in Listing 2, insert this line:

510  IF FL=1 THEN EXEC $A976: GOTO 40

“Cardio” (April 1985, Page 58): Rene St. Jacques informs us that he has been getting reports of an FC Error occurring in Line 5010. He passes along the following description to explain how that portion of the program works:

“Once you have determined the string of characters for each letter in a dimensioned array and that you are in graphics mode, you have to place the word to be drawn in ASCII and the position, scale and color of the word in OP$. Then the subroutine in Line 5000 will add together the strings of characters for each letter of the word and will draw them. For example, the first three instructions in Line 140 serve to draw the word “CARDIO” at the position X=8, Y=40 at the scale of 14 (see the DRAW instruction). I suggest to your readers to do a TRON test to see where the error comes from and I suggest to them to be especially careful about the ‘;’ character.”

Rene also tells us there are two errors in Line 1070. First, the word GOTO should be changed to GOTO, and the last command in the line should be GOSUB 6110 instead of GOSUB 6060. He also says that Line 1220 can be omitted.

One-Liner Contest Winner . . .

Typerite turns the CoCo into an electronic typewriter. Here are the commands:

| m ENTER | --- Reset margin and tab values |
| t ENTER | --- Tab next line |
| c ENTER | --- Center next line |
| ENTER | --- Prints the line (When pressed by itself, it spaces down one line.) |
| SHIFT | --- Shifts for capital letters and punctuation |
| Left arrow | --- Backspaces and erases a character |
| SHIFT Left arrow | --- Erases entire line |

The listing:

```basic
1551  JSR $A976
```

One-Liner Contest Winner . . .

Stan Osterbauer
Sequim, WA

(For this winning one-liner contest entry, the author has been sent copies of both The Rainbow Book of Adventures and its companion Rainbow Adventures Tape.)
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Federal Hill Software 8134 Scotts Level Rd. Baltimore, Md. 21208
If you're someone who uses the public library a lot and if you're often intimidated and/or annoyed by that cumbersome card catalog, **Bookmark** is just the program you've been waiting for.

The library card catalog is fine if no one is using the drawer you need or if you have a specific title or author in mind. But what if you just might like to browse through American fiction, astronomy or European history? In many libraries, just trying to locate the fiction or astronomy shelf can really wear you out, but no more — thanks to **Bookmark**.

(Robert Mauro, whose company, CompuRAM, sells games and educational programs for the CoCo, is a free-lance writer. Among other projects, he edits newsletters for the Long Island Center for Independent Living and the Association for Better Conditions for the Disabled — all on the Color Computer.)

Fortunately, public libraries all over the world use a single standardized mathematical cataloging system invented by, no, not John Dewey, the well-known American educator and philosopher, but Melvil Dewey, the lesser-known American librarian who invented the Dewey Decimal System back in 1876. Thanks, Mel!

Thanks to his “system of 10s,” I have been able to create the following helpful computer program to pinpoint exactly where, for example, that American fiction or astronomy shelf is. **Bookmark** even gives a printout of two Dewey Decimal numbers to look between for the book you want.

No more will you have to wait to have your library computerized or for that Ph.D. research fellow looking up 20 or 30 volumes to give back the very card catalog drawer you need. Type in **Bookmark** and enjoy your local library once again!

Following is the program breakdown:

<table>
<thead>
<tr>
<th>Line Number</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>20-150</td>
<td>Draws colorful billboard</td>
</tr>
<tr>
<td>150-310</td>
<td>Explains <strong>Bookmark</strong></td>
</tr>
<tr>
<td>320-540</td>
<td>Selects general categories and sets up first Dewey decimal</td>
</tr>
<tr>
<td>550-1830</td>
<td>Lets you choose specific area of interest</td>
</tr>
<tr>
<td>1840-1930</td>
<td>Sets up last Dewey decimals and asks if you want a printout</td>
</tr>
<tr>
<td>1940-2060</td>
<td>Displays two Dewey decimal numbers on screen to look between and gives you a printout if so desired</td>
</tr>
</tbody>
</table>

(For any questions regarding this program, Robert may be reached at 257 Center Lane, Levittown, NY 11756. Please include a SASE.)

September 1985 THE RAINBOW 227
The listing: BOOKMARK

1 REM BOOKMARK (C) Robert Mauro
, 257 Center Lane, Levittown, NY
11756
20 CLS:V=2:H=23
30 FORL=1TO10
40 SOUND RAND(250), RND(3)
50 SET(23, V, RND(8)): SET(24, V, RND(8))
60 SET(25, V, RND(8)): SET(26, V, RND(8))
70 SET(H, 6, RND(8)): SET(15, V, RND(8))
80 PRINT @324, 11
90 PRINT @384, 11
100 PRINT @428, 11
110 IFASC(A$) > 57 OR ASC(A$) < 47 THEN
120 PRINT "~generalities"
130 PRINT "l-philosophy & related areas"
140 PRINT "2-religion"
150 PRINT "3-the social sciences"
160 PRINT "4-language"
170 PRINT "5-pure science"
180 PRINT "6-technology (applied sci.)"
190 PRINT "7-the arts"
200 PRINT "8-literature"
210 PRINT "9-geography & history"
220 PRINT "* pick one *
230 IF ASC(A$) > 57 THEN
240 IF ASC(A$) < 47 THEN
250 PRINT "PRESS 'S' TO BEGIN"
260 IF B$ = INKEY$: IF B$ <> "S" THEN
270 PRINT "l-BIBLIOGRAPHIES & CATALOGS"
280 PRINT "2-LIBRARY & INFORMATION SCIENCES"
290 PRINT "3-GENERAL ENCYCLOPEDIC WORKS"
300 PRINT "4-GENERAL ENCYCLOPEDIC WORKS"
310 PRINT "5-GENERAL SERIAL PUBLICATIONS"
320 PRINT "6-GENERAL ORGANIZATION & MUSEUMS"
330 PRINT "7-JOURNALISM, PUBLISHING"
340 PRINT "NEWSPAPERS"
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1030 PRINT "9-Customs & Folklore"
1040 PRINT
1050 PRINT "* PICK ONE *":
GOTO 1030
1060 PRINT "1-Linguistics"
1070 PRINT "2-English and"
1080 PRINT "Anglo-Saxon Languages"
1090 PRINT "3-Germanic Languages"
1100 PRINT "4-French, Provencal, Catalan"
1110 PRINT "5-Italian, Romanian, Rhaeto-Romanic"
1120 PRINT "6-Spanish & Portuguese"
1130 PRINT "7-Italic Languages & Latin"
1140 PRINT "8-Hellenic & Classical Greek"
1150 PRINT "9-Other Languages"
1160 PRINT
1170 PRINT "* PICK ONE *":
GOTO 1030
1180 PRINT "1-Mathematics"
1190 PRINT "2-Astronomy & Allied Sciences"
1200 PRINT "3-Physics"
1210 PRINT "4-Chemistry & Allied Sciences"
1220 PRINT "5-Sciences of Earth & Other Worlds"
1230 PRINT "6-Paleontology"
1240 PRINT "7-Life Sciences"
1250 PRINT "8-Botanical Sciences"
1260 PRINT "9-Zoological Sciences"
1270 PRINT
1280 PRINT "1-Medical Sciences"
1290 PRINT "2-Engineering & Allied Operations"
1300 PRINT "3-Agriculture & Related Technologies"
1310 PRINT "4-Home Economics"
1320 PRINT "5-Managerial Services"
1330 PRINT "6-Chemical & Related Technologies"
1340 PRINT "7-Manufactures"
1350 PRINT "8-Miscellaneous Manufacturing"
1360 PRINT "9-Buildings"
1370 PRINT "* PICK ONE *":
GOTO 1030
1380 PRINT "1-Civic & Landscape Architecture"
1390 PRINT "2-Architecture"
1400 PRINT "3-Plastic Arts & Sculpture"
1410 PRINT "4-Drawing, Decorative & Minor Arts"
1420 PRINT "5-Painting & Painting"
1430 PRINT "6-Graphic Arts (Prints)"
1440 PRINT "7-Photography & Photographs"
1450 PRINT "8-Music"
1460 PRINT "9-Recreational & Performing Arts"
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165 PRINT"6-SPANISH & PORTUGUE S E LIT."
166 PRINT"7-ITALIC LANGUAGES" LITERATURE (LATIN)"
168 PRINT"8-HELLENIC LANGUAGES LIT."
169 PRINT"9-LIT. OF OTHER LANGUAGES"
170 PRINT
171 PRINT"* PICK ONE *": GOTO183Ø
172 PRINT"1-GENERAL GEOGRAPHY ( TRAVEL)"
173 PRINT"2-BIOGRAPHY,GENEALOGY, INSTITUTIONS"
174 PRINT"3-HISTORY OF ANCIENT WORLD"
175 PRINT"4-HISTORY OF EUROPE"
176 PRINT"5-HISTORY OF ASIA"
177 PRINT"6-HISTORY OF AFRICA"
178 PRINT"7-HISTORY OF NORTH AMERICA"
179 PRINT"8-HISTORY OF SOUTH AMERICA"
180 PRINT"9-HISTORY OF OTHER AREAS"
181 PRINT
182 PRINT"* PICK ONE *": GOTO183Ø
183 P$=INKEY$:IFP$="THEN183Ø
1835 IFVAL(P$)>90RVAL(P$)<9 THEN183 Ø
184 IFVAL(P$)=1THENB=1Ø
185 IFVAL(P$)=2THENB=2Ø
186 IFVAL(P$)=3THENB=3Ø
187 IFVAL(P$)=4THENB=4Ø
188 IFVAL(P$)=5THENB=5Ø
189 IFVAL(P$)=6THENB=6Ø
190 IFVAL(P$)=7THENB=7Ø
191 IFVAL(P$)=8THENB=8Ø
192 IFVAL(P$)=9THENB=9Ø
193 PRINT"DO YOU WANT A PRINT T OUT Y/N"
194 PO$=INKEY$: IFPO$="THEN183Ø
195 IFPO$="Y"THENCLS: SOUND2Ø,1 :GOTO198Ø
196 IFPO$="N"THENCLS: SOUND2Ø,1 :GOTO198Ø
197 IFPO$="Y"ORPO$="N"THEN194 Ø
198 IFFL=THEN2ØELSE199Ø
199 IFPO$="N"THEN2Ø1Ø
200 PRINT#-2,"LOOK BETWEEN DEWE Y DECIMAL # ";FL+B;" AND ";FL+(B +9.999);" ON THE LIBRARY SHELVES ":PRINT#-2,"IF NOT THERE, TRY LOOKING BETWEEN # ";LS;" AND ";LS +9.999;" ON THE SHELVES.
201 CLS8:PRINT" LOOK BETWEEN DE WEFY DECIMAL # ";FL+B;" AND ";FL+(B+9.999);" ON THE LIBRARY SHELVES." PRINT" IF NOT THERE, TRY BETWEEN ";LS;" AND ";LS+9.999;" ON THE SHELVES." END
202 IFPO$="Y"THEN2Ø5Ø
203 IFPO$="N"THEN2Ø6Ø
204 IFPO$="Y"ORPO$="N"THEN194 Ø
206 CLS8:PRINT" LOOK BETWEEN DEWEY DECIMAL # ";"ZERO ";FL+B;" AND ";"ZERO";FL+(B+9.999);" ON THE SHELVES" PRINT" IF NOT THERE, TRY BETWEEN ZERO ZERO ZERO AND ZERO ZERO ";9.999;" ON THE SHELVES"
Making CoCo Shine With More LEDs

By Tony DiStefano
Rainbow Contributing Editor

It seems to me a lot of people like to do projects that light up or make noise. The projects I get the most response from are the ones that involve LEDs (Light Emitting Diodes). Well, who am I to argue with my readers? (I'll let you in on a little secret — I like them, too!) In order to keep my readers happy, here is another one.

This month's project is a two-fold project, and maybe a little more. The first part involves three LEDs. These LEDs will be connected to the RS-232 port. The second part is a Reset button mounted up front. A Reset button up front may not be a new idea, but the way I do it the wires will not get in anyone's way. The part about "maybe a little more" means that if ever you want to add more things to your "cover," there are leftover wires. If you are confused, read on; it is all explained in this month's article.

The Color Computer's RS-232 port has four wires, three lines and one ground. There are two inputs and one output. As so labeled by Radio Shack, the two inputs are RS-232 "IN" and Carrier Detect, "CD." The third line is an output known as the RS-232 "OUT."

These three lines can take the standard RS-232C levels. The "level" in this case means at what voltage level the computer considers a logic level of one (logic level HI) or logic level of zero (logic level LO). The levels for standard RS-232C are plus 12 volts (+12V) and minus 12 volts (-12V). These levels are maximum output voltages. The Color Computer also has one RS-232 output. The standard for RS-232C output is also plus/minus 12 volts.

Now, here is where the interesting part begins. According to the EIA (Electronic Industries Association), a voltage above plus three volts shall be considered a logical one and a voltage below minus three volts shall be considered a logical zero. Any voltage in between these two limits will be considered undefined. That means if a voltage is 12 volts and on its way down, the logic level will not change from a one to a zero until it reaches minus three volts. The same is true for a voltage on its way up.

As far as the RS-232 is concerned, there are essentially two Color Computers. All of the "big" Color Computers (the older gray or white models) are the same. All of the "small" Color Computer 2s are also the same. They differ only in the output voltage levels. The CoCo outputs the full plus/minus 12 volts, while the CoCo 2 only outputs plus/minus five volts. On the input side, the CoCo can safely handle plus/minus 12 volts while the CoCo 2 can take up to plus/minus 25 volts.

I mentioned that the voltage levels less than three volts and greater than minus three volts are undefined. This is done to improve the reliability of RS-232 communications. It improves the noise margin level. For example, a signal that fluctuates a volt or two will not pass threshold level; therefore will not produce false data.

"If you find the LEDs never light, try soldering them in backwards."

Tony DiStefano is well-known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.)
This method of transmitting data is more reliable, but the electronic circuitry needed is also more expensive to produce. Radio Shack did not spend the extra money. Instead, they made a circuit that has no margin of safety. In the case of the CoCo, any voltage greater than 2.6 volts is considered to be a logic level of one, and any voltage less than 2.6 is considered to be a logic level of zero. The CoCo 2's voltage level is also 2.6, but I think on some CoCo 2s it is set to 2.0 volts.

That takes care of the "ins" and "outs" of RS-232 in the Color Computer; now let's get down to the hardware part. I have had several letters and phone calls about RS-232 compatibility between the CoCo 2 and the CoCo, or the CoCo 2 and some other peripheral such as a modem. This may not solve your problem, but it will focus on whether or not the computer is the problem because this month's project is an RS-232 monitor. Since there are only three lines on the CoCo's RS-232, you will need three LEDs.

The schematic in Figure 1 shows the simple circuit involved in building the RS-232 monitor. The chip I used is a TTL (Transistor-Transistor-Logic) chip. I used a buffer/inverter to drive the LEDs. Only three of the six buffer/inverters are used; the other three are unused and are free to be used in another project.

The inputs to these buffers come from the PIA (Peripheral Interface Adapter) that controls the RS-232. I took the signals from these points because the voltage levels are compatible with the TTL chip used. Also, these points are the points the computer sees and not what is coming in on the RS-232 lines.

The chip I used inverts the signal. I did it that way because on power-up, all three signals on my computer are ones. Normally that would mean all the LEDs would be on. To me, that is a bit distracting. The inverter turned all the LEDs off when I powered up.

The logic here is that everything is off until you use something. For instance, when the printer is online, the "IN" LED would light up. Another example is when my modem is on, the "CD" LED is on when there is a carrier not the other way around. If the LED says there is a zero (by being on) the computer sees a one. This way you can visually see exactly what the computer reads and writes. You will be able to see, at a glance, whether your modem

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slack, but be careful that the connector would be good. The chip can be mounted on an optional piece of protoboard or glued upside-down on top of the cover to give plenty of side of the connector to give plenty of power.

That way, when I remove the cover to dive into my CoCo, all that saves resoldering the wires every time one breaks off. Though any connector can be used, I used a DB-9 male and a DB-9 female.

A few of them will break off before the week is out, so I put in a connector. With the computer on, touch any two pins to use. The ones that have six pins are a bit different. The easiest way to figure out which one is which is use a short piece of wire. Leave eight to 10 inches of wire on each side of the connector to give plenty of slack, but be careful that the connector does not short out when you stuff it inside the CoCo. Some kind of sleeve would be good. The chip can be mounted on an optional piece of proto-board or glued upside-down on top of the PIA. Again, this is your choice.

The rest of the circuit is quite straightforward. If you find the LEDs never light, try soldering them in backwards. I always have trouble finding the anode to those things. Some people have expressed difficulty in finding where to connect to get plus five volts and ground. A good place to find plus five volts is on Pin 9 of the edge connector. Finding Pin 9 is simple. Start from the back of the connector (the part closest to the rear of the computer) and count the top pins 1, 3, 5, 7 and 9, and there you are. Ground is on Pin 33; count the same way.

As an added bonus to the RS-232 monitor, I added a Reset switch in the front of my computer. The circuit in Figure 2 shows how to add it in. Mount the switch on the front cover on whichever side that suits your needs. Use two of the unused pins on the DB-9 connector to do the wiring, so that you can disconnect it from the computer at the same time you disconnect the LEDs.

There are about as many different reset switches as there are different CoCos. Some of them have six pins, and some have only two. The one that has only two is easy to wire; put one on each and there you go. The ones that have six pins are a bit different. The easiest way to figure out which one is which is use a short piece of wire. With the computer on, touch any two pins on the reset switch with each end of the wire. When a reset occurs, those are the two pins to use.

In closing, I would like to mention that you have been very good in limiting phone calls to Monday nights. For those of you who missed it, my "Monday-night-only" number is (514) 473-4910. If you want to write me and expect an answer, please include a self-addressed, stamped envelope; otherwise I'll take it as just a comment.
Downloads/Dan Downard
Answers to your technical questions
KISSable OS-9/Dale L. Puckett
A getting-your-feet-wet course in OS-9 Pascal
Wanted: More Memory

By Dan Downard
Rainbow Technical Editor

I have a 16K CoCo 2 and have recently upgraded to Extended BASIC. Before the upgrade PRINT MEN gave me 14631, but now it gives me 8487. Why? Now I am thinking of upgrading to 64K and would like to know if I could make a plug-in pack of my old 16K chips to give me an additional 16K of memory.

Wayne Towe
Mosheim, TN

The reason you are getting less memory with Extended BASIC, Wayne, is that more memory is being reserved for graphics pages. Try a PCLEAR 1 and see if that doesn't help the situation.

In the case of your old 16K chips, I have found no use for them yet, unless you can sell them to someone with a 4K CoCo. When you upgrade to 64K you are at the maximum addressing limit of the CoCo.

Some schemes are available for adding more than 64K of memory to the CoCo (see the review of Thunder RAM in this issue, Page 209) by bank switching either another set of 64K RAM, or by using 256K RAM. I wouldn't think this would be practical for 16K of extra RAM.

Curiously Speaking

I am new subscriber to RAINBOW. While looking through the programs in my first issue (April 1985), I found a command I'm not familiar with: EXEC44539. I looked through my BASIC manual and couldn't find this command. Can you please tell me what it is?

In that same issue, I was reading about the Adventure contest. You (the magazine, that is) said something about list-guard. I have been wondering how to do this for a long time. Could you please tell me how?

Roy Geoo
Hot Springs, AR

According to 500 Pokes, Peeks 'N Execs, EXEC44539 waits for a keystroke. It is used as a substitute for the following:

10 A$=INKEY$: IF A$=" " THEN 10

If you want to foil someone's attempt to LIST or LLIST your Adventure, or any other BASIC program, Roy, try adding POKE 383, 159 into a program line. To return to normal listing, hit BREAK and then POKE 383,0.

The Family ‘String’

First, I want to thank you for answering my letter on “ASCII aggravation.” You were correct about the problem in the cassette recorder. That is a place I never thought it would be. I replaced it with Radio Shack's CCR-82 Computer cassette recorder and, except for the new not being able to read the old now and then, everything is working great.

Now if I can ask you to solve another problem. I have been working on an ancestry program where I store names and personal data in strings. I would CLEAR 10000 and dimension three arrays, example: (DIM A$(200), B$(200), C$(200). I find that even with 64K I am only able to use about 15K of it for working with strings.

Am I using the CLEAR statement improperly or is it necessary, and is there a way to access more of the memory so I may store names and personal data on about 200 people?

Rodney Lee Gibbons
Fairmont, WV

Rodney, there seem to be quite a few other readers with the same question from the looks of the mailbag this month. Rather than answer your question directly, let's take a look at memory allocated for programs in general.

A typical memory map for a Disk BASIC CoCo would have blocks of RAM from $0000 to $7FFF in the following order:

* RAM Pointers
* Screen memory
* RAM variables
* Disk buffers
* Graphics pages
* BASIC program
* Variable storage
* Array Storage
* Free memory
* Stack
* String space
* User reserved

There are a number of commands that affect changes in memory allocation. The most common BASIC commands are CLEAR and PCLEAR.

CLEAR sets the address reserved for string space in high RAM. It can also be used to reserve an area in high RAM for user programs, usually machine language routines. Upon BASIC initialization, 200 bytes...
are automatically CLEARed for string space. Essentially, CLEAR defines the address between the stack and string space. If an extension is used such as CLEAR 1000, &H7O00 it also defines the address starting the area called "User reserved."

PCLEAR allocates the number of graphics pages of RAM. Each page is equal to 1.5K. As you can see from the memory map, this is an area of low RAM between the disk buffers and the start of the BASIC program. Four graphics pages, or 6K of RAM, are PCLEARed during BASIC initialization.

The question most people are asking is how to allocate more memory for BASIC programs. You could possibly CLEAR1, but this would not allow any space for string variables. The safest thing to do is leave the default 200 bytes alone by not using a CLEAR statement in your program. At the same time, if you are not using Hi-Res graphics, a PCLEAR1 will give you an additional 4.5K of memory for your program and variables.

In your case, you are getting strings and arrays confused. A DIM command allocates memory for arrays. As you can see from the memory map, arrays use a different part of memory than strings. I would omit the CLEAR command and see if that doesn't help.

Banishing Rumors

- As I'm sure everybody has heard, Radio Shack has talked about making a 128K CoCo, but then somebody came out with a way to make the current CoCo have 128K and the rumors subsided.

- Now the rumors are that a new CoCo is coming out which is compatible with the Commodore and Atari computers. Is this possible, and if so, what happens to all of us with the old CoCos? We just get dropped down the tubes or what?

- If they come out with this new CoCo, could we take the new ROMs and put them in our CoCos to make them compatible? If this is possible, could we not take the Atari or Commodore ROMs and build sort of a switcher to use their software, too?

John Gormley

Imlay City, MI

The CoCo you are using at present has outlasted several versions of Commodore and Atari computers. Why do you want to change? I think the rumors you are hearing probably refer to graphics capability, as the computers you mention do not use the same microprocessor as the CoCo.

I still say I have seen better software for the CoCo than the Atari and Commodore combined. If you are serious about transferring machine language programs, and have time to read, there is no possible to transfer programs to the CoCo by the use of a cross-assembler. To do this, though, you have to be an expert assembly language programmer, and also have an understanding of the hardware used in both machines.

I don't foresee your CoCo becoming obsolete.
One of the only frustrations that comes with writing a column like this is the realization that you no longer have time to do much programming. This month, I fought back. You'll find the prose short and the listings Jong - and, not just one listing, either. Our "how-to-get-your-feet-wet" course in OS-9 PASCAL includes seven programs. All of them are filters and most are small tools you can use together to get big jobs done.

In addition to the PASCAL programs I prepared for the tutorial, we are listing one assembly language program, one BASIC09 program and four C programs contributed by our readers. We included the assembly and BASIC09 listings because they show you two more ways to solve a problem we tackled with the PASCAL programs.

Mark W. Smith of Latonia, Ky., contributed the assembly language programs, `upper.a` and `uppercase.b`.

Robert J. Apida of San Diego, Calif., sent in the other C listings to show us how he got his feet wet with a new language. When he finished his first programs, Bob had a few new tools, had learned how to run the OS-9 C compiler and had lost his fear of another programming language. He hopes his examples will help you get started with C, too.

**OS-9 PASCAL is a Pleasure**

We approached OS-9 PASCAL slowly by testing several versions of a few common algorithms you'll find in almost all PASCAL programs. The first, `charecho`, simply reads a character from the OS-9 standard input path and writes it to the standard output path.

OS-9 PASCAL always assigns the standard PASCAL files, `input`, `output` and `syserr`, to the OS-9 standard input, standard output and standard error output files, respectively. This makes it very handy for writing filters that work well within OS-9 pipelines. The same programs can also be used with OS-9's redirection operators, meaning you can write some very versatile tools.

We used our favorite editor and typed the source code for `charecho` into a text file with the same name, then we compiled it using the following OS-9 command line.

```
059: pascal <charecho
```

Notice here that you must always use the input redirection operator when you compile a PASCAL program. You must also have the program files `Pascal`, `Pascals` and `Pascaln` in your current execution directory, `/d0/CMDS`, when you are programming in PASCAL. The compiler printed a listing of the program on our terminal while it was compiling. We have included a listing of `charecho` to show you what they look like.

**Why did we need a second attempt?**

Well, we tested the program using an OS-9 command line like this:

```
059: pascaln pcodef
```

Notice here that you do not use the redirection operator when you run your PASCAL p-code programs. Notice also that the compiler stores your p-code in a file named `pcodef` in your current data directory. You can rename it after you have your program debugged, or you can use the compiler's 'O' command line options to give the `pcode` file another name.

Since we didn't instruct our program otherwise in the command line above, it took its input from the OS-9 standard input path, our keyboard, and echoed it on the standard output path - the screen. After watching it echo several lines we typed in by hand, we decided to test the redirection. To do that we used a command line like this.

```
059: pascal <charecho
```
Multi-User!

Frank Hogg Laboratory announces their Quad Terminal (QT) series of multi-user computer systems, designed to run Microwares new OS-9/68000 operating system. The QT offers 32 bit processor power in a compact integrated package that requires only a terminal to operate.

The QT hardware features: 68008 processor running at 8 Mhz, 128K bytes expandable to 512K bytes, an interval timer for time sharing, 4 serial ports with selectable baud rates from 300 to 19,200, 2 centronics compatible parallel printer ports. Supports 2 double sided double density 96 tpi floppy disk drives and a SCSI (SASI) bus interface for Winchester disk drives. The QT is available as a single floppy (1), a dual floppy (2) or as a single floppy and a 10 or 20 megabyte hard disk (HD). Size 5 1/2 high, 11 1/2 deep, 9 1/2 wide. Can be mounted vertically or horizontally.

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Note: The QT can hold 2 half height drives internally (floppy or hard). Provision has been made for hooking up external floppy drives. This allows using large capacity full height hard disk drives in the QT case with floppy drives in another case. You can boot from the hard disk so floppys would only be necessary for program transfers and backup. Removable hard drives are also available. Call or write for complete specifications and prices.

Frank Hogg Laboratory
770 James St., Syracuse, New York 13203
315/474-7856
By the way, we could have also used this command line.

059: list charecho ! pascaln pcodef

Take your choice of command line syntax, but before you get too excited about our program, take a look and see what it did when it read our nicely formatted source code listing. Would you believe it removed all the carriage returns from the file? Oh well, if at first you don't succeed, try again. That's one way to learn how a compiler operates.

We called our second program charechotwo (didn't want to be too original). If you study the listing, you'll see how we solved the missing carriage return problem. And, there's another teaching point in the listing.

Take a look at the third line from the bottom of the listing where we call a procedure named "INTERACTIVE." This procedure is unique to OS-9 PASCAL. It's a handy extension to the ISO standard because it makes it easy for you to write a program that will work the same with a sequential device — your terminal for example — or a random access file device like your disk drives. Sequential devices use the OS-9 SCF file manager module. Random storage devices use RBF.

Why should you care? Well, each file manager handles the character buffer a little differently; because of this, the EOLN and EOF flag can become true at different times on the two file managers. This means a program written for an SCF device may act strangely when reading characters from an RBF device. The opposite is almost always true.

The procedure INTERACTIVE tests the file you are using at the time. If you are using a sequential device like your terminal, it returns "true" and the program line in the listing will get the next character so you can check to see if it is the end of a line (EOLN) or the end of your file (EOF). If you are reading a file from one of your disk drives, however, INTERACTIVE will return a value of "false" and OS-9 PASCAL won't GET the extra character. Nifty, huh?

Following the source code listing, you'll see the output of the OS-9 compiler. It is easy to look at and gives you a lot of information. If you're strong on form and like things lined up neatly, you could even indent the different levels of your program so they fall under the number on the header line that matches their nesting level. We did it with charechotwo just for the fun of it. However, it caused us to notice that the nesting level shown in the third column of this listing agrees with the number in the header line. This could sure come in handy if you get lost in your logic and can't follow your program.

Run one of the two command lines below and you should see a clone of your original source code on your screen. Our copy output the listing below the compiler's listing.

059: pascaln pcodef <charecho
059: list charecho ! pascaln pcodef

You may echo characters from the keyboard to the screen by typing:

059: pascaln pcodef

Or, you may echo characters from your keyboard to your printer with this command line:

059: pascaln pcodef >/p

All of the command lines above assume that the file pcodef, which is stored in your current data directory by the compiler, contains the p-code generated from the source code file named charechotwo. Remember, each time you run the compiler it writes new pcodef code over the code in any existing pcodef file in your current data directory.

After finishing the primitive character echo program, we moved on to a couple of character counting routines. The first one shows you the characters in each line as it counts them and then gives you a final total. The latter skips the listing and simply counts and reports the number of characters and the number of lines in your file. It's a program of few words.

In charecho and charechotwo we only had to define one variable, achar. In charcount and charcounttwo we had to add three variables of type integer — charechotwo, totalchars and numoflines. Notice the similarity of PASCAL and BASIC09. You must define your variables in both languages, but as you start to program in PASCAL you'll find that it makes you play by the rules. If you don't, the compiler doesn't hesitate to call foul and print an error message on the screen.

We moved next to the program wordcount. If you run this one side by side with the "wc" utility we published in C several months ago, you'll notice you get the same answers. Amazing, I must have had a lucky day!

We added the PASCAL CONST statement to this program. It is similar to the DEFINE statement in C. Simply stated, it assigns a value to a word. In wordcount, every time the compiler sees the word space it will insert the value of an ASCII space — it's hidden there between the two single quote marks.

Likewise, when the compiler sees the character string cr, it will substitute the decimal value 13, and when it sees tab, it will substitute a value of nine. We also introduced a Boolean variable in this program. When the program is

---

**Listing 1:**

```pascal
program charecho (input, output);
var
  achar: CHAR;
BEGIN (* main *)
  WHILE NOT EOF(input) DO
    BEGIN
      READ(input, achar);
      WRITE(output, achar);
    END
END.
```

---

**Listing 2:**

```pascal
program charechotwo (input, output); var
  achar: CHAR;
```

---
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running, "inword" can only have one of two values at a given time — it can be true or it can be false.

If you are brave, I challenge you to type in the IF statement without using the OS-9 PASCAL built-in function, CHR. Go ahead, compile it. What happened? I bet you got an error message about the value you were trying to assign to the variable achar. Did the compiler tell you it was the wrong type?

That experiment will show you just how finicky PASCAL is about data typing. You must have your act together when you use this language. In the long run that's probably good because your programs will probably run better and your debugging sessions will be shorter — once you get the plot. To try the experiment, replace the line in the program with the following line:

```pascal
IF (achar = space) OR (achar = linefeed) OR (achar = tab) OR (achar = cr) THEN inword := FALSE.
```

Do you understand why you are getting the error message? In a nutshell, you have defined the variable achar to be of type char. But, on the other hand, you assigned integer values to the names linefeed, tab and cr; PASCAL caught you. To make the types agree, you must use the CHR functions which convert the integer value of your variables to a char value.

Incidentally, the program `wordcount` is based on the theory that if you are reading a text file, you must be in a word — in which case the variable `inword` is TRUE. Or, you must be not in a word and the value of `inword` is FALSE. Every time you change the value, or state, of this variable you have hit a new word, so you count it.

The programs `upper` and `lower` illustrate two different ways to translate a char value.

```
BEGIN (* This is the main program *)
WHILE NOT EOP(INPUT) DO (* we must read the entire file *)
  BEGIN (* We want to echo each character a line at a time *)
    WHILE NOT EOLN(INPUT) DO
      BEGIN
        READLN;
        IF INTERACTIVE(input) THEN GET(input);
      END (* we have completed a line *)
    END (* we have echoed all except CR *)
  END; (* we have echoed all except CR *)
END. (* This is the end of the main program *)
```

---

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characters in a text file. If you study upper closely, you'll find it is very similar to the BASIC09 program named uppercase, which is also listed in this month's column. In both programs we are converting every lowercase character to an uppercase character. If a character in the file is already uppercase or is not in the alphabet, our program simply outputs it as is.

We make the conversion by subtracting the decimal value 32 from the value of the lowercase character. To see how it works, work the problem by hand with a lowercase 'a.' This character has a value of 61 Hex. When we subtract 32 decimal from it, we are also subtracting 20 Hex. When you subtract 20 Hex from 61 Hex you get 41 Hex. Now look up 41 Hex in an ASCII code table. Did you find an 'A'?

Now you know how the OS-9 PASCAL and BASIC09 programs work. To see how to solve the problem at the assembly language level take a close look at the upper.asm listing submitted by Mark Smith. Hopefully, by studying the programs in this issue together, you will be able to understand how the many different high level languages we have available with the OS-9 operating system relate to each other. By comparing the higher level versions to the assembly language version you can get a better idea of what the machine has to do to make a particular computation.

The program lower works basically the same way as upper. However, with it we show you how PASCAL's sets make it easier to program certain operations. For example, compare the two lines below.

```pascal
IF (achar >= 'a') AND (achar <= 'z') THEN (* It's lower *)
IF achar IN ['A' .. 'Z'] THEN (* It's uppercase *)
```

If you are interested in the C programming language, study Mark Smith's C program called asc. It will convert all characters in a file to uppercase or to lowercase. You tell it what you want in the OS-9 command line. Mark reads this parameter from the command line and takes the proper action within the program.

The C variables "argc" and "argv" are at the heart of the decision. They also had me completely confused for many months before I finally figured out what they were: argc is C shorthand for argument count; argv is short for...
XTERM

XTERM is a full featured OS-9 communications program that takes full advantage of the power of OS-9. It works with the normal text screen, XSCREEN, or the Wordpak 80 column board.

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XTERM works with a Color Computer using the standard serial interface, but also will work with a hardware serial port. Also, if you are using a hardware parallel printer port, you can print data to the printer as it is received.

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XMENU is a system that creates a menu-driven environment for the Color Computer using OS-9. OS-9 now becomes easy-to-use with command selections made from menus. Menus are included to access OS-9 commands. An easy-to-use utility is provided that allows for the creation and maintenance of menus.

XMENU works with XSCREEN, the normal text screen, O-PAK, and the WORDPAK 80-column board.

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XWORD is a powerful word processing system for the Color Computer using OS-9. XWORD is feature packed with only a few features mentioned here.

Some of the editing features of XWORD include: true character oriented full screen editor; works with the normal text screen, XSCREEN, O-PAK, or WORDPAK 80 column card; full block commands with blocks displayed in inverse characters (except with normal text screen) for easy block manipulation; file size not limited to a buffer size; full find and replace commands with wildcard character; able to execute an OS-9 shell command in the middle of editing. Many, many more features, too many to mention here.

Some of the formatting features of XWORD include: proportional spacing supported; perfectly aligned hanging indents and columns, even when using proportional characters; full printer control with control of character size, emphasized, italics, overstrike, underlining (with or without spaces), super and sub-scripts; up to 10 header/footers; page numbering in decimal or Roman numerals; margins and headers can be set differently for even and odd pages; automatically reads printer initialization file to define XWORD for your printer (many included, and easy to write or modify your own). Many more features.

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inword := false
ELSE IF (NOT inword) THEN
BEGIN
inword := true;
umwords := numwords + 1
END;
END;
WRITELN;
WRITELN('We have found ', numwords:1, ' words in your file.' )
END;

program upper (input, output);
CONST
toupper := 32;
VAR
achar: CHAR;
BEGIN (* main *)
WHILE NOT EOF(INPUT) DO
BEGIN
WHILE NOT EOLN(input) DO
BEGIN
(* Just before we quit, we’ll report the totals *)
(* But to get a true count of the number or characters *)
(* in the file, we must add the number of carriage *)
(* to the total *)
totalchars := totalchars + numoflines;
WRITELN;
WRITELN( 'We counted ', numoflines:1, ' lines containing ' 
totalchars:1, ' total characters.' )
END. (* This is the end of the main program *)

program charcounttwo (input, _output);
var
achar: CHAR;
charsinline: integer;
totalchars: integer;
umoflines: integer;
BEGIN (* This is the main program *)
totalchars := 0;
umoflines := 0;
WHILE NOT EOF(INPUT) DO (* we must read the entire file *)
BEGIN (* We must count each character in a line *)
charsinline := 0;
WHILE NOT EOLN(INPUT) DO
BEGIN
READ(input, achar);
charsinline := charsinline + 1
END; (* we have counted all character except carriage return*)
READLN; (* Now we’ll get another line *)
IF INTERACTIVE(input) THEN GET(input);
(* We must now add the characters in this line to the total *)
totalchars := totalchars + charsinline;
(* and we must count the line *)
umoflines := numoflines + 1
END; (* we have counted all characters *)
(* Just before we quit, we’ll report the totals *)
(* But to get a true count of the number or characters *)
(* in the file, we must add the number of carriage *)
(* returns to the total *)
totalchars := totalchars + numoflines;

argument value. Once I figured this out, I felt better.

I recently saw a long conversation on the CompuServe OS-9 SIG led by John Heywood. John really got to the heart of the matter. I’m passing his description along because I think it will help you. It’s one of the best descriptions of argc and argv I’ve ever seen, and I’ve scanned several books on the subject. Let’s start by looking at a couple of definitions you’ll find in almost every UNIX-style C program.

main(argc,argv)
int argc;
char **argv or *argv[ ]

The definition of argc is fairly obvious on the surface — it contains the value of the number of arguments on a C command line, but argv is another story. First, look at the C word "**argv." In English it means argv is a pointer to a pointer to a character. If you can think in terms of two levels of indirection clearly, John has really put the story in a nutshell with that short sentence. However, he went on to paint a picture for people like myself.

"Suppose," John said, "the operator types ‘cc -0 test.c’ in a command line. The value of argc would then be three, argv[0] would equal ‘cc,’ argv[1] would equal ‘-0’ and argv[2] would equal ‘test.c.’" For the first time, it was all starting to make sense. Let’s take it one step further.

Imagine the string "cc" is stored at location 0x0900. If so, the pointer to argv[0] will be equal to 0x0900, the pointer to argv[1] will be equal to 0x0903 and the pointer to argv[2] will be equal to 0x0906.

Since the pointer stored at 0x0900 is a pointer to a character, we need to store that pointer. John picked location 0x0950 for his example. He put the next at 0x0952. If you look in memory at 0x0950 you will find 0x0900 — a pointer to a character is stored there. On the other hand, if you use the *argv[ ] convention, the value of argc and argv would look like this after your command line was parsed by the C compiler.

argc=2
argv[0] = "cc"
argv[1] = "-0"
argv[2] = "test.c"

Wrapping up our descriptions of this month’s program listings, we see Bob Apida contributed some very short,
very simple C programs. I think they'll give you a good starting point and a chance to get the feel of your OS-9 C compiler while you build up your confidence. In Bob's words, "These are my very first attempts at C programming so they may be a little ragged. I just hope they give some of your readers the courage to get started with the language."

Bob also suggested that we run a contest. "Give a prize (a Rolls Royce or Lear Jet or a copy of next month's RAINBOW) to the person who can write a program using the least amount of memory. You call it the 'I can write that program in 20 bytes' contest!' he said. Maybe we can do that sometime in the future. Gee! I can write that program in 'X' bytes!

Random Thoughts
It's time to start planning to attend Microware's 1985 OS-9 seminar in Des Moines. You'll find it a fantastic learning experience and a fun-filled three days. Besides, we'll have an OS-9 Users Group meeting there and hopefully pass the gavel to a new group of officers.

Speaking of officers, Bryan Lantz of Computerware fame has agreed to run for president. I endorse his nomination 100 percent. Additionally, George Dorner has agreed to fill another term as treasurer. He's doing a tremendous job so he should be a shoo-in. If you are a member you should receive your ballots sometime within the next month.

Because the Users Group hospitality room was such a hit at RAINBOWfest-Chicago, we may do it again in Princeton. And we plan to hold a formal meeting Saturday afternoon following the last RAINBOWfest seminar. Hope to see you there!

The Last Word
It's exciting to watch an operating system like OS-9 evolve, especially the software. During the past month and a half I have had a chance to look at several versions of Michael Bailey's mouse-based editor, The Last Word. He seems to be taking suggestions to heart and is working hard to make this program really shine.

Since we wrote about the program last month, Mike has added several features. You can now access the pull-down menus from the keyboard. To do this you type a CLEAR D and the cursor will jump to the menu bar. Once there,
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you move the cursor through the menu with the Color Computer arrow keys.

At our suggestion Mike set up the SHIFT left- and right-arrow keys to move from word to word through your text. Great! That’s the way writers work. The tab functions are still available, however; they just use another key. The block move operations now highlight the selected text — like the Mac and the Model 100. This change makes it easy to see what you are moving and makes it harder to make mistakes.

The Last Word now lets you adjust your margins by pulling a marker along a ruler line at the top of the screen, and Mike says he plans to set it up so you can insert a number of menu bars throughout your text whenever you want to change margins. The flicker from joystick noise is now almost gone and files in your current data directory in his program that prints a list of the

an alternative spelling while you are to check the spelling of a word or find the operation is much smoother.

to run OS-9 c with one disk drive. We’ll

ideally suited to the OS-9 environment," he said.

Next month? Jonathan Guthrie of Westerville, Ohio, wrote to tell us how to run OS-9 c with one disk drive. We’ll pass his tips along with a few solutions to the “How do you remove the GOTO from the PRIMES program” question we asked in June. And, who knows what else will cross the desk or pop into mind. Till then, enjoy what’s left of summer.
DIM char, cr, cls : STRING[1]
DIM text: BYTE
DIM offset, code : INTEGER
cr ::= CHR$(9)$
cls ::= CHR$(27)$
offset ::= -32
OPEN #text, inpah
WHILE NOT(EOF(#text)) DO
GET #text, char
IF char < "z" AND char > " " OR char = cr THEN
IF char > "a" AND char < "z" THEN
code ::= ASC(char) + offset
char ::= CHR$(code)$
ENDIF
PRINT char;
ENDIF
ENDWHILE
CLOSE #text
END

/* asc -- ASCII conversion utility */
/* Written by Mark Smith */
/* Latonia, Ky. */
#include <stdio.h>
#include <ctype.h>
define YES 1
#define NO 0
main(argc, argv)
int argc;
char **argv;
if (--argc != 0)
printf("%n");
printf("asc <options> -l -u -?
") ;
exi t();
while ((++argv) [0] != 0)
for (s = argv[0]+1; *s != '"'; s++)
switch (*s) { 
  case 'l':
    upc = NO;
brea k;
  case 'u':
    upc = YES;
brea k;
  case '?':
    printf("%n");
    printf("asc: <options> -l -u
") ;
exi t();
} 
while ((c = getchar()) != EOF) {
  if (!isprint(c) || isspace(c)) {
    if (isalpha(c)) {
      if (upc) {
        c = tolower(c);
      }
      else {
        c = toupper(c);
      }
    }
  }
  alpha[0] = c;
}
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---

printf("%c", alpha[j]);
}
}

*******************************************************************************/

/* * * * * 0-Pak utility - - - - - - notes * * * */

by Robert J. Apida
18 October '84
San Diego, Ca.

This utility will remove and upload the 0-pak
HIRES screen utility, and place the user in the 32
by 16 standard os-9 screen format.

This utility is handy when running compilers
or other programs which will not run under 0-pak HIRES
because of memory restrictions or compatability problems.

#include <stdio.h>
define CLEAR 12
define C1 31
define C2 41
define C3 49
main()
{
    putchar(C1);
    putchar(C2);
    putchar(C3);
    putchar(CLEAR);
}

*******************************************************************************/

/* * * * Command - - - - - - cls * * * */

by Robert J. Apida
18 October '84
San Diego, Ca.

This command will clear the screen with a one
word command - - - - cls.

#include <stdio.h>
define CLEAR 12
main()
{
    putchar(CLEAR);
}

*******************************************************************************/

/* -------- 0-Pak Utility -------- Change --------*/
/* */
/* by Robert J. Apida */
/* San Diego, Ca */
/* */
/* 16 January 1985 */
/* */
/* This program, when used with the 0-Pak char. sets */
/* will allow the user to change the set with a single */
/* command line entry. */
/* */
/* Initial requirements are that the char set be */
/* installed in the execution directory. You may chose */
/* to install your char. sets in another directory. */
/* If this is the case, an os 9 path may be used. */
/* */
/* This program requires that the standard */
/* os 9 commands, echo and display, be installed */
/* in the current exec. directory. The program error */
/* messages were set up using the 64 col. char. set */
#include <stdio.h>
define CLS 12 /* clear screen */
define CHD "display lb 4a ; echo "

---

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THE RAINBOW September 1985

---
main(argc, argv)

int argc;
char *argv[];
{
    char *Cmd_Line[80];
    if (argc != 2)
    {
        help();
        if (argc > 2)
            printf("Only ONE argument may be used with the change command...\n"");
        exit(0);
    }
    if (strlen(argv[1]) > 57)
    {
        printf("COMAND ARGUMENT OVER SIZED * * *");
        exit(0);
    }
    strcpy(Cmd_Line, argv[1]);
    strcat(Cmd_Line, argv[1]);
    system(Cmd_Line);
    exit(0);
    help()
    {
        printf("O-Pak Character Set Change\n");
        printf("Format:\n");
        printf("change [character set name]\n");
        printf("change [directory\n");
        printf("Change will support full OS-9 path descriptors if the character set
is not located in the current execution directory.\n");
    }

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ILLINOIS
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IOWA
Des Moines - Software City

KANSAS
Lawrence - Software City

KENTUCKY
Louisville - Global Electronics

LOUISIANA
Lafayette - Software Plus

MASSACHUSETTS
Brookline - The Computer Experience

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Minneapolis - Read-More News

Mississippi
Jackson - The Book Nook

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<td>Artist color palette</td>
<td>$9.95</td>
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<tr>
<td>5C</td>
<td>Large char set drawn with master design (from Deminger Software)</td>
<td>$9.95</td>
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<tr>
<td>6C</td>
<td>Same as 5C but set up as stamp set</td>
<td>$9.95</td>
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<td>Miscellaneous Art Set 1</td>
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<td>GDI DISK</td>
<td>$9.95</td>
</tr>
</tbody>
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Each disk contains 40 or more font disks (10C or more GRAPHICOM PART II fonts, 4 versions each of each existing display mode) and three "FONT INDEX" screens to make identification and use much easier.

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- #12 Pararel-50 Pin (UniFLEX-020): $536.12
- #134 Port Serial-50 Pin (OS9 & UniFLEX-020): $586.13

**I/O BOARDS (6809 SYSTEMS ONLY)**

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- #43 Serial, 2 Port: $128.43
- #45 Serial, 8 Port (OS9/FLEX only): $318.45
- #42 Parallel-2 Port: $88.42
- #44 Parallel, 2 Port (Centronics pinout): $128.44
- #45 Pararel-50 Pin (OS9 & UniFLEX-020): $586.45

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- #53 Cent. Cable Set: $36.53

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- Windrush EPROM Programmer: $30 (OS9/FLEX 6809 only): $34.50

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  - #39 O90 GMX II/ and FLEX
  - #79 O90 GMX III/ and FLEX
  - #38 UniFLEX
  - #89 UniFLEX III

  - CPU Included: #05
  - Serial Ports Included: 2
  - High Speed Static RAM: 64KB

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- GMX 68020 SYSTEMS

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