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June 1983

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RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

A PRINTER SPECIAL

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Monster Master

—More Than Two Dozen
Product Reviews—

Tom Nelson
CoCo Counselor

D.S. Lewandowski
The Assembler

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See
page
38.

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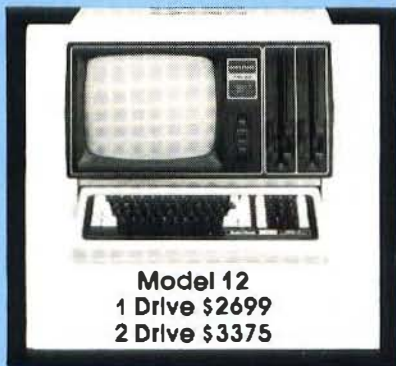
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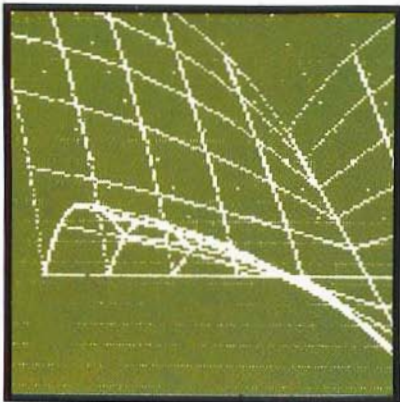
Under the Rainbow

COVER photograph © by James E. Reed for *the Rainbow*.

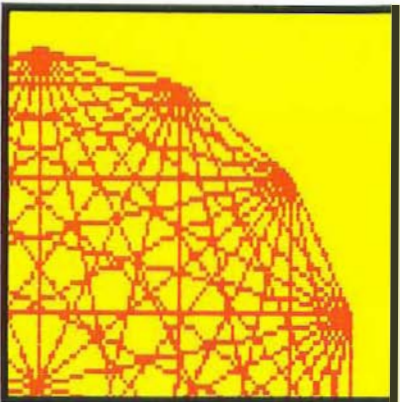
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NEXT MONTH: Will be our super-duper Second Anniversary Issue! And there will be a very special surprise for everyone—a first for *any* computer magazine.

For those of you who want to know what's inside CoCo, we'll have the most complete and accurate memory map ever published. It is so big, it will be serialized, with Part One as an Anniversary Issue special. It covers *all* CoCo configurations.

Yes. Yes. Yes. Our Anniversary Issue will also feature an Index! It is something many of you have been asking for.

Plus . . . a report on RAINBOWfest, and more programs, more reviews, more information on CoCo than you can possibly find *anywhere* else. Don't miss July's *Rainbow*!

The Rainbow

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Limited back issues are available. Please see notice for issues which are in print and costs. Payment accepted by VISA, MasterCard, American Express, Cash, Check or Money Order in United States currency only.

RAINBOW

WEAVER'S CORNER

Editor:

As a very enthusiastic CoCo owner, I am enjoying your magazine very much.

I'm also very enthusiastic about the CGP 115 printer and think it has great potential for use in weaving, which is what I do. But I'd like to see someone come out with a roll of address labels that would fit it. Does anyone make a roll of labels that would fit? Does Radio Shack plan to market such a roll of labels?

And how about pens in other colors? It would be handy to be able to print out a weaving draft in brown and beige, for instance. Or yellow and lavender. Do you know whether RS has any further plans for the CGP 115?

Sandra L. Willard
Chireno, TX

HERE TO ATARI?

Editor:

In a news bulletin from a local computer club last August, it mentioned an adapter to permit Atari and Activision cartridges to run on the 80C. Have your readers heard anything about when it is to be expected and if it will also allow Imagic, Parker Brothers, Coleco (for Atari) and other manufacturers' cartridges to run on it?

Peter Stumpf
McHenry, IL

TRECKING FOR STAR TREK

Editor:

I have been searching, in vain, for a color version of one of my favorite games...*Star Trek*. I know that it works well on a Model I Radio Shack computer; it was written by Joshua Lavinsky and copyrighted 1978; features Starbase attack alerts, movement of the Enterprise within a quadrant by means of the arrow buttons, three button warp drive (one button to signal warp, two others to indicate destination quadrant), ten levels of play (with 8-12 Klingons in the first level, around 70 in the highest), and a ration of three photon torpedoes between resupply at a Starbase.

If your readers know where I can contact the writer of this program, or if he has written a version of that same game for the Color Computer, I would very much appreciate being provided with that information. My address is General Delivery, Whitehorse, Yukon Y1A 3S7.

Geoffrey B. Capp
Whitehorse, Yukon

Editor's Note: I don't know about this one, but there are some excellent Star Trek games available on the commercial market. Some we have played are

even better than that which you describe.

AID NEEDED

Editor:

I own a 32K Extended BASIC Color Computer, which I recently upgraded to disk. I am making the transition from tape to disk, and I need some assistance in locating a certain utility.

I am looking for a program that will load my machine language tape programs to disk so they will execute properly. If your readers have any information on this, please contact me at R.D.8, Raritan Grds., Flemington, NJ 08822.

Fred K. Herrman
Flemington, NJ

Editor:

Is there a way to increase the number of characters per line for the display on the Color Computer?

Derric Hawkins
Richmond, KY

MACHINE TROUBLES

Editor:

Is there any way to LLIST a machine language program? Can you key in a program that is written in assembler? Also, how do you understand and follow a program written in assembler or machine language?

Lenny Munitz
Bellerose, NY

Editor:

I have a question that may sound stupid but here goes. How do I get a printout on my VII printer of a machine language program and what is the procedure for typing in a machine language program?

I enjoy your magazine.

A.J. McNabb
Orange, TX

Editor's Note: You can list an assembly language program with an assembler or a disassembler. For some other information, see our *Rainbow Info* feature. To understand a ML program you must first understand how ML works. There are a number of good books (and articles in *the Rainbow*) on the subject.

TV TITLES NEEDED

Editor:

I would like to know if any of your readers know of any programs that would turn my CoCo into a professional graphics and titling system to be used with my video recorder. Easy pre-programmed commands to effect animation and moving titles would

be a plus. I'm also interested in any programs concerning amateur radio.

Your magazine is first rate, keep up the good work.

Peter M. White
Lauderhill, FL

CHEATERS WANTED

Editor:

When I tried to "cheat" at Mr. Keys' program, *Raaka-tu*, it would only print the start and end addresses, then get stuck on 19345. Does anybody in *Rainbow* land have information that could help me?

For anyone that enjoyed John Fraysse's graphics in *Cadet Trainer* I suggest that you purchase *Space Shuttle* by Tom Mix Software. *Space Shuttle* is so much like flying the real thing that when I got into space I was waiting for weightlessness.

Steve Schweitzer
Sewell, NJ

Editor:

I need help solving *Keys Of The Wizard* and *Madness And The Minotaur*. If anyone can help, please contact Robert Kiser at P.O. Box 631, Monticello, MS 39654.

Robert Kiser
Monticello, MS

GOLF HANDICAPPING?

Editor:

Can anyone please advise how or where I may obtain a program for use with my Color Computer, Extended BASIC to allow handicapping players in my golf league? I have been unable to find such a program to date.

Gene Eggers
Villa Park, IL

PEN PALS

Editor:

First I wish to say I really *love* your magazine. It has a lot of variety as well as great programs for all uses. I have one question, though. Could you please explain what FLEX is? I'm a novice and do not know such words.

One more thing. How about getting a Pen Pal section going so computer lovers like myself can write to each other.

Kim Moyer
Bethlehem, PA

Editor's Note: FLEX is an operating system for disk-based CoCo's. We'll have a full report on the three systems currently available in next month's issue. If anyone wants correspondents, just let us know. We'll print names and addresses.

SOMETHING IS AMISS

Editor:

I saw your article on upgrading a "D" board CoCo to 64K. I own a 4K "D" board CoCo so I decided to upgrade following your instructions. I read your instructions over and over. Then I ordered the 64K chips and my dad and I installed it following the instructions carefully. When we were done I hooked up my TV and typed in PRINT MEM. Then the numbers 2343 appeared on the screen! I still have 4K! If there is someone who saw this modification in the March issue and has installed it with better success than I have, and can help me end this nightmare, please contact me by writing Chris Woods, RR1 Box 140, Hollandale, WI 54533, (608) 967-2385.

You have an awesome magazine! Keep up the good work!

Chris Woods
Hollandale, WI

TTY INTERFACING

Editor:

I have a used teletype model 33TY and I need a printer program to give me a carriage return, line feed, and margin with line width all in one. I can make a paper taping but how do I reload this paper tape?

If possible, at different times I would like to use the keyboard from the teletype to input to the Color Computer.

I hope there is someone who can help me.

A. Stolk, Jr
Kendal, Ontario, Canada

Editor's Note: Did you check out Dan Downard's article in our February issue?

DANGER OF 'SURVIVALISM'

Editor:

When I first saw the cover of the March issue of *the Rainbow*, I thought it was drawn with a macabre sense of humor for a new war game program. I had to re-read "Predicting Fallout" twice before I began to realize that this "feature program" was serious.

The philosophy expressed therein is that which may yet make high technology man's destroyer, rather than greatly improving his life. This so-called "survivalist" philosophy is infinitely more dangerous than a fifty megaton bomb, for it provides the only way a nuclear war could deliberately be started. I'll acknowledge that man's history has been devoted to destroying himself more efficiently. However, there is one great difference since nuclear weapons were invented. War has always been waged with at least some hope of winning. I'm sure no one would consider having a few survivors scattered between cities burned to ashes "winning." Regarding the idea of Soviet workers sandbagging their machines in a nuclear war, the idea would be comical if this whole subject were not so deadly. Can you really imagine telling a working man, "A nuclear war has just started. Enemy missiles will strike in 30 minutes. We want you to spend your last minutes sandbagging your

machines!" Replies would be varied, but none would be printable in *the Rainbow*.

I appreciated Mr. Mickle's hope that his program may save a few American lives. Thus I say, "Be a real survivalist, and join the effort to prevent nuclear war and save 250 million Americans, along with a few hundred million Russians and perhaps a few billion other people."

Jeffrey Blaufarb
New York, NY

ON REVIEWERS' OPINIONS

Editor:

This letter is in response to the Software Review of *Final Countdown* by Paula Giese. Trying to be objective about the review I will say that she did a good job of evaluation.

She, like every one, has a right to their opinions on any subject whether it is about their favorite automobile or type of music.

However, her remarks about Southern sheriffs, cattle prods and quotes from Father Berrigan were as appropriate as the amount of her fee on the latest case she had as a private detective.

I hope that in the future, *Rainbow* does not turn into a political publication and that reviewers will confine their opinions to the subject at hand.

Stanley A. Parke
Franktown, CO

CLUBS, CLUBS, CLUBS

Editor:

I would like to inform your readers of a new Color Computer Club for users in the Utica—Rome—Western Mohawk Valley region of New York. We meet on the third Monday of each month at 7:30 p.m. in the Galaxy Room of the French Road General Electric Plant in Utica. For further information please contact: The Color Computer Club of Central New York, c/o Joseph Short, Secretary, 248 South Fourth Avenue, Iliion, New York 13357, (315) 895-7730.

Thanks for a great magazine!

Joseph D. Short
Iliion, NY

Editor:

The Toronto Color Computer Club has decided to make the writing of software for children with learning disabilities a club project. We have several talented programmers involved but could use some help from readers as to program ideas. We would particularly like to hear from educators and parents with suggestions for the type of programs that are required. Program descriptions should be as complete as possible and should be sent to Geoff Wells, The Dataman, Box 431, Sta B, Hamilton, Ontario, Canada, LBL 7W2. As programs are completed, we will make the programs available to *the Rainbow* for publication and also supply them on tape for the cost of the tape plus postage.

Geoff Wells
Ontario, Canada

Editor:

Anyone interested in learning more about Aggie Color Computer Group in the Bryan-College Station area can call for information at (409) 696-1656 or write me at 1301 Francis, College Station, Texas 77840.

Thank you for a good magazine on the Coco.

Louise Darcey
College Station, TX

Editor:

The Halifax-Dartmouth Color Computer User Group meets from 7 to 11 p.m. on the third Monday of each month at the main branch of the Dartmouth Regional Library in the auditorium. For additional information, write me at 1034 Wellington St. #703, Halifax, Nova Scotia, B3H 2Z9.

Bob Hamilton
Halifax, Nova Scotia

Editor:

For information about The Quad City CoCo Club, contact me at 4211 Seventh Ave., Rock Island, IL 61201.

John Greve
Rock Island, IL

Editor:

I would like to form a CoCo club in Huntington, W.Va. If anyone is interested in joining, call me at (304) 522-2872, or write me at 614 11th Ave., Huntington, WV 25701.

Robert Cox
Huntington, WV

Editor:

The Billings Color Computer Club in Billings, Mont., would like to hear from all clubs about what you are doing at meetings, etc. Write to Jayne Kenyon, 4306 Phillip, Billings, MT 59101.

Jayne Kenyon
Billings, MT

Editor:

The L.A. CC Users Group welcomes new members. For information contact Mark Mooneyham, 2227 Canyon Road, Arcadia, CA 91006.

Mark Mooneyham
Arcadia, CA

Editor:

I would like to form a CoCo club for Washingtonians. For information contact Jack Darling, P.O. Box 8827, Washington, D.C. 20003, or call (703) 780-6159.

Jon Tiffany
Washington, DC

Editor:

I am interested in starting a computer club in Austin, Tex. Persons may join regardless of the computer they own. The purpose of this club would be to exchange programs, games and ideas. Interested persons may contact me by writing to: David Karam, 1809 Dexter, Austin, TX 78704, or call me at (512) 442-6317.

Your magazine is excellent and getting better all the time (I have seen back issues). Keep up the great work.

David Karam
Austin, TX

P.S. My father would like to know if you get any correspondence from the International Users Group.

Editor:

Richmond, Va., CoCoNuts, call Randy Graham (320-0019 evenings and weekends) for information about our next meeting.

Randy Graham
Richmond, VA

Editor:

We are a group of about ten New York City Color Computer owners who meet once a month. Our members' expertise ranges from those who just got the CoCo out of the box a few months ago to one fellow who (the thought is almost terrifying) actually opens up his CoCo himself to add extra switches and make changes. One of our members can hardly wait to get a printer. Anyone in New York City wishing to join us should contact Ray Normandeau, P.O. Box 854, Times Square Station, New York, NY 10108-0854; (212) 392-1267, 24 hours.

Ray Normandeau
Long Island City, NY

Editor:

I'd like to start a *kids* (I emphasize that!) CoCo club in Puyallup, Wash. Please contact Chris Nitz, 6118 83rd St. Ct. E., Puyallup, WA 98371.

Chris Nitz
Puyallup, WA

Editor:

The Tucson 6809 Color Computer Club meets at my office the first Thursday of the month at 7:30 p.m. (door opens about 7 p.m.) at Kolb Road Chiropractic Center (yellow sign), 902 S. Kolb Rd., Tucson, AZ 85711, (602) 747-8233.

Michael A. Watts
Tucson, AZ

KUDOS

Editor:

Thanks for Dan Downard's article on Teletype interfacing in the February issue. That article alone was worth the price of the subscription (which my eleven year old son received as a Christmas gift). It helped me learn a little electronics and gave me a chance to use my assembler and disassembler.

Needless to say, not everything worked the first time. Some of the following observations may be helpful to others contemplating this project.

1) I substituted a 4N25 and a 2N2222 for the 4N33, which was unavailable where I live.

2) I used three or four 1800 ohm 1/2-watt resistors in parallel for the adjustable resistor R2.

3) I had to reverse the connections to Pins 1 and 2 on the opto-isolator because logic zero at the Color Computer serial port (—12V. at Pin 4) must cause current to flow in the 20MA loop.

4) For a 16K machine the values poked into locations 360 and 361 in line 290 of Listing 2 must be changed to point to the beginning address of the driver. (Jumping to non-existent memory has interesting effects!)

5) When I finally got both hardware and

software working, I still got numerous mistakes (e.g. @ instead of blank). I was able to correct these by slightly slowing the baud rate (*POKE* 149,2 : *POKE* 150,10) and increasing the carriage return delay (*POKE* 151,128).

6) I like the slash through the zero, not the oh, so I modified the driver to interchange these characters.

7) In order to print *Spectaculator* worksheets I covered Pins 7 and 8 (top and bottom towards back of the computer) with tape. Then the computer comes up in BASIC. I can first load and run the driver, then jump to *Spectaculator* with *EXEC &HC000*.

Again, thanks for a helpful article and a helpful magazine.

Robert W. Langer
Eau Claire, WI

JUST CLUE THEM IN

Editor:

We were pleased to see our program *Inspector Cluiseau* reviewed favorably in the March 1983 issue. We would like to assure readers that they can obtain a version of *Cluiseau* without the high speed *POKE* commands—just let us know with the order.

Susan Petrocci
Tucson, AZ

BOUQUETS AND BRICKBATS

Editor:

I want to again recommend Custom Software Engineering of Cocoa Beach, Fla. I bought their Disk Double Entry system last month.

Since I was having some problems getting the account numbering system to do exactly what I wanted it to do, I sent them some printouts reflecting all of the work I had done.

Melvin Hefter marked them up so that the system would do what I wanted, and returned them with a very nice letter that gave me additional insights into the system.

You can't ask for any better service than they gave me.

S. E. Clarke
Calabasas, CA

Editor:

Thanks for your help in finally obtaining my solution program from Snake Mountain Software. I am sure that their decision to send me the program is a direct result of your involvement in the matter.

The solution is a great program which I know I am going to enjoy very much. If this program is any example, Snake Mountain produces excellent quality software.

They do, however, have a lot to learn about customer relations. As a result, I won't be buying any more software from them in the future and I won't be recommending them to my friends. This is too bad, considering the apparent quality of their products.

Thanks again for your help. If possible, I have an even better impression of *the Rainbow* than I did before.

Jack O. Bevill
Mountain City, GA

Editor:

I would like to compliment one of your advertisers. I ordered a set of 64K chips from Spectrum Projects. The price was \$15 less than any other advertisement I'd seen. The chips arrived a little over a week later (and I paid for them with a check). Complete instructions were provided for both "D" and "E" board installations. I was very surprised at the speed in which I received my order! Keep up the good work?

James D. Nicholson
Columbus, OH

SLEW POKE

Editor:

For all you *Donkey King* addicts who find three men are just not enough, try this. After loading the program but prior to executing, type from the keyboard:

POKE 12914,A

The "A" represents the number of men you would like. Substitute any number in place of the A.

Mike Huffman
Glendale, AZ

HINTS 'N' TIPS

Editor:

As I was playing a game on my 32K CoCo, a thought dawned on me. I was wondering if there was some way to give me extra men (ships) on some of the more challenging games in my program library. As I attempted to do so I found it was easier than I imagined. Here are the results on three of my newer programs:

After loading type,

Donkey King *POKE* 12904, (1-200)

Invasion *POKE* 7446, (1-40)

Dunkey Munkey . . . *POKE* 15121, (1-100)

Note: on *Donkey King* specify a practice game.

Harry Sawyer
Watchung, NJ

Editor:

Enjoy reading your magazine—like the articles. Hate the typing...so I think the following will help anyone keying in *Half Life* by D.C. Lengyel, page 35, March 1983 issue. Rather than type in all that data, how about:

55 I=0

60 FOR B=1TO29 STEP 2: FOR
A=0TO45 STEP 5

70 I=I+1

75 X(I)=A:Y(I)=B

80 NEXT A:NEXT B

Then you can delete lines 90-128.

Should be easier.

Harry Poster
S. Hack, NJ

Editor:

One evening after a long period of use, my computer no longer recognized when a key was struck. A call to a local Radio Shack set me at ease. It seems that if one leaves the joysticks plugged in, and conditions are right (or wrong depending on your point of view), the joysticks somehow, sometimes, block the keyboard signal. I unplugged them and no more problem with my keyboard locking up.

Jim Taylor
Miami, FL

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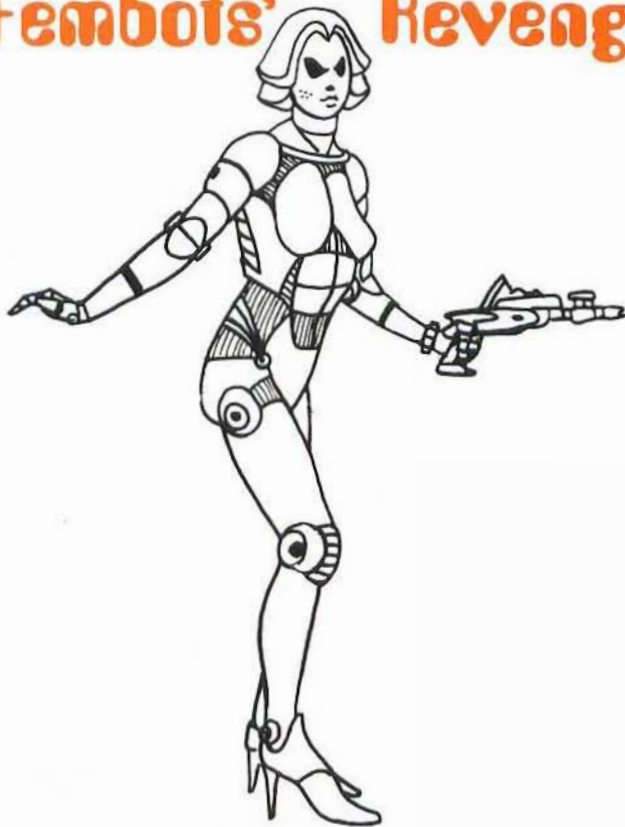
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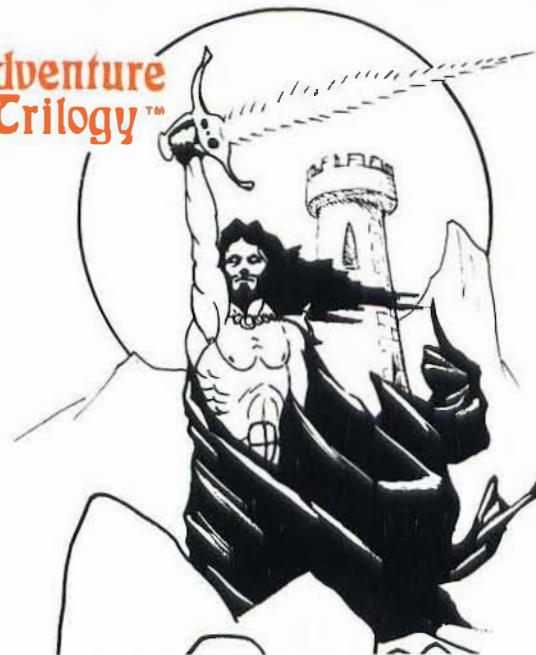
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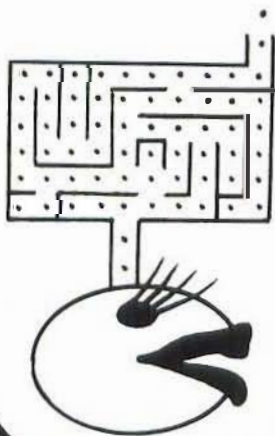
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Print #-2,

I have only to think back to a year ago at this time to remember how excited we were! *The Rainbow* had only then received its first typesetting unit and plans were a-buzz for the First Anniversary Issue in July. We had a few surprises up our sleeves then — a four-color cover, typeset copy and some other really interesting things. And we were really impressed by the size, 64 pages in total.

Now, we are in the middle of preparations for the Second Anniversary Issue. And it is going to be something. I hope that you will be impressed with some of the features which we plan to include. And, even more, I am certain you will be doubly impressed with a major innovation which we will be including with the July issue next month.

This is *not* the Anniversary column — that comes next month. But it is a sort of preview to the next issue in that I think you will really enjoy the surprise we have planned for you. It is truly something which has never been done by a computer magazine before — at least to our knowledge — and I think it will be the talk of the industry. Too, we believe it will be something that will be useful, as well. Don't miss the July Second Anniversary Issue! It is one you will be wanting to have for sure!

Portable Computing

MAGAZINE

By the way, I want to take this time to introduce a new publication to those which we at Falsoft, Inc., our parent company, will be introducing in a month or so. The title is *Portable Computing Magazine*, and it is designed primarily for the new TRS-80 Model 100 Portable Computer.

You may have seen a mention of this new computer in *The Pipeline* last month. We think it is really sensational and believe *Portable Computing Magazine* will be able to aid in the growth and development of this system much as we hope it has been able to for the Color Computer.

Nope, we certainly do not plan to slacken our interest in, excitement for and affection directed at CoCo. But, just as we have grown from 64 pages in July, 1982 to 276 pages today — just 11 short months — we have grown from two members of our staff to almost 20 full-time. I believe we can easily support a second magazine without doing injustice to either computer system.

As did *The Rainbow*, *Portable Computing Magazine* will start small and expand. And, although it will not start quite as small as did *the Rainbow* (two pages in July, 1981), we expect it — like its big brother — to grow and expand. I hope you will take a look at the Model 100 and at *Portable Computing Magazine* when it appears. And yes, we're taking subscriptions at a charter rate of \$23 until July 1 — \$28 afterwards. Canadian and foreign subscriptions will be slightly higher.

So, where's Falk's picture this month, you might wonder. It is missing because we wanted to show you the logo for *Portable Computing Magazine* instead. For those of you who want something to throw darts at, it'll be back next month.

(continued on page 78)

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KEYS OF THE WIZARD-Super adventure game. Hundreds of rooms filled with treasures, magic spells, traps and puzzles. Save game in progress. 16k.
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GALAX ATTACK-If you want a challenge, this is it! Patterned after Galaxians. An arcade quality game. 16k and joysticks required.
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SUB HUNT-As the commander of a destroyer, you must destroy as many enemy subs as you can before they destroy you. 16k extended basic.
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ALCATRAZ II-No one escapes from Alcatraz II, not even you! Think you can be the first? 16k extended basic.
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COSMIC SUPER BOWL-Fast action interstellar football. Five skill levels to provide a challenge. One or more players. 16k
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GHOST GOBBLER-Four relentless ghosts intent on your destruction. Chase your gobbler around this super maze. Best of the pac-man type games. 16k and joysticks required.
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LOTHAR'S LABYRINTH-An excellent version of the popular word search puzzle. The computer hides up to 48 words on the screen in all directions. Use the computers words or your own. Extended basic.
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PLANET INVASION-If you enjoy Defender, you will love this one. Lots of fast action. 16k and joysticks required.
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SPACE RACE-Maneuver yourself around a race track in space, but beware of alien ships, the collectors, swarms and bezerkers they are all out to do you in.
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DEFENSE-If you like Polaris and Missile Command this game is for you. A must for your collection. 16k and joystick required.
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PIRATES AHOY-Find a sunken ship and treasures in this witty and humorous text adventure. 32k.
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COLOR ZAP-Super space game! Dodge incoming photon torpedoes before they penetrate your defenses. 16k and joysticks required.
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**TOM MIX
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DONKEY KING-Exciting sound and graphics, four screens like the arcade game. Never before have you seen a game like this for your Color Computer. The best! Requires 32k.
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WAR KINGS-Shield your castle against cannonball attack and deflect them towards your opponents castle. 16k extended basic and joysticks required.
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PROTECTORS-Enemy fighters drop bombs on your city. Destroy them before they destroy your city. Just like the Defenders arcade game. Requires 32k.
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KATERPILLAR ATTACK-A fast-paced arcade game. Rave reviews by color computer magazines. 16k and joysticks required.
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STORM-A real TEMPEST of a game. Exciting and colorful. 15 battlefields, 9 levels of play.
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EL DIABLOERO-You awake, dazed and confused, in the middle of the desert. You have been learning techniques of sorcery from an old man who lives in these parts. He told you of his enemy, an evil sorcerer, "Diabloero", now your teacher is missing and you are alone! Pure adventure.
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DOODLE BUG-Your lady bug hustles through an intricate maze of barriers and turnstiles, eating dots, letters and hearts. Exquisite sound and graphics.
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RAIL RUNNER-Your engineer must scurry over the tracks of the busiest switch yard ever, to rescue the hobo's on the other side of the tracks.
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SHARK TREASURE-You must dive through shark infested waters to bring back treasures from the ocean floor.
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DEATH TRAP-As a tank commander it's your job to find a safe passage through the maze of city streets that contain mines and other hazards.
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OKI-PRINT-Is a basic language program that is designed to do high resolution screen dumps from the Radio Shack or TDP-100 Color Computer, to an Okidata Microline 82A printer. OKI-PRINT will dump any P MODE M, P(N)=MODE, P=PAGE). If the P MODE is 1 or 3 (which are color modes) the printer will attempt to shade the different colors in lighter and darker intensities of black in order to make them more recognizable. Extended basic required.
CASSETTE \$19.95

DISASSEMBLER 6809-This is an interactive disassembler that allows you to call and examine subroutines or look at labels in an ASCII mode without losing your place in the disassembly. It is primarily a SCREEN oriented disassembler, but does have printer output capability.
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ANIMATED HANGMAN-Playing hangman has never been so much fun. He winks..he blinks..he almost lives! An outstanding game for the whole family. Fun and educational.
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CONCENTRATION/CONNECT UP 4-Concentration is a memory type game. You are trying to match up the screen displays. Connect up 4 is a game where you try to match 4 dots of color in a row, but the person that you are playing with is trying to do the same thing. A game of strategy.
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HURDLERS-You are a hurdler running down the track trying to clear the jumps. If you miss, you fall flat on your face. Requires 16k extended basic.
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CAVE HUNTER-Maneuver your way through a spooky cave to retrieve the treasures at the bottom. 16k and joystick required.
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BUILDING JUNE'S RAINBOW

The Printed Word Issue . . .

Our May-becomes-June get ahead edition . . .

Some things defy easy explanation. You can see it in people's eyes when they don't really understand. With a perplexed look they mutter something like, "Well, I can see where you're coming from," even when you suspect they don't have the foggiest glimpse. Such was the case when I tried to explain why I decided to spray paint the vintage family typewriter and make a planter out of it.

My grandmother would have understood, and never have questioned my motives. Of course, she might have preferred to make a lamp out of it. She and I shared a feeling of sentimentality over utilitarian items. But, for those of you who can drive the old family car to the car lot without a twinge of emotion, who wouldn't dream of placing an old wagon wheel in the garden and, otherwise, can't "relate" to a bit of whimsicality, let me just say that making a planter out of the old Royal seems, to me, like the "highest and best" use of a machine whose turn

has come, and gone, in this computer printer age.

This month we're focusing on printers with a baker's dozen articles directly related to the Color Computer's most popular peripheral! A centerpiece is our printer control code conversion chart on page 156. And Dick White's printer utility on page 198 is a guaranteed crowd pleaser. The LLIST is too long to mention them all, but check them out—including our printer reviews.

Of course, as always, we aim for a balanced mix of article and program offerings. For armchair pilots, we have "Flying the Sopwith CoCo," a toughy of a Simulation program. (Are you developing an entry for our Simulation contest?) And, for gamers, our John "Crazy" Fraysee masterwork, *Rainbow Roach*, is a fast-moving, arcade-like run-for-your-lifer that'll slay you for sure. Get started on page 38 with a bit of Fraysee-ness that seems a lot more plausible than those frogs on logs who drown every time they hit the water.

In addition to more than two dozen reviews, from *Autoterm* to *Zaxxon*, there's plenty for the serious Color Computer user from our expert panel of contributing editors, including our new technical editor, Dan Downard, who's out to debug the magazine as well as develop a hybrid bug of his own creation.

Among our four articles on education, Dr. J. C. Kretschmer's piece on using CoCo to estimate the difficulty level of reading material is especially intriguing.

All in all, it's 276 pages all for CoCo, all for about a penny a page on the newsstands. That sounds hard to beat, but here's a proven method: pull out our subscription card and mail it before midnight tonight—then you'll be among the ranks of those in the CoCo Community who never worry about arriving at the local bookstore too late and who get all that's Under the Rainbow for just \$22 a year.

—Jim Reed

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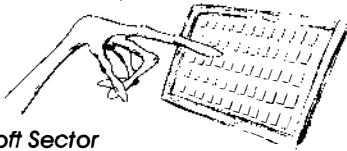
16k minimum

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From Soft Sector

NEW — Extra Terrestrial Typing — Those famous fingers are familiar — none other than E. T.! His sensitive five fingers expertly tutor from novice to expert. You couldn't ask for a friendlier teacher— watch closely as E. T. points the way.

16K Tape, \$19.95



CATERPILLAR

From Soft Sector Marketing

This is the fast-action arcade game you've been waiting to play at home! You must hit mushrooms and caterpillars — segment by segment — moths and tumble bugs. The challenges: they are all moving; when hit they split into additional segments or metamorphose into different shapes; when you destroy a caterpillar, the new one that replaces it is a segment longer than the original!

16K Tape, \$19.95



VOYAGER I

From Avalon Hill

You're on board a spaceship infested with killer robots in this graphic science fiction game. You must clear the 4-level 144-location ship of robots and arm it to self-destruct. Can you do it and escape before you, too, are blown up? High-speed graphics are represented in 3-D perspective representing your eye's view; with instant switching to floor plan maps. Extended BASIC required.

16K Tape, \$19.95

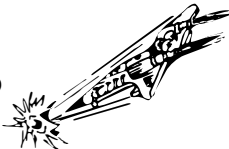


COLOR ZAP

*By Frank Smith
From Spectral*

Super space game written in machine language with highest resolution graphics. Avoid the incoming photon torpedoes as defensive fighters appear and attack your ship. Guaranteed fun and fast action. Zap the enemy! Joystick required.

16K Tape, \$9.95



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3 D TIC-TAC-TOE



By Scott Adams

From Adventure International

A real family favorite with 8 separate skill levels. Use four 4X4 boards stacked one atop the other for Tic-Tac-Toe you never imagined. This real-time game features sound, optional joystick and the challenge and excitement to thrill your friends and family.

16K Tape, \$14.95



DRAGONQUEST

By Charles Forsythe

From Programmer's Guild

Search for the Monarch of Dragonfolk in a desperate race against the sun. You, Sir Knight, must rescue and return the kidnapped Princess before nightfall. Find the weapons, food and magical items you need while exploring unfamiliar lands in this magnificent machine language adventure. Can you vanquish Smaegor and beat the setting sun? Extended basic required.

16K Tape, \$15.95

WAR KINGS

From Tom Mix

A challenge game for two with three skill levels. Battle to save your King and Castle. Not only can you protect your castle by moving your shields, but you can deflect the cannonball towards an opponent's castles. High resolution graphics and outstanding sound. Requires extended basic and joysticks.

16K Tape, \$19.95



SOLO POOL

From Tom Mix

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answer: Gary Wick

Here it is. A Trivia Game that can be used by every 80C user. You don't need more than 4K and you don't need Extended BASIC. If you do have more memory or Extended—Great, your Trivia Game will be that much better.

The program listed below allows you to add your own sounds and graphics. Create your own scoringscheme or the amount of time allowed to players to answer each question. This game has been designed so that you can change it to your own tastes. Best of all, for those who don't program much, it's easy to make up your own Trivia Game with this program. You can make it a Sports, Rock & Roll or Old Movie Stars Trivia Game. Whatever you want.

This game has been tested at several social gatherings by non-computer people and has proven to be popular. Rules for this game are:

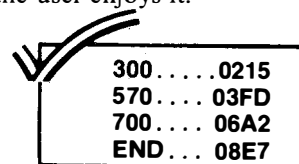
- 1) One player per game.
- 2) Player earns +10 points for correct answer, —5 points for incorrect answer.
- 3) If player doesn't enter an answer within 5 seconds, the game ends.
- 4) Game also ends when program runs out of questions. (Twenty-five questions is enough. More than that can tire or bore the player.)

You're sure to enjoy this very versatile game.

Here is how you can design the game to your own tastes:

Lines	Program Description
10-100	Sets score(s) to zero and starts the game.
120	N is the number of trivia questions.
140	A\$ are the trivia questions.
160	B\$ are the trivia answers.
240-330	This loop checks to see if input to the keyboard equals B\$, the correct answer. Line 300 is the time given player to complete his (her) answer. Line 270 is the time given player to enter an answer.
350-400	Program goes to this routine if the answer is wrong. This is a good place to insert your own sounds and graphics.
430-510	Program goes to this routine if answer is correct. This is a good place to insert your own sounds and graphics.
570-810	Insert your own questions and answers.

Obviously, this game is very simple. Some of you more experienced programmers are probably wondering, "Why didn't he do this?" or "Why didn't he do that?" I did write it other ways but found that this simple version was the most popular. It goes to show that a program doesn't depend on its complexity but on whether the user enjoys it.



The listing:

```

0 *****TRIVIA GAME*****
1 *****GARY WICK*****
2 *****MADISON, WI*****
10 S=0
20 FOR P=1 TO 600: NEXT P
30 CLS
40 PRINT @233,"TRIVIA QUIZ"
50 FOR K=1 TO 850:NEXT K
60 CLS(4)
70 PRINT@ 52,"SCORE:"S
80 INPUT"ENTER YES WHEN READY-RE
ADY";Y$
90 IF Y$="YES" THEN 100 ELSE 80
100 CLS
110 N=N+1
120 IF N=25 THEN GOTO 520
140 READ A$
160 READ B$
170 PRINT @34,"FOR TEN POINTS...
"
180 PRINT @96,A$
190 T=0
200 T=T+1
210 SOUND 128,1
220 FOR Q=1 TO 390:NEXTQ
230 IF T=10 THEN 240 ELSE 200
240 PRINT@ 298,"ANSWER NOW"
250 X$=""
260 T=0
    
```


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```

270 IF T=100 THEN GOTO 515
280 Z#=INKEY$
290 T=T+1
300 IF T=300 THEN GOTO 340
310 X#=X#+Z$:PRINT @ 360,X$
320 IF X#="" THEN GOTO 270
330 IF X#=B$ THEN 430 ELSE 280
340 CLS
350 SOUND 100,10
360 PRINT @225,"SORRY, YOU'RE WRO
NG"
370 FOR Q=1 TO 1000:NEXT Q
380 S=S-5
390 CLS
400 GOTO 20
430 SOUND 200,15
440 S=S+10
450 CLS
460 C=0
470 C=C+1
480 FOR Q=1 TO 300:NEXT Q
490 CLS(C)
500 PRINT@235,"CORRECT!!!";
510 IF C=7 THEN 20 ELSE 470
515 CLS(8):PRINT @ 69,"SORRY, YO
U'RE TOO SLOW.":FOR Q=1 TO 1000
:NEXT Q
520 CLS

```

```

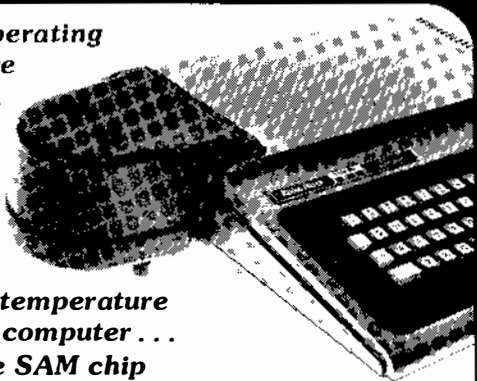
530 PRINT @ 202,"END OF GAME"
540 PRINT @ 38,"YOUR SCORE IS:"S
550 PRINT @ 353,"TO PLAY AGAIN,E
NTER RUN"
570 DATA NAME RIN TIN TIN'S OWNE
R,RUSTY
580 DATA HOWDY DOODY LIVED IN -?
,DOODYVILLE
590 DATA WHO PLAYED ALAN BRADY O
N THE          DICK VAN DYKE SHOW
?,CARL REINER
600 DATA FULL NAME OF BATMAN'S B
UTLER,ALFRED PENNYWORTH
610 DATA WHO PLAYED MRS PEEL IN
THE          AVENGERS?,DIANA RIGG
620 DATA THE VOICE OF MR MAGOO?,
JIM BACKUS
630 DATA IN CAR 54 WHO PLAYED OF
FICER          MULDOON?,FRED GWYNNE
640 DATA WHAT WAS BARNABY JONES'
OFFICE          NUMBER?,615
650 DATA WHO PLAYED THE PENGUIN
IN BATMAN,BURGESS MEREDITH
660 DATA WHAT IS "KING OF BEERS"
?,BUDWEISER
670 DATA ANDY TAYLOR WAS SHERIFF
OF WHAT TOWN?,MAYBERRY
680 DATA POPEYE'S FOE IS-?,BLUTO
690 DATA ERIC CARTWRIGHT'S NICKN
AME WAS-?,HOSS
700 DATA HEAD OF P&O(SECTION I)
FOR UNLCE?,ALEXAND
ER WAVERLY
710 DATA COMMANDER OF FORT APACH
E          ON RIN-TIN-TIN?,
LIEUTENANT RIP MASTERS
720 DATA NAME THE MILLIONARE,
JOHN BERESFORD TIPTON
730 DATA SERGEANT JOE FRIDAY'S B
ADGE NO.?,714
740 DATA NAME CISCO KID'S HORSE,
DIABLO
750 DATA CASPER'S HORSE GHOST FR
IEND?,NIGHTMARE
760 DATA WHO WAS MR. WIZARD?,DON
HERBERT
770 DATA ACADEMY AWARD FOR BEST
PICTURE          OF 1961?,WEST
SIDE STORY
780 DATA ACADEMY AWARD FOR BEST
PICTURE          OF 1973?,THE
STING
790 DATA BEATLE'S LAST ALBUM?,
ABBEY ROAD
800 DATA ACADEMY AWARD FOR BEST
SONG          OF 1961?,MOON
RIVER
810 DATA NAME ZORRO'S SERVANT,BE
RNARDO

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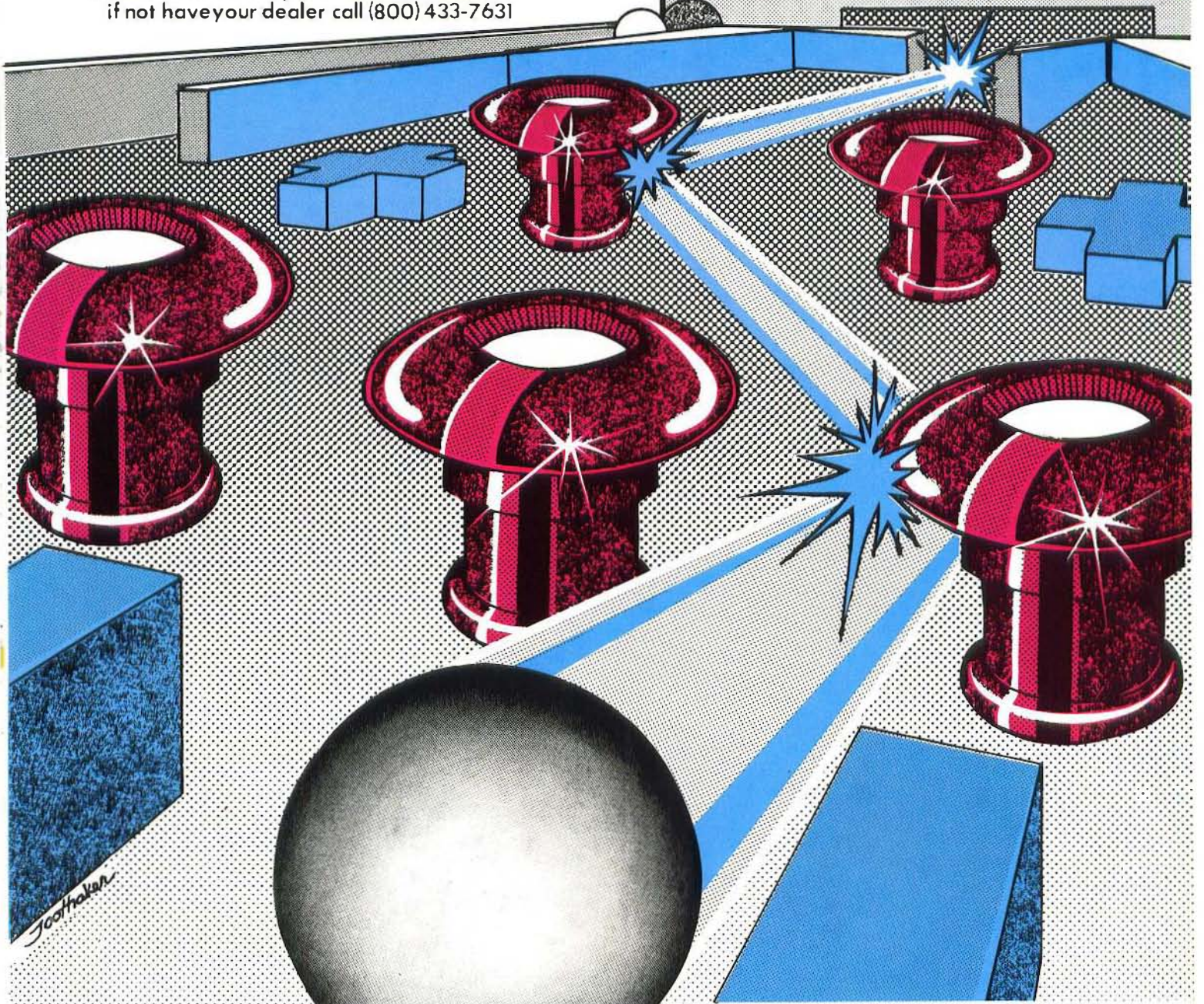
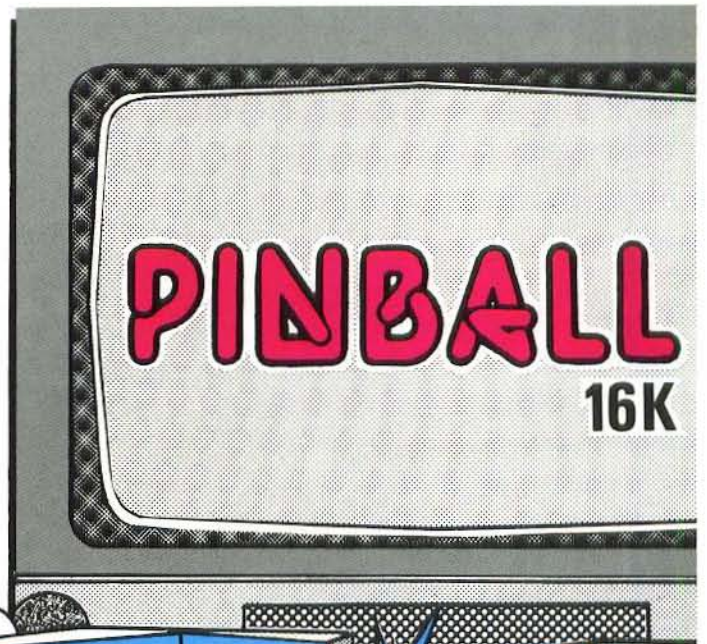
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Building A Color Computer To EPSON MX Printer Interface

By Dennis Snyder

You have finally got your own Radio Shack TRS-80 Color Computer home and running. Like most of us, you soon develop a burning desire to make listings of your programs, or to do fancier things like word processing and budgets. So you read all of the literature on printers and decide on one of the lowest Epson MX series printers. There are three models: the MX-70, the MX-80 and the MX-100. Since descriptions of these printers have been covered sufficiently elsewhere, I will not go into them here.

After making your selection and rushing home with it, you hurriedly unpack it, itching to see, in print, all of those great programs that you wrote. What? It needs a cable! You rush back to the store and then find out the bad news—there is no stock cable to connect your Color Computer to the Epson. And, the Epson requires either a parallel Centronix plug or a serial converter board. Epson happens to make two different boards; one is strictly a serial to serial converter and the other is a serial to parallel converter with 2K of buffer memory. Both plug into an internal, 26-pin, 100 mil center connector. However, at discount prices, these cost approximately \$70 and \$140 respectively. The \$70 Serial RS-232C/Current Loop Serial Interface (Cat. Nos. 8140 and 8141) model provides a general purpose RS-232 interface and a TTY current loop interface, much of which is superfluous to a Color Computer application. Epson's Serial Interface with 2K of buffer memory board is nice with its own 8048 microprocessor on it, but at about half the price of the Color Computer, it seems at odds with the objectives of a low cost system. If you bought the MX-70 or the MX-100 which come with built-in graphics capability, or you intend to eventually add the Epson "Graphtrax-80" graphics ROM set, you will need either a parallel Centronix interface or the 2K of buffer RAM to support the graphics mode. This is necessary because a line of bit-image graphics rapidly fills the internal buffer of the MX printer.

At this time, although I have the MX-100, I do not have the need for its graphics capabilities. Therefore, I came up with a very simple, 2 IC design which interfaces the serial,

RS-232 I/O port of the Color Computer to the internal serial port of the MX printers.

Construction

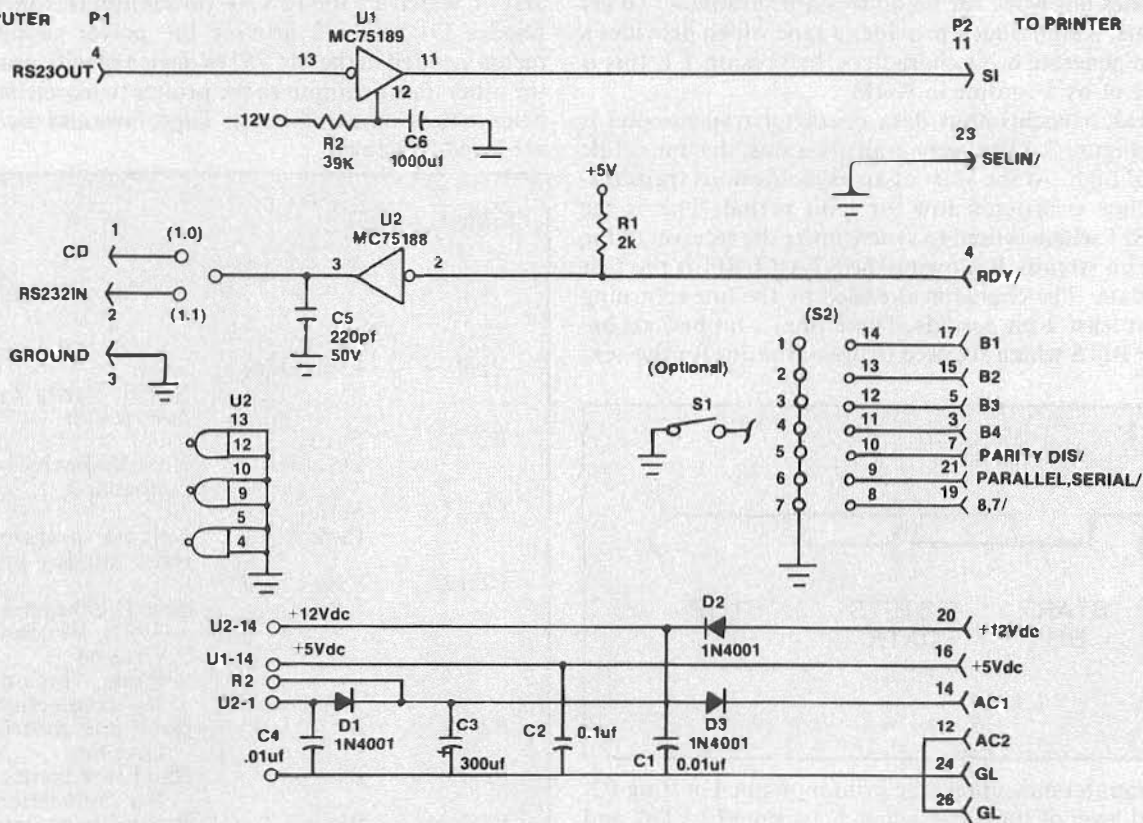
Although the MX series' PC boards appear very similar, there are some subtle differences between them and definite differences in the EPROM programs in each machine. However, the Epson serial interface boards are identical with all models which implies that area of the circuitry is at least the same. The serial interface circuit described in this article has been used successfully with both the Epson MX-80 and MX-100 printers, and should work with the MX-70. It will handle alpha-numerics and graphics characters but does not provide the necessary buffer for bit image graphics. As can be seen in the schematics (Figure 1), the circuit consists of only two ICs, a few resistors, capacitors and diodes. I built mine on a small, 2.5 x 2.5 inch perf board using point-to-point wiring. Rather than using a full, 25-pin EIA connector, I used a smaller connector since the Color Computer's I/O port requires only 3 wires.

With the small number of components used in the circuit, wiring of the PC board and installing the components is very straight forward and not critical. However, it is necessary to ground all of the unused inputs of the MC75188, or your printer output will be garbled, if the circuit works at all. I have wired in S2, the DIP switch, because I may use my printer with other kinds of computers. If you intend to use your printer with only a Color Computer, you may want to eliminate this switch and hardwire in these functions. Switch S1 is optional and can be mounted on the small, removable plastic panel at the rear of the printer. Since I dislike moving equipment with cables dangling, I also installed a connector for the printer cable in this panel.

I had a hard time finding the 4-pin DIN plugs that Radio Shack uses, so I opted to buy their 4-pin to 5-pin cable which is a little longer, and the same price as their 4-pin to 4-pin cable. I removed the 5-pin connector and attached a connector from my spare parts box. You could use any 4+ pin connector here, or wire it directly to the serial interface

Figure 1

EPSON MX SERIAL INTERFACE



board. Before making the 4-wire connections, it is necessary to determine whether your Color Computer has a Version 1.0 or 1.1 BASIC ROM. There are several ways of determining this; however, the easiest that I have found is to do a simple EXEC 41175 which will then print on the screen the Radio Shack heading and the BASIC version.

The Color Computer transmits data to the printer and, in return, expects an acknowledgement. Thus, on the computer to serial I/O interface, data is sent on the RS-232 Out line. Apparently, when Radio Shack and Microsoft were defining Version 1.0, they did not completely understand what the other was doing. Some problems arise in receiving the acknowledgement if you have the Version 1.0 BASIC ROM. Depending on the BASIC ROM version, the acknowledgement is input on either the Carrier Detect (CD) line or the RS-232 In line. Thus, the printer end of the cable is wired as follows, depending on your BASIC version:

Version 1.0 — The printer's RDY (Ready) output is connected to the computer's CD line.

Version 1.1 — The printer's RDY output is connected to the computer's RS232 In line.

Another variation in the wiring, due to the different ROM versions, is the connection of the 7- or 8-bit character options. If you have:

Version 1.0 — Ground pin 19 of the 26-pin connector, thereby putting the MX printer in the 7-bit mode. If you always intend to run the computer with Radio Shack's free PTFX4k or PTFX16k program that puts the computer's serial output in an 8-bit format, then follow the Version 1.1 instructions below.

Version 1.1 — Do not connect pin-19 of the 26-pin connector. This places the printer in the 8-bit mode.

Parts List

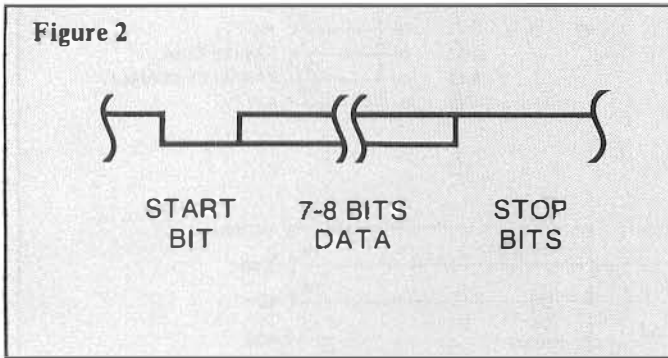
- U1 MC75188 TTL to RS232 Driver
- U2 MC75189 RS232 to TTL Receiver
- C1 0.01 microfarad Capacitor
- C2,C4 0.1 microfarad Capacitor
- C3 100 to 440 microfarad Capacitor, 35 VDC
- C5 220 picofarad Capacitor
- C6 1000 picofarad Capacitor
- D1,D2,D3 1N4001 Diode (or any other diode capable of 25ma @ 35 VDC)
- R1 2k, 1/4 watt Resistor
- R2 39k, 1/4 watt Resistor
- S1 SPST Switch
- S2 DIP Switch, 8-pole, single throw (optional)
- P1 Radio Shack 4-pin to 5-pin DIN Cable, No. 26-3009
- P2 26-pin Header Connector, 2 rows, 100 mil centers
- * Male and female connector pair, minimum 4-pins (opt.)
- * 2.5 x 2.5 inches 100 mil center, perf board
- * 1 14-pin DIP sockets
- * 1 26-pin DIP socket (optional)

Circuit Operation

The Color Computer transmits data to the printer using a software generated, asynchronous serial protocol via a PIA's output pins and the RS232 Out line. As previously

mentioned, there is a bug in Version 1.0 as it transmits only a 7-bit character. This is fine for transmitting ASCII characters but does not work for bit addressable graphics. To get around this, Radio Shack provides a tape which provides a routine to generate 8-bit characters. In Version 1.1, this is taken care of by a routine in ROM.

A typical asynchronous data character transmission is shown in Figure 2. In between transmissions, the line is idle and is held high. At the start of an asynchronous transmission, the line is brought low for 1 bit period. This is the START BIT which is used to synchronize the receiver to the incoming bit stream. Following the START BIT is the 7-or 8-bits of data. The character is ended by the line returning high for at least 2-bit periods. These final 2-bit periods are the STOP BITS which are used to preset the line for the next character.



The computer data enters the printer on pin 4 or Plug P1. The signal level of the data swings between +12 VDC and -12VDC, and enters pin 13 of U1. U1 is a Motorola MC75189 EIA RS232 receiver and level shifter which lowers the input voltage to the standard TTL levels of 0 to +5 VDC. This +VDC signal now becomes the Epson's Serial-In line and is presented to the printer on P2-11.

The only other active signal on the serial I/O board is RDY/, which is output by the printer on P2-4. RDY/ is driven by an open collector device and requires pulling-up through resistor R1 to +5 VDC. The Motorola MC75188 line driver is also a level shifter which converts the 0 to +5 VDC RDY/ signal to +12 and -12 VDC. The + and - 12 VDC output signal is now connected to CD or RS232 In as described earlier. This signal from the printer tells the computer when the printer is ready to accept another data character. If you have trouble getting the printer to receive data, watch the printer's Ready light. The Color Computer always sends the first character without checking the printer's status. If the Ready light flicks OFF and then back ON once, then the data character is being received by the printer. The computer will not send a second character until the printer acknowledges receipt of the first character, which, of course, cannot happen until the proper RDY/ to ED, or RS232 In, connection is made. Another technique would be to peek at the PIA inputs and verify that the line was high. Thus, if the printer is ready then:

```
Version 1.0 — PRINT PEEK(65313)
              Returns an even number
Version 1.1 — PRINT PEEK(65314)
              Returns an even number
```

Capacitor C5 is possibly not necessary in this simple system but is generally recommended to match the MC75188's slew rate to that of the LM330 input circuit of the Color Computer.

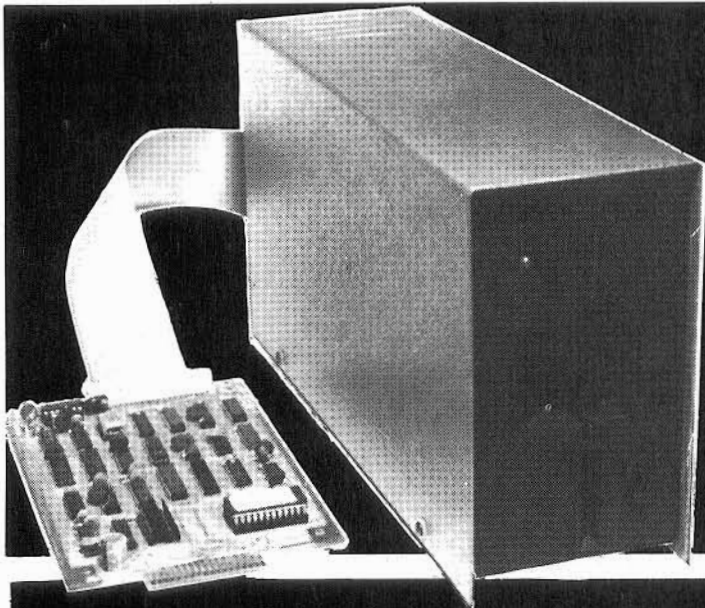
The -12 VDC supply for the circuit board is generated by the half-wave rectifier formed by D3 and C3 across P2-12 and 14, which are the 12 VAC power inputs from the printer. Diodes D1 and D2 provide the power supply isolation recommended in the MC75188 device specification. Most of the other lines are input to the printer to match its characteristics to the Color Computer. These lines and their functions are listed in Table 1.

Table 1:

P2-9	Even Odd/	Selects Parity Type—No connection
P2-7	Parity Disable/	Enables Parity—No connection
P2-21	Serial-Parallel	Selects printer's data input mode—ground
P2-19	8 Bit-7 Bit/	Selects character length—7 bits, Version 1.0—Ground—8 bits, Version 1.1—No connection
P2-17	B1	Baud rate control 1—Ground
P2-15	B2	Baud rate control 2—No connection
P2-5	B3	Baud rate control 3—No connection
P2-4	B4	Baud rate control 4—600 pbs = No Connection—2400 pbs = Ground
P2-23	SELIN/	Printer select—Ground

Use of switch S1 is optional, but it allows us to take full advantage of the Color Computer and Epson printer. Normally, after power-on, the Color Computer outputs data to the printer at the rate of 600 bps. I use the term bps (bits-per-second) which is generally more accurate than baud rate. Baud rate defines the number of data bits per second and excludes synchronization and framing bits such as the START and STOP bits. For short transmission, 600 bps is adequate, as the time required to print a line at the Epson's 80 cps is much longer than the transmission time. However, if you are printing as much as half a page or more, speeding up the transmission rate provides a significant time savings. Fortunately, both machines can operate at 2400 bps. The printer requires a mere flip of the switch S1 and the Color Computer requires a *POKE* 150,18. A *POKE* 150,87 returns the computer to 600 baud. Just remember, the computer and the printer must agree on bit rate.

Despite the best intentions of Epson's manual writers, getting the right combination of switches on the printer so the Color Computer can communicate with it is sometimes frustrating. Figures 3 and 4 illustrate the combinations that have been used successfully with the MX-80 and MX-100. That about covers everything needed to get your computer and printer talking to each other.



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Figure 3

MX-100 Switch Settings

	Position	Condition
Switch 1	1	ON
	2	OFF
	3	OFF
	4	OFF
	5	OFF
	6	ON
	7	ON
	8	OFF
Switch 2	1	ON
	2	ON
	3	ON
	4	OFF

The following listing is a short print demonstration which can be used to verify your circuit's operation and illustrate the use of the various character codes used with the Epson printer. Note that when using the Escape codes with other character codes, there is no punctuation between the character codes, i.e., to turn on the emphasized character mode, you enter this line, followed by your text:

```
PRINT#-2,CHR$(27)CHR$(69)"YOUR TEST"
```

In comparing the MX-80 manual and the MX-100 manual I found an interesting anomaly; the MX-100 manual does not describe use of produce Double Strike printing on the MX-100. Another problem that I have found with the Color

The listing:

```
10 POKE 150,18 'set 2400 bps
20 A$="This is "
30 B$=" printing."
40 PRINT#-2,A$"NORMAL"B$
50 PRINT#-2,CHR$(27)"E"A$"EMPHAS
IZED"B$
60 PRINT#-2,CHR$(27)"F" 'turns
off emphasized mode
70 PRINT#-2,CHR$(27)"G"A$"DOUBLE
STRIKE"B$
80 PRINT#-2,CHR$(27)"H" 'turns o
ff double strike mode
90 PRINT#-2,CHR$(27)"E"CHR$(27)"
G"A$"EMPHASIZED, DOUBLE STRIKE"B
$
100 PRINT#-2,CHR$(27)"F"CHR$(27)
"H" 'returns to normal print
110 PRINT#-2,CHR$(15)A$"CONDENSE
D"B$
120 PRINT#-2,CHR$(14)A$"CONDENSE
D, DOUBLE WIDTH"B$
```

Figure 4

MX-80 Switch Settings

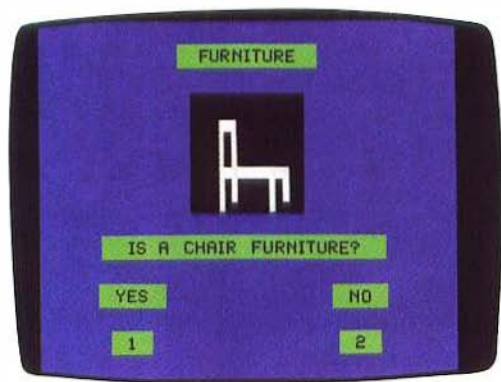
	Position	Condition
Switch	1	ON
	2	OFF
	3	OFF
	4	OFF
	5	ON
	6	ON
	7	OFF
	8	ON
Switch 2	1	ON
	2	ON
	3	ON
	4	OFF

Computer's BASIC ROMs lies in setting the printer line width. According to the Color Computer manuals, it should be possible to Poke new line widths into location 153. However, that does not seem to work as the computer continues to output 132 characters per line. If you have a MX-80, this probably will never bother you. However, the first time you try to list a program on 80 column paper on your MX-100 you will see the print head running off the paper and across the platen. Of course, you will need to study your Epson printer manual thoroughly and experiment, to really explore the capabilities of this fine printer. However, I am sure you will enjoy this combination of the TRS-80 Color Computer and the Epson printer.

Time to LList!

```
130 PRINT#-2,CHR$(27)"G"A$"CONDE
NSED, DOUBLE STRIKE"B$
140 PRINT#-2,CHR$(14)A$"CONDENSE
D, DOUBLE STRIKE, DOUBLE WIDTH"B
$
150 PRINT#-2,CHR$(10)CHR$(27)"H"
'turns off condensed, double st
ike
160 PRINT#-2,A$CHR$(14)"DOUBLE W
IDTH"CHR$(20)B$
170 PRINT#-2,CHR$(14)CHR$(27)"E"
A$"DOUBLE WIDTH, EMPHASIZED"B$
180 PRINT#-2,CHR$(27)"F"'turns o
ff emphasized
190 PRINT#-2,CHR$(14)CHR$(27)"G"
A$"DOUBLE WIDTH & STRIKE"B$
200 PRINT#-2,CHR$(27)"H"'turns o
ff double strike
210 PRINT#-2,CHR$(14)CHR$(27)"E"
CHR$(27)"G"A$"DOUBLE WIDTH & STR
IKE, EMPHASIZED"B$
220 PRINT#-2,CHR$(27)"F"CHR$(27)
"H"'turns off double strike & em
phasized
```


RADIO SHACK TRS-80® COLOR COMPUTER Software* Update



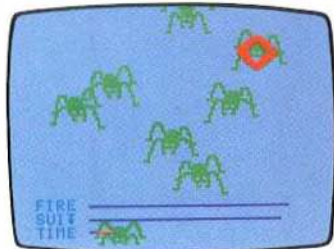
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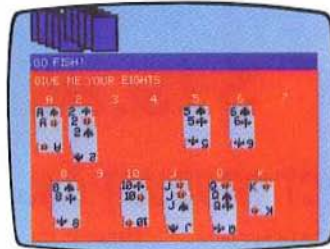


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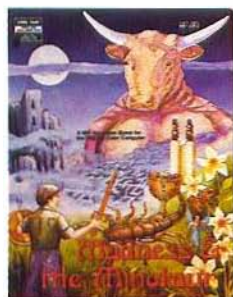


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Telewriter-64 is feature packed. Besides the standard features

TELEWRITER-64

found in any word processor, Telewriter also includes: user-friendly full-screen editing, rapid cursor and scrolling control, page jump, right justification, menu-driven disk or cassette access, compatibility with spelling checkers (such as Spell-and-Fix), and a clever double check that asks the user "Are you sure?" before executing any operation that would kill any sizeable amount of your text.

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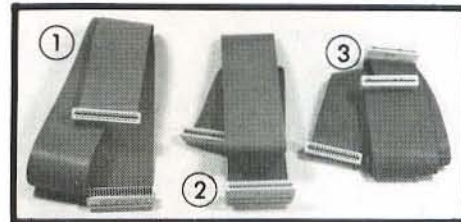
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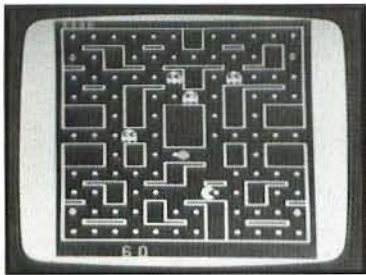
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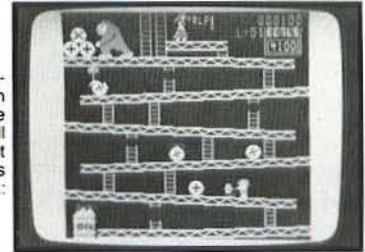
GHOSTGOBBLER

From Spectral Associates, this "Pac" theme game is the best of it's type. Brilliant color, action and sound, just like an arcade gobble your way to glory, but watch for those ghosts! Get in on the wild fun of this game craze now. Tape: \$21.95. Disk: \$25.95

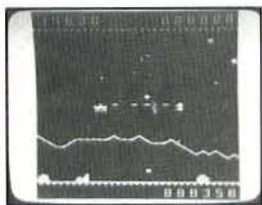
DONKEY KING

DONKEY KING

You simply can not buy a more impressive game for your color computer than this new wonder from Tom Mix. The graphics, sound, and animation are all just astonishing! There are four different graphic screens and each is endless fun. Requires 32K. Tape: \$24.95, Disk: \$27.95

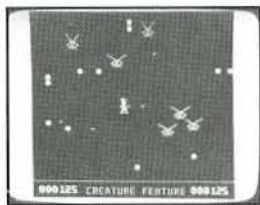


GHOST GOBBLER



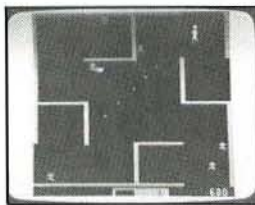
PROTECTORS

There are several good versions of the "Defender" theme available for the CoCo. None, however, rival this one from Tom Mix. No other game matches the detailed graphics and sheer excitement of this top seller. Requires 32K. Tape: \$24.95. Disk: \$27.95



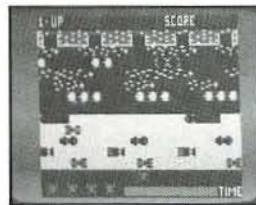
CREATURE FEATURE

From Color Software, comes a lightening swift shoot & dodge the enemy game. It's clever cross between "Robotron" and "Beserk" themes, with bullets flying everywhere. Solid, shoot-em-up-fun. Requires 16K. Tape: \$17.95. Disk: \$19.95



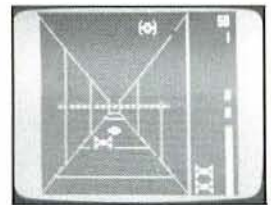
ANDROID ATTACK

Spectral Associates' very well done "Berserk" type game with some interesting added features. Each cassette contains both the 16K and 32K version. The 32K version has voice output! Plenty of action. Tape: \$21.95



FROGGER

Just released by The Cornsoft Group, this is the officially licensed version from Sega, the arcade manufacturer. It has it all! 4 lane super highway, snakes, turtles, logs, alligators, etc. Lots of action and laughs! Requires 16K. Tape: \$19.95



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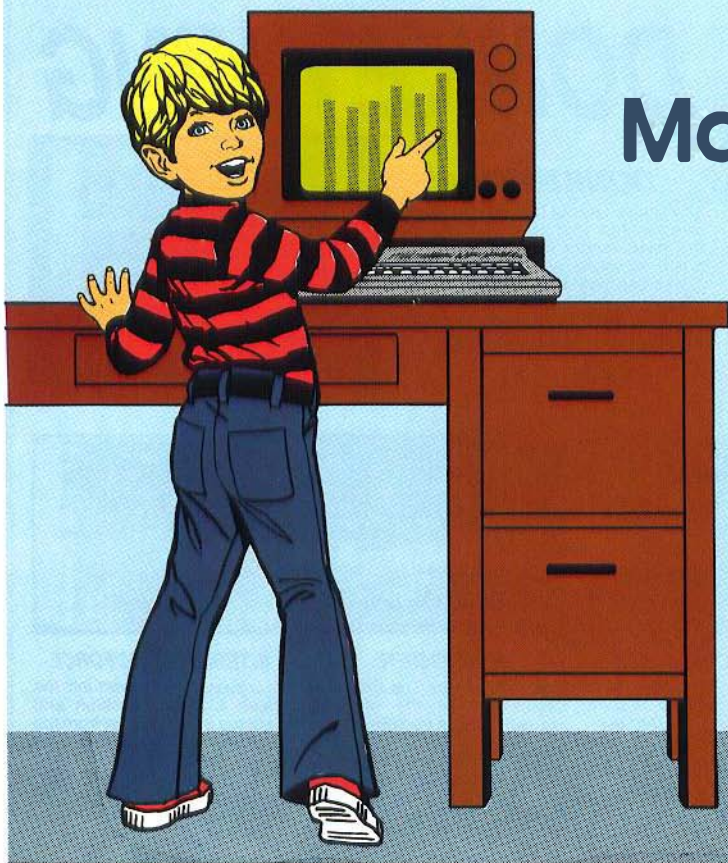
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Make A Bar Graph Of Your Child's Test Scores

By Steve Blyn
Rainbow Contributing Editor

A child's grades or marks are very important to him. They are very personal and deserve to be highlighted. If they are especially good, then special attention should certainly be shown. Graphs are one way that computers can aid in this type of reinforcement. This month's program demonstrates a bar graph. Bar graphs are an illustrative means of clearly showing comparisons of various scores.

It is very important to keep relating computer projects to the individual child. With the advent recently of so many wonderful arcade games for our computer, we don't want to take the chance of losing a child's interest in the personal uses of computers for him. Whenever we can relate a computer use to the individual's personal interests, we should encourage this. Let the child learn to utilize the computer for as large a variety of tasks as possible.

A bar graph compares scores from several occasions. Our graph can use up to eight scores. The reason that eight is our upper limit is tied into the fact that our computer can print only 32 spaces across the screen. If a child scores 100, the three digits and a space would take up four spaces to record that grade. We therefore must allow for four spaces per grade or $32/4 = \text{eight test marks}$.

(Mr. Blyn, who teaches both exceptional and gifted children, holds two Master's degrees in the field of education and has won an award for the design of a computer program to aid handicapped children. He and his wife, Cheryl, own Computer Island.)

Our graph will record and draw up to eight grades for any child. Most children receive weekly spelling or math or other subject quizzes. A graph could be made for each subject. After the graph is drawn, the average is computed and included on the screen.

Don't just look at the graph. Try to use it for further learning. Think of interesting or challenging questions to ask the youngster such as:

Which was the highest mark?

Which was the lowest?

Which two times did you score the same or nearly the same?

Which time did you score 10 points higher than another time?

Which time did you score twice as high as another time?
How would your average change if you scored a 100 on test five?

What would have to change to average two points higher?

The list of possible questions is only limited to your imagination and the child's level of understanding.

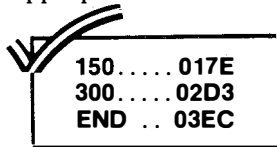
The listing that follows picks up the child's name in line 50 and limits it to 10 letters on the screen in line 60. Lines 70-90 set the limit at eight tests. Lines 110-170 ask for the actual test grades. Scores higher than 100 and lower than 0 are rejected on lines 130 and 140. Lines 180-250 draw in the graph's axes. Lines 260-420 draw in the vertical bars.

The bars are advanced by fives so that they will fit on the screen. The bar for a score of 76 will thus appear identical to

a score of 79. The real scores will however be printed just below the bars. Line 300 divides the real numerical value (H) by five to accomplish this. Line 440 computes and prints the average. If any key is pressed after the graph is drawn, the screen will clear and the program will run again to let you create a new graph.

The program that follows is set up for an individual's scores. It could be modified easily to compare different children's performances on the same test by entering your own information on the bottom of the screen after the chart is completed. Please feel free to use this idea for your own children's purposes in any way that is appropriate for them.

The listing:



```

10 REM"BAR GRAPH"
20 REM"*** STEVE BLYN, COMPUTER
ISLAND, 1983"
30 Z=3:Y=27
40 CLS RND(8)
50 PRINT"WHAT IS YOUR NAME";:INP
UT N$:SOUND220,3
60 N$=LEFT$(N$,10)
70 PRINT@64," ":PRINT@ 68,"HOW M
ANY TESTS";:INPUT T
80 REM"***SET LIMIT AT 8 TESTS"
90 IF T<1 OR T>8 THEN SOUND10,10
:GOTO 70
100 SOUND220,3
110 FOR X= 1 TO T
120 PRINT@128," ":PRINT@128,"GRA
DE ON TEST #";X;:INPUT Y$(X)
130 IF VAL(Y$(X))>100 THEN 120
140 IF VAL(Y$(X))<0 THEN 120
150 SOUND150,1
160 PRINT@128," "
170 NEXT X
180 REM"***POKE IN BOUNDARIES"
190 CLS0
200 FORQ=1024 TO 1472STEP32:POKE
Q,143:NEXT:SOUND200,1
210 FOR Q=1472TO1503:POKEQ,143:N
EXTQ:SOUND200,1
220 FORQ=1503TO1055STEP-32:POKEQ
,143:NEXT Q:SOUND200,1
230 PRINT@5,N$;"'S TEST MARKS";
240 FOR W=1504 TO 1535:POKEW,207

```

```

: NEXT
250 PRINT@489,"bar ";:PRINT@498,"
graph";
260 REM"***MAKE THE BARS"
270 FOR X= 1 TO T
280 H=VAL(Y$(X))
290 AV=AV+H
300 V=INT(H/5)
310 FOR J=0 TO V-1
320 PRINT@447+L,H;
330 IF H=0 THEN 360
340 SET(Z,Y,8)
350 SET(Z+1,Y,8)
360 Y=Y-1
370 SOUND252,2
380 NEXT J
390 Z=Z+8
400 L=L+4
410 Y=27
420 NEXT X
430 REM"*** FIND THE AVERAGE"
440 PRINT@73,"AVERAGE =";INT((AV
/T)+.5);"%";
450 REM"*** PRESS ANY KEY TO GO
AGAIN"
460 IN$=INKEY$
470 IF IN$="" THEN 460 ELSE RUN

```

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*TM Tandy Corp.

Spruce Up Your Tapes With This Cassette Label Print Program

By J. D. Ray

I recently invested in a supply of five and ten minute blank cassettes in order to store just one or two programs and not have to spend so much time searching and rewinding tape. GREAT! One problem solved and another created! How do you keep up with all those tapes? Well, writing on those labels with a pen or pencil is no easy matter (even if you can find a pen that will write on the labels). Besides, there is so little room! Thus, I end up scratching out a brief message or code on the tapes only to discover later that the codes have no meaning. Total Frustration!

While browsing through my last issue of *the Rainbow* I ran across an ad for cassette tapes and tractor feed labels. I ordered a supply and developed the program listed below.

The program will prompt you to input five lines of information. After each line is typed in, it will be printed on the label when *ENTERed*. You are informed of the length of the line and warned if your input line is too long. Note that lines three and four are printed on the sides of the label and are very short.

You have four options for the title (first line), depending on how you want your label to look and the length of your title. All titles on the first line will be underlined except for the elongation type. The fifth line can handle useful information such as the source of the program, copyright notice, index of contents, etc.

```

240... 02F4
440... 05FA
600... 082A
800... 0AET
1020... 0D76
1200... 0FEF
1330... 1281
END... 145B
    
```

The listing:

```

10 '***CASSETTE LABEL PR
OGRAM***
20 'BY J. D. RAY
30 ' 5065 FRANCE AVENUE
40 ' N. CHARLESTON, S.C. 2940
6
50 ' <C> COPYRIGHT MAR, 1983
60 ' VERSION #1
    
```

I use the Radio Shack DMP-200 dot-matrix printer. The control codes for this printer are listed below:

- CHR\$(13) — Line Feed
- CHR\$(14) — End Underline
- CHR\$(15) — Start Underline
- CHR\$(27);CHR\$(14) — Start Elongation
- CHR\$(27);CHR\$(15) — End Elongation
- CHR\$(27);CHR\$(19) — Select Standard Character
- CHR\$(27);CHR\$(20) — Select Condenses Character
- CHR\$(27);CHR\$(23) — Select Compressed Character
- CHR\$(27);CHR\$(31) — Start Bold Print
- CHR\$(27);CHR\$(32) — End Bold Print

The codes are identified in the program as they are used.

I am sure that this program can be adapted for use with any printer. Extended BASIC is not necessary, however, if you do not have Extended BASIC, you will need to change all the *LINE INPUT* statements to just *INPUT*.

If you need to print more than one label, type "R" or REPEAT and you will be asked for the print type you want for the title and you will need to realign your label with your printer. If the printing is off centered, you might need to adjust the labels.

The program should be bug free, however, if you have any problems, drop me a line. If you want this program already on tape, send \$4.95 to J. D. Ray, 5065 France Ave., North Charleston, S.C. 29406.

```

70 CLS:PRINT @ 100,STRING$(24,"
#");
80 PRINT @ 132,"# CASSETTE LAB
ELS #";
90 PRINT @ 164,"#
#";
100 PRINT @ 196,"# BY J. D.
RAY #";
110 PRINT @ 228,"# COPYRIGHT <C
> 1983 #";
120 PRINT @ 260,STRING$(24,"#");
130 FOR X=1 TO 150:NEXT X
140 CLS:PRINT @ 234,"INSTRUCTION
S?":PRINT @ 270,"(Y/N)"
150 R$=INKEY$:IF R$=""THEN 150
    
```

(J. D. Ray is Minister of Music and Youth at Cooper River Baptist Church, N. Charleston, S.C.)

(The Cassette Label Print Program is also available on Rainbow on Tape)

```

160 IF R$="Y" THEN GOSUB 126 ELSE 170
170 CLS:PRINT@5,"CASSETTE LABEL PROGRAM"
180 PRINT@65,"DO YOU WANT THE FOLLOWING FOR THE TITLE:"
190 PRINT@130,"1. ELONGATION (16 MAX)"
200 PRINT@162,"2. STANDARD (32 MAX)"
210 PRINT@194,"3. COMPRESSED (38 MAX)"
220 PRINT@226,"4. CONDENSED (55 MAX)"
230 PRINT
240 SOUND 200,1
250 INPUT X
260 IF X<1 OR X>4 THEN GOTO 240
270 ON X GOTO 280,410,520,640
280 'ELONGATION MODE
290 PRINT#-2,CHR$(27);CHR$(19);CHR$(27);CHR$(14) 'SELECT STANDARD & ELONGATION MODE
300 GOSUB 1190
310 CLS:PRINT@128,"YOU HAVE SELECTED THE ELONGATION MODE FOR YOUR TITLE."
320 PRINT:PRINT@97,"ENTER TITLE (LESS THAN 16":PRINT" CHARACTER S)":PRINT
330 IF R$="R" THEN 370
340 SOUND 200,1
350 LINE INPUT A$
360 IF LEN(A$)>16 THEN PRINT"TITLE TOO LONG FOR THIS TYPE":SOUND 150,40:GOTO 170
370 PRINT#-2,A$
380 PRINT#-2,CHR$(27);CHR$(15);CHR$(14);CHR$(27);CHR$(19) 'END ELONGATION, UNDERLINE:BEGIN STANDARD PRINT
390 GOTO 750
400 'STANDARD MODE
410 PRINT#-2,CHR$(27);CHR$(19);CHR$(15);CHR$(27);CHR$(31) 'STANDARD CHARACTER SELECT, UNDERLINE, BOLD
420 GOSUB 1190
430 CLS:PRINT@160," YOU HAVE SELECTED THE STANDARD PRINT MODE FOR YOUR TITLE"
440 PRINT:PRINT@224," ENTER TITLE <LESS THAN 32 CHARACTER S>":PRINT
450 IF R$="R" THEN 490
460 SOUND 200,1
470 LINE INPUT A$
480 IF LEN(A$)>32 THEN PRINT"TITLE TOO LONG FOR THIS TYPE":SOUND 150,40:GOTO 170




```

```

490 PRINT#-2,A$;CHR$(14);CHR$(27);CHR$(32) 'END UNDERLINE, BOLD
500 GOTO 750
510 'SELECT COMPRESSED MODE
520 PRINT#-2,CHR$(27);CHR$(23);CHR$(15);CHR$(27);CHR$(31) 'SELECT COMPRESSED MODE, UNDERLINE, BOLD
530 GOSUB 1190
540 PRINT@128," YOU HAVE SELECTED THE COMPRESSED PRINT MODE FOR YOUR TITLE"
550 PRINT:PRINT"ENTER TITLE <LESS THAN 38 CHARACTER S>":PRINT
560 IF R$="R" THEN GOTO 600
570 SOUND 200,1
580 LINE INPUT A$
590 IF LEN(A$)>38 THEN PRINT"TITLE TOO LONG FOR THIS PRINT":SOUND 150,40:GOTO 170
600 PRINT#-2,A$
610 PRINT#-2,CHR$(14);CHR$(27);CHR$(32);CHR$(27);CHR$(19) 'END UNDERLINE, BOLD:SELECT STANDARD TYPE
620 GOTO 750
630 'SELECT CONDENSED MODE
640 PRINT#-2,CHR$(27);CHR$(20);C

```

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```

HR*(15);CHR*(27);CHR*(31) 'SELEC
T CONDENSED MODE, UNDERLINE, BOL
D
650 GOSUB 1190
660 PRINT@128," YOU HAVE SELECTE
D THE CONDENSED PRINT MODE FOR Y
OUR TITLE"
670 PRINT:PRINT" ENTER TITLE <LE
SS THAN 54          CHARACTERS>:" :P
RINT
680 IF R$="R" THEN GOTO 720
690 SOUND 200,1
700 LINE INPUT A$
710 IF LEN(A$)>54 THEN PRINT" TIT
LE IS TOO LONG FOR THIS TYPE":SO
UND 150,40:GOTO170
720 PRINT#-2,A$
730 PRINT#-2,CHR*(14);CHR*(27);C
HR*(32);CHR*(27);CHR*(19) 'END U
NDERLINE, BOLD:SELECT STANDARD T
YPE
740 GOTO 750
750 'START 2nd LINE
760 CLS:PRINT@32,"ENTER 2nd LINE
USING LESS THAN 32 CHARACTERS"
770 PRINT
780 IF R$="R" THEN 820
790 SOUND 200,1

```

```

800 LINE INPUT B$
810 IF LEN(B$)>32 THEN PRINT"LIN
E IS TOO LONG**RE-TYPE**":GOTO8
00
820 PRINT#-2,B$
830 'START 3rd LINE
840 PRINT#-2,CHR*(27);CHR*(23) '
SELECT COMPRESSED PRINT MODE
850 CLS:PRINT@32,"ENTER 3rd LINE
USING LESS THAN 5 CHARACTERS"
860 PRINT:IF R$="R" THEN 940
870 PRINT "LEFT SIDE":SOUND 200,
1
880 LINE INPUT C$
890 IF LEN(C$)>5 THEN PRINT"LINE
IS TOO LONG**RE-TYPE**":GOTO870
900 PRINT
910 PRINT"RIGHT SIDE":SOUND 200,
1
920 LINE INPUT D$
930 IF LEN(D$)>5 THEN PRINT"LINE
IS TOO LONG**RE-TYPE**":GOTO910
940 PRINT#-2,C$;TAB(34);D$
950 'START 4th LINE
960 CLS:PRINT@32,"ENTER 4th LINE
USING LESS THAN 5 CHARACTERS "
970 PRINT:IF R$="R" THEN 1050
980 PRINT "LEFT SIDE":SOUND 200,
1
990 LINE INPUT E$
1000 IF LEN(E$)>5 THEN PRINT"LIN
E IS TOO LONG**RE-TYPE**":GOTO98
0
1010 PRINT
1020 PRINT"RIGHT SIDE":SOUND 200
,1
1030 LINE INPUT F$
1040 IF LEN(F$)>5 THEN PRINT"LIN
E IS TOO LONG**RE-TYPE**":GOTO10
20
1050 PRINT#-2,E$;TAB(34);F$
1060 'START 5th LINE
1070 PRINT#-2,CHR*(27);CHR*(20)
'SELECT CONDENSED CHARACTER
1080 CLS:PRINT@32,"ENTER 5th LIN
E USING LESS THAN 54 CHARACTERS
"
1090 PRINT
1100 IF R$="R" THEN 1140
1110 SOUND 200,1
1120 LINE INPUT G$
1130 IF LEN(G$)>54 THEN PRINT"LI
NE IS TOO LONG**RE-TYPE**":GOTO1
10
1140 PRINT#-2,G$
1150 CLS:PRINT@32,"DO YOU WANT T
O PRINT ANOTHER LABEL (REPEAT
) ENTER <R>":PRINT:PRINT "DO YOU
WANT TO PRINT A NEW LABEL?
ENTER <N>"

```



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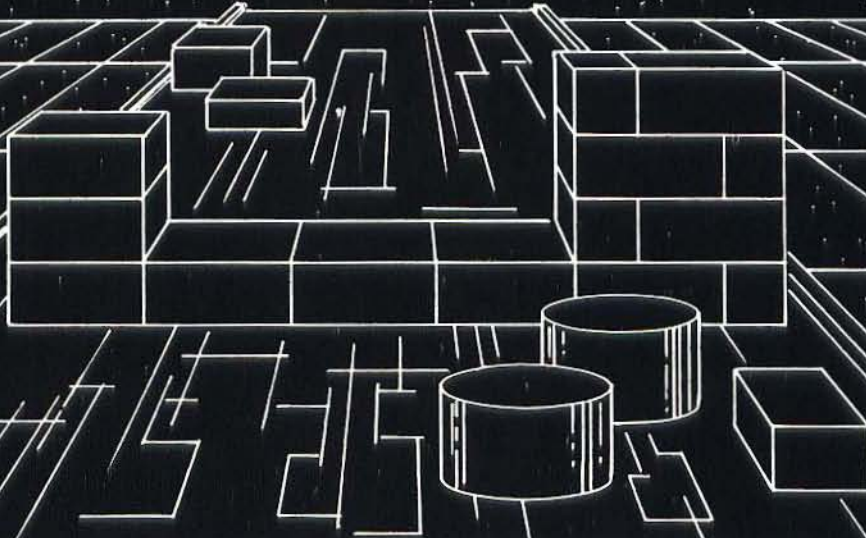
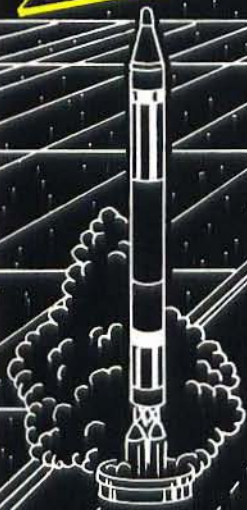
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```

1160 SOUND 200,1
1170 INPUT R0:IF R0="N" THEN GOS
UB 1230
1180 IF R0="R" THEN GOTO 1230
1190 CL8:PRINT @ 64," LINE UP LA
BELS WITH PRINTER HEAD FOR P
ROPER ALIBNMENT"
1200 PRINT:PRINT" PRESS <ENTER>
WHEN READY"
1210 P0=INKEY$:IF P0="" THEN 121
0
1220 RETURN ELSE GOTO 170
1230 FOR X=1 TO 3:PRINT@-2,CHR$(
13):NEXTX
1240 GOTO 170
1250 'INSTRUCTIONS
1260 PRINT @ 5,"CASSETTE LABEL P
ROGRAM"
1270 PRINT:PRINT"THIS PROGRAM WI
LL ALLOW YOU TO PRINT LABELS FO
R YOUR COMPUTER TAPES. THIS PR
OGRAM IS DESIBN- ED FOR USE WITH
TRACTOR FEED LABELS.
1280 PRINT"YOU HAVE FOUR TYPE CH
OICES FOR YOUR TITLE:"
1290 PRINT TAB(5)"ELONGATED TYPE
(16 CHAR)":PRINT TAB(5)"STANDAR
D TYPE (32 CHAR)":PRINT TAB(5)"C

```

```

OMPRESSED TYPE (38 CHAR)":PRINT
TAB(5)"CONDENSED TYPE (34 CHAR)"
1300 PRINT:PRINT TAB(4)" HIT <EN
TER> TO CONTINUE"
1310 R0=INKEY$:IF R0="" THEN 131
0
1320 CL8
1330 PRINT"THE FOURTH LINE IS US
EFUL FOR COPYRIGHT INFORMATION
, LOADING INSTRUCTIONS, OR A LI
STING OF PROGRAMS ON THE TAPE.
"
1340 PRINT:PRINT"FOR A MORE UNIF
ORM LABEL, TRY TO CENTER EACH
LINE ON THE LABEL. AFTER P
RINTING YOUR LABEL, YOU WILL
BE ASKED IF YOU WANT TO PRI
NT ANOTHER LABEL OR PRINT A NEW
LABEL."
1350 PRINT:PRINT TAB(5)"HIT <ENT
ER> TO CONTINUE"
1360 R0=INKEY$:IF R0="" THEN 136
0
1370 CL8
1380 PRINT"IF YOU CHOSE TO PRINT
ANOTHER LABEL, YOU WILL HAVE
TO SELECT YOU TITLE TYPE AGAIN
AND CHECK YOU LABEL ALIGNMENT W
ITH YOUR PRINTER.
1390 PRINT:PRINTTAB(5)"HIT <ENTE
R> TO CONTINUE"
1400 R0=INKEY$:IF R0=""THEN 1400
1410 RETURN
1420 END

```

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STYLOGRAPH™

6809 WORD PROCESSING SYSTEM

AVAILABLE FOR FLEX™, UniFLEX™, and OS-9™

The STYLOGRAPH text processing system is a very easy to use but powerful method of creating and printing text. It allows the operator to type text on the CoCo, modifying and correcting it as it's typed, and then print it out. The STYLOGRAPH SYSTEM is cursor-oriented with dynamic screen formatting. Cursor based editing means that any portion of the text may be worked on by moving the cursor to that point. Dynamic screen formatting means that the text is formatted on the screen in the same way it will appear on the printed copy. The display is continuously updated to show how the text will appear. This is a very important feature and is normally available only on very expensive commercial word processing systems. It significantly reduces the time required to produce a finished copy.

FULL FEATURED TEXT EDITING

A full array of commands help in the creation and modification of text. The text displayed on the screen may be moved up, down, left or right. The cursor can be moved to any page or to any specified series of letters or words. The cursor itself can be moved left, right, up, down, to any tab position, or to the extreme left or right. Any block of text can be moved, copied or deleted. The operator may also do a **global replace** so that all occurrences of a given string will be replaced with or without a "prompt" asking if the item should be replaced.

OPERATOR CONVENIENCE

Files longer than memory can be edited. The operator can move forward through a long text file by selectively dumping text to the disk or filling from the disk.

The supervisor mode is **menu driven** and self prompting so that the operator does not have to remember the syntax of commands. This makes it easier for new operators to use the system.

An "assist" or "**help**" function makes it easy to learn the system since it is normally not necessary to consult the manual to learn the commands. This function is menu driven and lists all of the keyboard functions and the formatting commands.

At the beginning of the text the operator normally types in a few simple commands indicating the line length, left margin, and so forth, and then enters the header and footer as they should appear. After that the operator need not worry about formatting since it is taken care of automatically. Words that extend beyond the end of the line are automatically removed and placed on the next line. **Headers** and **footers** are automatically inserted so that the operator always knows what portion of the page is being worked on. **Ghost hyphens** can be entered so that if the word falls at the end of a line, and a ghost hyphen has been inserted, the hyphen will automatically be added.

FLEXIBLE DISPLAY

Lines longer than the screen width are allowed. STYLOGRAPH can scroll right and left on the screen so that tables can be constructed and appear on the screen exactly as they will appear on the print out.

A command allows viewing of the formatting commands on the screen. Another command allows the operator to see which characters will be modified at print out by underlining, superscripting or boldface. A page status command shows the current format values and other useful information.

COMPLETE FORMATING CONTROL

The text of individual lines may be centered, left justified, right justified, or right and left justified. **Tabs** can be set or cleared at any point. Spacing of the lines on the page is under complete operator control with end of page, spacing and vertical tab commands.

While entering text, it may be specified that the characters have some kind of modification when they are printed, such as underlining, superscript, boldface, overline, or subscript. These character modifications are done with "control" key strokes. For example, to start underlining characters, simply hold down the "CTRL" key, hit the "U" key and continue entering text. To stop underlining, hit the "DEL" or "RUB" key.

POWERFUL PRINTING OPTIONS

Underlining is supported on TTY type printers. For those people who have specialty printers there are a variety of additional capabilities including:

- 1.5 line spacing
- BOLDFACE**
- superscript¹
- subscript₂
- underline, overline,
- or any combination

Right and left justification of text is accomplished by incremental printing on TTY type printers. True proportional spacing is supported on the specialty printers.

Control codes may be embedded in the text for special applications. For example, some printers require special control sequences for double width, graphics or boldface. These sequences may be embedded in the text for those users that have these printers. In conjunction with this, it is possible to cause the printer to stop in the middle of a print out for changing printwheels. A backspace feature allows overstriking.

OPERATING SYSTEM COMPATIBILITY

STYLOGRAPH is compatible with the FLEX, UniFlex, and OS-9 disk operating systems. Text files prepared using STYLOGRAPH are directly usable by other software such as BASIC and the assembler. (This significantly aids software development since cursor-based editing allows full viewing of the text being worked on, thereby reducing errors and decreasing programming time). File size is limited only by the capacity of the disk system. Files may be loaded into the text at any point making it possible to rapidly create "boiler plate" documents using portions of text that have been previously saved to a text file. Any portion of a text may be saved to a text file for use at a later point. The printer output may be directed to a disk file for later print spooling. Most operating system commands are directly accessible without leaving STYLOGRAPH.

FULLY ADAPTABLE TO MOST PRINTERS

STYLOGRAPH is easily configured by the user for most terminals so there is no need to send for updates as equipment changes are made. Source code of the terminal interface is supplied so that users with unusual equipment configurations may adapt it to their systems. The source code for all of the "prompts" is also supplied so that foreign language versions may be easily constructed.

Printers currently included as standard are: Diablo, Qume, Starwriter, NEC 5515/25, NEC 5510/20; CENTRONICS 737/739; TTY type printer with backspace function; TTY type printer without backspace function.

COMPLETE INSTRUCTIONS

A special tutorial section is included in the manual so that people with little or no computer experience can easily learn to use STYLOGRAPH in a few hours. A text file is included which demonstrates most of the features of STYLOGRAPH and allows the operator to practice most of the functions. The logical arrangement of the commands and the immediate display of the results greatly simplifies the learning process. In addition there is an "assistance" command which helps the new operator learn the commands.

STYLOGRAPH MAIL MERGE

A major option of STYLOGRAPH is the related MAIL MERGE program. This program adds "form letter" capability to STYLOGRAPH. Variables such as names addresses, dates, may be taken from a disk file or the keyboard at print out time and inserted into the text. Successive letters may be printed out without operator intervention.

The second important capability of the MAIL MERGE program allows many STYLOGRAPH text files to be appended at print out time. This allows files to be edited in smaller, more convenient blocks and then appended at print out time so that the page numbers will remain consecutive and the headers and footers will automatically be retained through all of the print out.

STYLOGRAPH SPELLING CHECKER

Another major option of STYLOGRAPH is the related SPELLING CHECKER program. This program reads through a text file and compares the words in the file with a dictionary. Words that are not found in the dictionary may be marked in the text for later editing, corrected on the spot, skipped, or added to the dictionary. Words may be added to or deleted from the dictionary to create unique vocabularies for particular applications.

STYLOGRAPH for the Color Computer FLEX	195.00
STYLOGRAPH MAIL MERGE	125.00
STYLOGRAPH SPELLING CHECK	145.00
STANDARD FLEX Version	295.00



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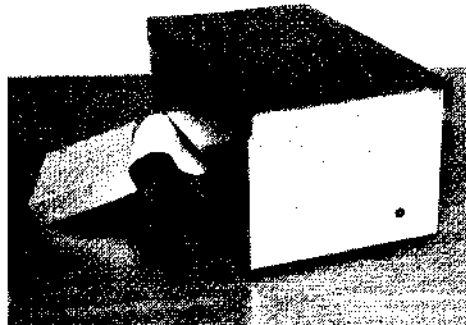
1. Here is Jeri plugging The Solution into the CoCo. Then she will move the main case up close to the CoCo. The cable is kept short to prevent noise and interference. The disk controller can be plugged into the side slot. The power supply plugs into a socket on the back of the case. All wires for the internal boards exit out the back of the case.



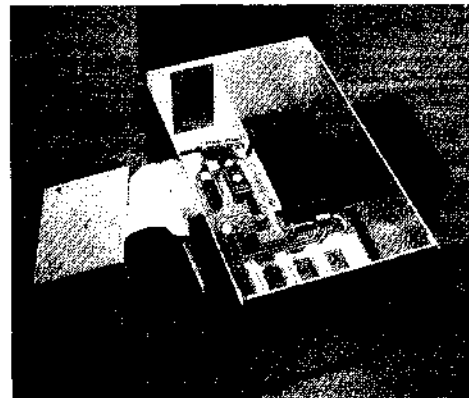
2. Here Jeri is setting the dip switches in The Solution. The hinged top makes the job easy. The switches can be set for three different things. Up to four boards can be installed inside the case.



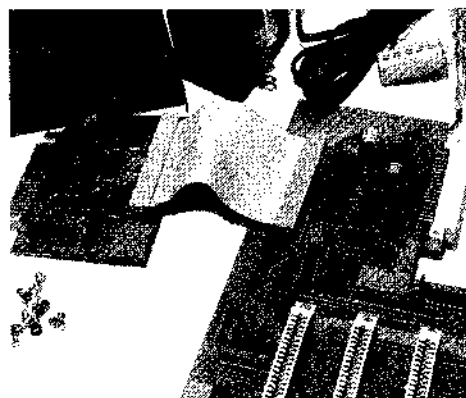
3. Here is The Solution at work. It makes a very nice addition to your CoCo with a black anodized top and a silver anodized main case both made from heavy aluminum stock.



4. Here's The Solution all by itself. The heavy aluminum anodized case is a thing to be proud of. The buffer board can be seen to the left of the main case. The LED indicator on the front comes on when you turn on the power to your CoCo. The Solution needs no on/off switch.



5. All that's missing from this picture is the plug in the wall power supply. You can see the 4K EPROM monitor and the 4 position dip switch. At the front are four of the five expansion slots with a disk controller plugged into the fifth slot on the side. The power LED is at the lower right front of the case.



6. Here's the real guts to The Solution. We took it all apart so that you could look at the parts. The 1 amp power supply can be seen in this picture. All the connectors are gold as you would expect. The small board is the buffer board. The white connectors are the same as the CoCo's.

THE SOLUTION AND WHY WE BUILT IT

When we first introduced FLEX for the CoCo in February 1982 we received hundreds of calls from software and hardware developers who wanted to use the CoCo because it was so inexpensive compared to everything else on the market. However there is not enough expansion or I/O in the CoCo to make this possible for most of these users. I know that the CoCo is viable in most cases, but for many, there needed to be more. So that was the original reason for designing the expansion box we call "THE SOLUTION."

The motherboard has the 2K/4K EPROM socket with a 4K monitor EPROM in it. Also inside are 4 vertical connectors for internally mounted boards or ROM type cartridges. The fifth connector is horizontal and is made for the disk controller, ROM cartridges or additional expansion out the side of The Solution. A four position dip switch allows for 3 options to be selected. One option will cause the CoCo to get its interrupt and reset vectors from the monitor instead of RS Basic.

If you choose to come up in the monitor, then it is not necessary to have RS Extended Basic in the CoCo to boot FLEX because the monitor has a built-in boot. This saves \$100.00 of the cost of The Solution. The power supply is a plug-in-the-wall type with a connector in the back of the case. The back of the case is open and it is thru this that all the cables for the different cards go. This makes for a very neat appearance.

TECHNICAL SPECIFICATIONS

Bus Structure... Fully buffered Color Computer compatible bus. Priority daisy chained arrangement where each slot has a priority assigned to it. The farther out on the bus that you are, the less priority you have. The disk slot (0) has the highest priority with slot 1, 2, 3, and then 4 has the lowest. The pinout and the timing is the same as the Color Computers with the exception of the sound line. This is used on the motherboard for the priority line.

Power Supply... The power supply is a tracking power supply which means that the Color Computer itself turns The Solution on and off so that there is no need for an on/off switch. A LED on the front of The Solution indicates when the entire system is on or off. The tracking power supply means that The Solution's bus voltage will be the same as the Color Computers to within a very few millivolts. The power supply included with The Solution is a 1 amp supply for the 5 volt line only. The +12 and -12 voltages are taken from the Color Computer.

Dip switch options...

1) Select the 4K ROM monitor. When this option is selected, the system will come up in the monitor and get interrupt vectors from it rather than the Radio Shack Basic ROM. The reason you might want to do this is so you can boot FLEX from the monitor rather than Basic. This will allow running FLEX without have to have Extended Color Basic in the CoCo. This also ties in with the option on the serial card to come up on a terminal instead of the CoCo TV set and keyboard.

2) Disable the disk slot (0). This will allow using ROM cartridges in The Solution without unplugging the disk card. When the switch is on, the ROM is active. When it is off, whatever ROM cartridge is there is active. This infers that you could switch back and forth between a cartridge and the disk system. This is NOT necessarily true because of the need to initialize the disk software in the ROM and this may destroy what is in memory. It may be possible under special circumstances to do this but it is up to the user to work it out.

3) Select either a 2K or a 4K EPROM. This is set for a 4K EPROM which is included with The Solution. However, it can be changed if you have a need. The EPROM is addressed at \$E000.

4) User definable. This means that we didn't use this switch for anything, but you can if you want, or we could call it 'reserved for future expansion.' This means that we don't have any use for it now, but we may in the future.

The Solution I/O cards are addressed at either the \$FF60-\$FFBF area OR the \$FE00-\$FEFF area.

These prices and specs are subject to change without notice. Call for confirmation.

THE SOLUTION \$249.00
(Price includes case and power supply.)

CARDS FOR THE SOLUTION
DUAL SERIAL PORT \$130.00
Two 6551 ACIAs, programmable baud rates (110-19,200), full RS-232, DB-25 conn.

CLOCK and PARALLEL PRINTER CARD \$110.00
OKI clock w/battery backup and 1 parallel output port

PROTOTYPE Cards \$ 37.00
3½ by 9 inch card

EPROM/RAM Card \$ 90.00
Up to 16K ROM (2732) or 8K static RAM (6116). Each device individually addressed anywhere in memory

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Program 2K, 4K or 8K EPROMS. Software included either on disk or on board ROM.

TRIPLE PARALLEL I/O Card \$105.00
Two 6821's and one 6522 for parallel I/O.

Note: We are considering several other cards for The Solution. Please let us know what you want, if there is enough interest, we will make it.

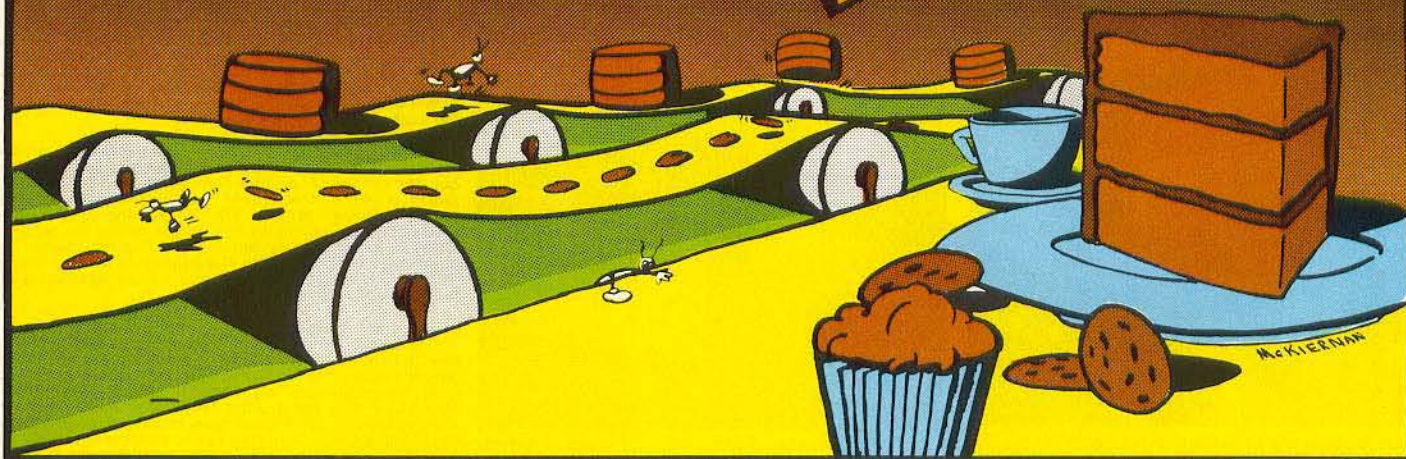
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WARY OF THE HIT-MAN'S DEADLY SPRAY, YET DRIVEN TO THE EDGE OF SELF-ABANDONMENT BY THE ENDLESS ASSORTMENT OF PASTRIES, "R&S" THE ROACH GOES FOR THE GUSTO...

RAINBOW ROACH

By JOHN FRAYSSE



This tutorial is in response to an accusation from *the Rainbow* (I won't mention any names, okay, Lonnie?) that I had forgotten about them ever since several of my programs went out nationally for sale. It is also to prove that BASIC games can be fun, challenging and responsive.

Witness the *Rainbow Roach*, written especially for our own magazine. Countless folks have criticized the program's name, but whatever you call it, you will undoubtedly recognize it as a "frogger-like" game although it is more difficult. You may also wonder how I got those six counter-rotating belts to move at such a rapid pace. Remember Charlie Roslund's article in the January '83 *Rainbow* on machine language subroutines? Well, that's the answer. To be exact, 72 bytes of machine code can do the rotations at a rate of 25 times per second! The BASIC coding around this routine slows the belts down to a playable rate and starts your Roach (or whatever) jumpin', ridin', slippin', and slidin'. You may want to challenge your friends with those "other" computers to come up with a similar game written with their Extended Color BASIC and watch them slowly lose their minds!

If for some reason you would like a copy of *Rainbow Roach* send \$3, a blank cassette and a self-addressed, stamped-twice envelope to John Fraysse, AFABEAR Software, Box 822, Dahlgren, VA 22448. I'll have it in the mail the day after I receive your letter.

PLEASE NOTE: *Rainbow Roach* uses a POKE 65495,0 speed-up and a BREAK KEY disable. To exit the program or **BEFORE SAVING TO TAPE, PRESS THE RESET BUTTON** in the back, right-hand corner of your machine. This will automatically POKE 65494,0 and slow the CPU down. I/O from tape or any other device will *not* function correctly otherwise.

For those of you who wish to go through the "ins-and-outs" of how this program works, you will find my commentary starting at *Program Features*. For those who wish to "type 'n' run" (it's long!) here are the instructions.

RAINBOW ROACH INSTRUCTIONS

Objective: Get as many roaches as you can to the safe zone with the highest score possible.

Your situation: You are a *Roach* (!!!) in a pastry factory trying to make your escape. The factory management is wise to your presence and has hired a "hit-man" to do you and your fellow co-roaches in. As a "bug-a-der" general you must guide your roaches through the exterminator's detection system (See figure 1).

When you jump on a belt, you will be detected and the exterminator will stop drinking coffee to look, but his system won't see you if your legs and body are not on a pastry. As an added precaution, he also sprays the floors (spaces between the belts) when he finishes his coffee. You will be sprayed under three conditions: 1) when the coffee (upper left) runs out; 2) if you jump on a pastry; 3) if you ride a belt to either screen edge (the wall sensors get you). It has been reported that there is an extremely small area on just one or two pastries where you may jump and eat without being detected. Very few "generals" have guided all seven of their assigned roaches to complete safety; you know *how nasty and gross humans are!*

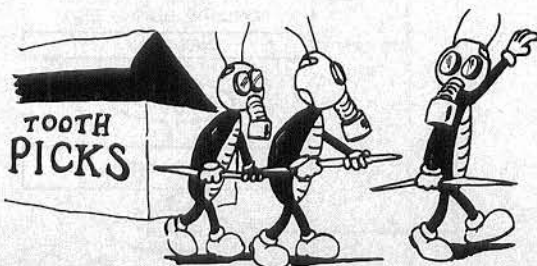
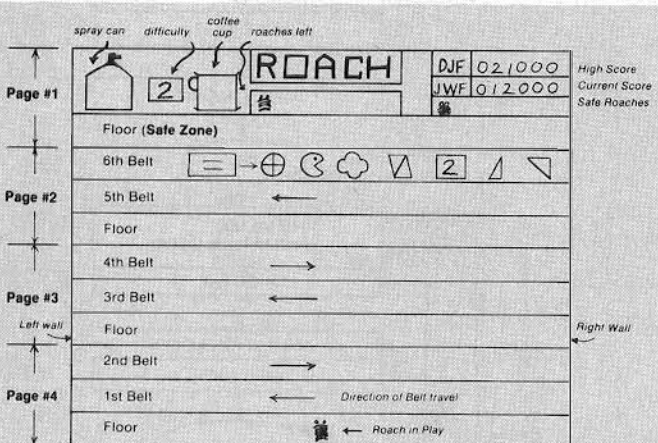
Scoring: 100 points are awarded for each floor or belt you successfully cross. A completely safe trip to the top (SAFE AREA) is 1,000 points and a "safe" roach is one in the safe-roach box (upper right below the current score). A game cycle is seven roaches. However, for multiples of 5,000

points, you receive seven more roaches. High score and initials are displayed in the right, upper-most box. Just below the high score are the initials and score of the current player. Note: When asked to enter your initials, please enter only *capital letters*. No special characters, please.

Control: The right joystick controls the left-right motion while on the floors. Roaches on the belts ride with the belts. Extreme forward joystick will cause a jump to the next floor or belt. A single jump is accomplished by quick forward-back (to center) joystick motion. Slightly slower action may cause a multiple jump situation until the stick is centered. Multiple jumps (without any stopping) from the bottom floor to the top safe zone are next to impossible because the belts rotate every time you jump to a floor, in addition to their normal rotation rate (determined by difficulty level). The belts rapidly rotate at the end of each game and initially when the program starts. Press the spacebar to continue to another game.

Difficulty Levels: The difficulty level is indicated by the number in the box between the spray can and coffee cup. Increasing the level generally increases the speed at which the belts rotate. At level four the belts rotate at one (fast) speed while your roach is on the floor and 33 percent faster when on the belts. You will soon find out that the coffeecup timer is the limiting factor at the lower levels, while riding a belt into a wall is the problem at levels three and four. You should also note that your roach can outrun the belts at levels one through three, but not at level four. So, if you should miss a jump point when playing at the higher levels, wait or run right to another. You may never catch the one you missed! You may also run and jump at the same time.

Beforewarned! The position at which your roach starts at the bottom is random over +/- 2 pixels. Therefore, do not assume that since you jumped safely in a particular place on your last roach that you may necessarily do it again. In many cases +/- 2 pixels turns a successful jump into a "roach-in-the-round pie."



10.....	0401
23.....	079D
40.....	0BF2
50.....	1208
58.....	1707
END...	1ABC

The listing:

```

0 POKE65495,0:CLS6:PRINT@167,"af
abear software";:PRINT@174,CHR$(
223);:PRINT@299,"presents";:SCRE
EN0,1:IFPEEK(&H3EB9)<>&H32 THENC
LEAR350,&H3EA0:FORI=&H82B9 TO&H8
31E:POKEI-&H4400,PEEK(I):NEXTLS
E3
1 FORI=0TO2:POKE&H3EBD+I,18:NEXT
:I=&H3F1E
2 POKEI,&H26:POKEI+1,3:POKEI+2,&
H7E:POKEI+3,&H83:POKEI+4,&H22:PO
KEI+5,&H7E:POKEI+6,&HA4:POKEI+7,
&H4C
3 POKE&H19B,&H3E:RUN4
4 GOSUB44: SX=0: NX$=""
5 CLS2:RS=50:PUT(177,14)-(254,20
),XM,PSET:PRINT@192,"PLEASE ENTE
R YOUR INITIALS";:INPUTN$:LX=LEN
(N$):IF LX>3 OR LX<1THENS
6 B$="":FORN=1TO LX:B$=B$+L$(ASC
(MID$(N$,N,1))-54):NEXTN:N$=B$:D
RAW"BM177,14;C1;XN$;BM210,14;XL$
(0);XL$(0);XL$(0);XL$(0);XL$(0);
":FORN=98TO158 STEP10:PUT(N-3,26
)-(N+3,34),R,PSET:NEXTN:PUT(176,
26)-(254,34),XM,PSET
7 PUT(155,26)-(161,34),XM,PSET:C
LS2:PRINT@194,"PLEASE ENTER DIFF
ICULTY LEVEL";:PRINT@232,"1-EASY
4-HARD";:INPUT DF:IF DF<1 OR DF
>4 THEN 7
8 CLS8:FORN=22TO28:LINE(33,N)-(4
1,N),PRESET:NEXTN:DRAW"BM33,22;C
1;XL$(DF)";:SCREEN1,1:RC=6:S=0:S
R=0:IH=0
9 KD=16-DF*4:X=124+RND(3)*2:I=16
:J=0:K=0:FORN=0TO4:PLAY"V3104L24
T24BAFEDC":NEXTN:PLAY"T201C":FOR
N=0TO150:NEXTN:PLAY"C":PUT(155,2
6)-(161,34),XM,PSET
10 IF J<9 THEN 11 ELSE26
11 PUT(X-7,Y(J)-4)-(X+7,Y(J)+4),
RW,PSET:I=I+.2:K=K+1:LINE(56,I)-
(72,I),PRESET:JX=INT((JOYSTK(0)-
31)/40+.5)*4:IF JOYSTK(1)=0THEN1
5
12 X=X+JX:IFABS(X-128)>116THENX=
128+116*SGN(X-128)
13 IF I>34 THEN 26 ELSE IF K<KD
THEN 11
14 PLAY"V31T255L25503A":EXEC1631
0:K=0:GOTO11

```

```

15 ID=0:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),XM,PSET:PLAY"T10L1005AB":J=J+1:GET(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,G:GOTO17
16 PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,AND:PLAY"T12L1205AB":J=J+1:GET(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,G
17 IF PPOINT(X-3,Y(J))=5 OR PPOINT(X+3,Y(J))=5 OR PPOINT(X-2,Y(J)-1)=5 OR PPOINT(X+2,Y(J)+1)=5 OR PPOINT(X,Y(J))=5 OR PPOINT(X,Y(J)-4)=5 THEN 18 ELSE 19
18 PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,OR:ID=1:GOTO26
19 PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,OR
20 K=K+.25:N=JOYSTK(0):IF JOYSTK(1)=0 THEN 24 ELSE IF K<KD THEN 20
21 XX=X:X=X+DX(J):IF ABS(X-128)>120 THEN 22 ELSE 23
22 X=128+123*SGN(X-128):PUT(XX-3,Y(J)-4)-(XX+3,Y(J)+4),RX,AND:GET(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,G:PUT(X-3,Y(J)-3)-(X+3,Y(J)+4),R,OR:GOTO26
23 PUT(XX-3,Y(J)-4)-(XX+3,Y(J)+4),RX,AND:PLAY"V31T255L25503A":EXEC16310:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,OR:K=0:GOTO20
24 IF J=1 OR J=4 OR J=7 THEN 16
25 PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,AND:PLAY"T10L1005AB":J=J+1:EXEC16310:GOTO10
26 IF J=9 THEN 29 ELSE IF I>34 AND ID=0 THEN 28
27 GOSUB31:FORN=0TO10:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,OR:SOUND255,1:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),RX,AND:NEXTN:GOSUB32:S=S+J-ID:GOTO3028 GOSUB31:FORN=0TO10:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,PSET:SO
UND255,1:PUT(X-7,Y(J)-4)-(X+7,Y(J)+4),XM,PSET:NEXTN:GOSUB32:S=S+J:GOTO3029 PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),R,OR:FORN=1TO120 STEP20:SOUNDN,1:NEXTN:PUT(X-3,Y(J)-4)-(X+3,Y(J)+4),XM,PSET:SR=SR+1:XX=175+SR*10:PUT(XX-3,26)-(XX+3,34),R,PSET:S=S+10
30 RC=RC-1:XX=98+10*RC:GOSUB33:GOSUB40:PUT(XX-3,26)-(XX+3,34),XM,PSET:ID=0:IF RC=-1 THEN 41 ELSE 9
31 LINE(25,10)-(45,5),PSET:LINE(25,12)-(45,17),PSET:LINE(25,11)-(45,8),PSET:LINE(25,11)-(45,14),PSET:RETURN
32 LINE(25,10)-(45,5),PRESET:LINE(25,12)-(45,17),PRESET:LINE(25,

```

A note on difficulty is in order. I feel most games are too easy. Usually BASIC games are only hard due to their lack of playability or lack of responsiveness. *Rainbow Roach* is very responsive and as good as any BASIC game you'll find on the market today. The choice of difficulty levels makes it playable to my 6- and 12-year olds and I have trouble with level four. I believe this is a good mix (sorry, Tom!). I sincerely hope *Rainbow Roach* will be as entertaining to your family as it has been to mine.

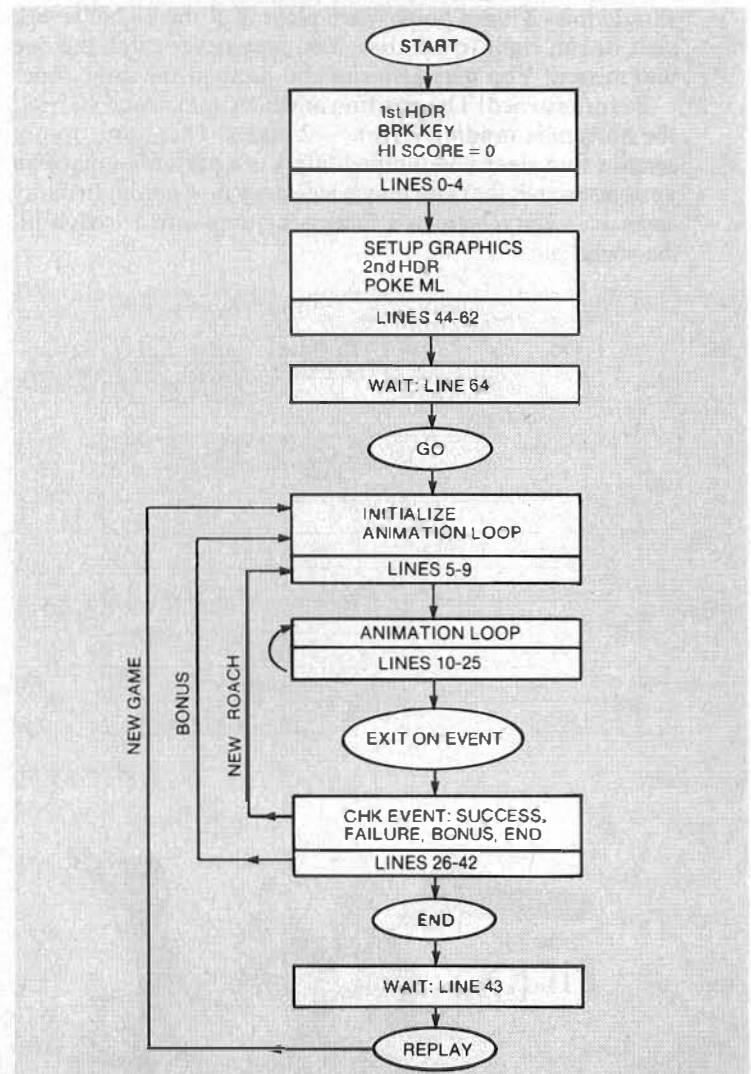
Rainbow Roach has several features that many arcade games possess. These include:

- * Colorful, hi-res, action graphics
- * Interesting sound effects
- * Joystick control with quick response
- * Bonus play feature
- * "Initials & Scores" and high score tally
- * Difficulty levels

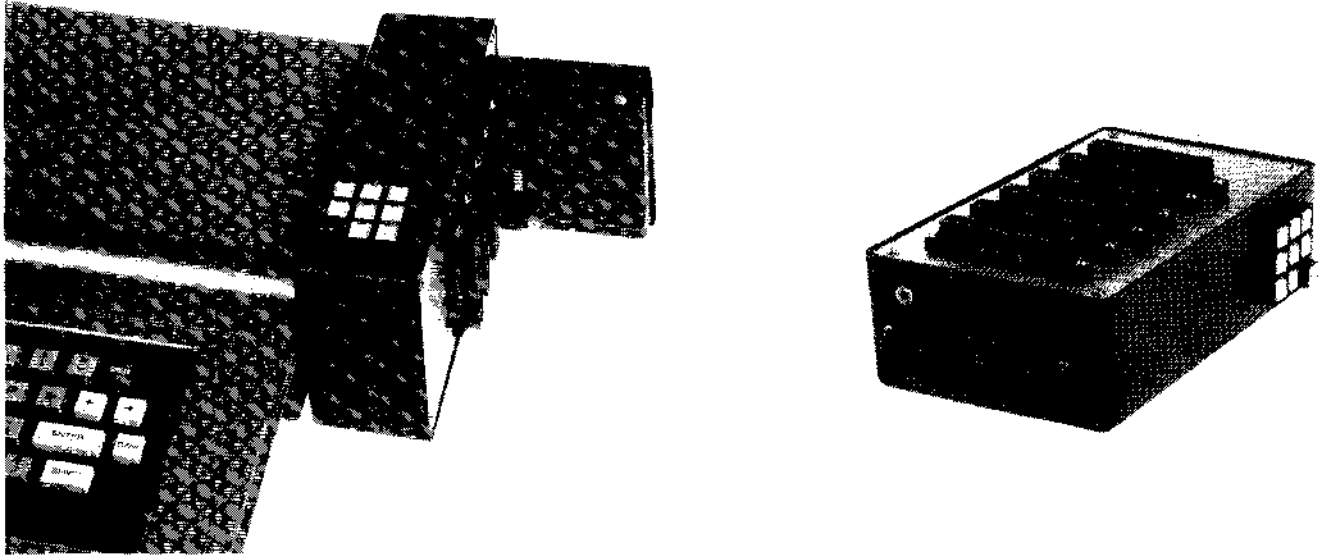
Rainbow Roach utilizes many aspects of ECB programming. These include:

- * Hi-res graphics
- * Complete character set [letters (A-Z); numbers (0-9)]
- * String manipulation
- * Break key disable
- * Machine language subroutine

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11)-(45,8),PRESET:LINE(25,11)-(4
5,14),PRESET:RETURN
33 B$="":S$=STR$(S):LX=LEN(S$):I
F LX=3 THEN B$=L$(0)ELSEIF LX=2T
HENB$=L$(0)+L$(0)
34 FORN=2TOLX:B$=B$+L$(VAL(MID$(
S$,N,1))):NEXTN:IF IH=1THEN36
35 PUT(177,14)-(255,20),XM,PSET:
DRAW"BM178,14;C1;XN$;BM210,14;XB
$:XL$(0);XL$(0);":GOTO37
36 PUT(177,3)-(255,11),XM,PSET:D
RAW"BM178,3;C1;XNX$;BM210,3;XB$;
XL$(0);XL$(0);":IH=0:GOTO39
37 IF SX>=S THEN 39
38 IH=1:SX=S:S=SX:NX$=N$:GOTO33
39 RETURN
40 DRAW"C1":FORN=34T017 STEP-1:L
INE(56,N)-(72,N),PSET:NEXTN:RETU
RN
41 IF (S-RS)>=0THEN42ELSE43
42 RS=RS+50:FORN=0T03:PLAY"V31T8
L801ABDCFEL2G":NEXTN:FORN=98T015
8 STEP10:PUT(N-3,26)-(N+3,34),R,
PSET:PLAY"V31L1201AB":NEXTN:PUT(
176,26)-(254,34),XM,PSET:RC=6:SR
=0:IH=0:GOTO9
43 EXEC16310:PLAY"V31T255L25503A
":IFINKEY$=CHR$(32)THEN5ELSE43
44 DIM L$(36),R(2),RX(2),RW(3),P

```

Line No(s)	Description	Function
0-3	1st HDR+BRK key disable	Initial header & break key disable
4	Initial set-up	GOSUB 44 (set-up graphics; define character set; put program in the wait mode; look for <spacebar>)
5-6	New game & player	Enter initials; erase old initials, write new on hi-res screen
7-8		Erase old difficulty level, enter new, write new difficulty level
9	Bonus game new roach	Set initial counters, roach position and belt rate. Play "prepare to play;" tune; Blank out next roach
10	Begin animation loop	Check if at top floor (J=9); if so go to EVENT CHECK (26)
11	Floor loop	Put floor roach ("RW") on appropriate floor; increment coffee timer; Calc. Horiz. Roach rate (JX); check vert. joystick for jump (=0). If 0; GOTO 15 (JMP FL-BLT)
12-13		CALC. new horiz. position: Limit travel; check coffee timer (>34?) If so then go to EVENT CHECK (26); else check time to rotate belts (K=>KD?) If so then 14 else back to 11
14	Rotate belts End floor loops	Play "Rotate" Note: EXEC ML; Set K=O; Go to 11
15	JMP, FL → BLT	Assume successful JMP (ID=0); Blank floor roach, Play "JMP" Notes; INC J (Jump counter); Get Ref. roach array ("RX"); go to 17 (jump on pastry test)
16	JMP, BLT → BLT	Blank roach on old belt (Use "RX") Play "JMP" notes; INC J, Get ref. roach array ("RX")
17	ck: JMP → PASTRY	Are any of six points relative to the roach's future position set? If so then 18 else 19
18	DIE ON BLT	Put roach (OR) on Pastry; set ID=1; go to 26 (EVENT CHK)
19	Successful JMP	Put roach on new BLT
20	BLT LOOP	INC BLT COUNTER (k); sample joystick ck: If vert = 0; If so go to 24 (JMP to BLT or FL test) else ck: If K<kd; If so then 20 else 21 (ROTATE BLTS)

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1 (54), Y(9), XM(20), DX(9)
45 L$(1)="BM+2,0;R1D6L3R6;BM+3,-
6":L$(2)=";D1U1R6D3L6D3R6;BM+3,-
6":L$(3)=";R6D3L4R4D3L6;BM+9,-6"
:L$(4)=";D3R6L1U3D6;BM+3,-6":L$(
5)=";R6L6D3R6D3L6U1;BM+9,-5":L$(
6)=";D6R6U3L6;BM+9,-3":L$(7)=";D
1U1R6D6;BM+3,-6":L$(8)=";R6D6L6U
3R6L6U3;BM+9,0"
46 L$(9)=";R6D6U3L6U3;BM+9,0":L$
(10)=";R6D6L6U6;BM+9,0":L$(11)=";
BM+0,+6;U3E3F3L6R6D3;BM+3,-6":L$
(12)=";R6D3L6R6D3L6U6;BM+9,0":L$
(13)="BM+6,+1;U1L6D6R6U1;BM+3,-5
":L$(14)=";R4F2D2B2L3U6L1D6;BM+9
,-6":L$(15)=";R6L6D3R3L3D3R6;BM+
3,-6"
47 L$(16)=";R6L6D3R3L3D3;BM+9,-6
":L$(17)=";BM+6,+1;U1L6D6R6U3L3D
1;BM+6,-4":L$(18)=";BM+0,+0;D6U3
R6U3D6;BM+3,-6":L$(19)=";R6L3D6L
3R6;BM+3,-6":L$(20)=";R6L3D6L3U2
;BM+9,-4":L$(21)=";D6U1E5;BM+1,+
6;H3F3;BM+3,-6":L$(22)=";D6R6;BM
+3,-6"
48 L$(23)=";D6U6F3E3D6;BM+3,-6":
L$(24)=";D6U6F6U6;BM+3,0":L$(25)
=";R6D6L6U6;BM+9,0":L$(26)=";R6D
3L6U3D6;BM+9,-6":L$(27)=";R6D6H3
F3L6U6;BM+9,0":L$(28)=";R6D4L2F2
H2L4D2U6;BM+9,0":L$(29)=";R6L6D3
R6D3L6;BM+9,-6":L$(30)=";R6L3D6;
BM+6,-6"
49 L$(31)=";D6R6U6;BM+3,0":L$(32
)=";D3F3E3U3;BM+3,0":L$(33)=";D6
E3F3U6;BM+3,0":L$(34)=";F6H3G3E6
;BM+3,0":L$(35)=";F3E3G3D3;BM+6,
-6":L$(36)=";D1U1R6G6R6U1;BM+3,-
5":L$(10)=";BM+4,0"
50 Y(0)=186:Y(1)=172:Y(2)=153:Y(
3)=138:Y(4)=124:Y(5)=105:Y(6)=90
:Y(7)=76:Y(8)=57:Y(9)=42:DX(0)=0
:DX(1)=-8:DX(2)=8:DX(3)=0:DX(4)=
-8:DX(5)=8:DX(6)=0:DX(7)=-8:DX(8
)=8:DX(9)=0
51 PMODE4,1:PCLS:PMODE3,1:DRAW"BM
M15,8;C2S4R4D2R4D2L4D2L4R4F4D17L
12U17E4U6;BM31,20;C4R12D10L12U10
;BM54,15;C3D20L5R30L5U20;BM84,0;
C2D17R85U17;C3R1D16L83U16;BM175,
1;C2R80BM+0,+10;L80U10;BM175,12;
C3R80BM+0,+10;L80C2U10"
52 PAINT(120,10),4,3:PAINT(18,11
),4,2:PAINT(19,25),3,2:PMODE4,1:
DRAW"BM54,15;C1H2;BM49,35;H2;BM7
4,15;E2;BM79,35;E2;BM92,25;D11R7
1U11L71;BM175,25;R80D11L80U11"
53 DRAW"BM210,3;XL$(0);XL$(0);XL

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21 ROTATE BLTS Store previous horiz posi-
tion (xx); Calc new horiz.
position (x): Is new position
on either wall?; If so, then 22
(HIT WALL) else 23 (RIDE
BELT)
22 HIT WALL Set horiz. position at wall;
Blank the old roach posi-
tion; Get the wall position
graphics (RX); Put new
roach at wall; Go to 26
(EVENT CHK)
23 RIDE BLT Blank old roach position;
Play "Rotate" Note; Exec
ML; Rotate BLTS; Put new
Roach position; reset BLT
counter (k=0); Go to 20
(BLT LOOP)
24 JMP, BLT → FL Were you on a lower BLT. If
TEST so then 16 JMP, BLT → BLT
else 25 (JMP, BLT → FL)
25 JMP, BLT → FL Blank old roach; Play
End Animation "JMP" notes; INC J, EXEC
Loop ML (ROTATE BLT); Go to
10 (FLOOR LOOP)
26 EVENT CHECK CK for top Floor; If so, go to
29 (Success) else CK for
1>34 (out of coffee and on
floor) then 28 (Die on floor)
else 27 (Die on BLT)
27 DIE ON BELT Turn on spray; Blink roach;
make "Error" sound; Turn
off spray; Calc score; Go to
30 (BOOKKEEP)
28 DIE ON FLOOR Turn on spray; Blink roach;
make "Error" sound; turn
off spray; Calc. score; Go to
30 (BOOKKEEP)
29 SUCCESS! Put roach at top floor; make
"Success" sounds; INC Safe
roaches; Put SAFE roach in
box; Calc. score
30 BOOKKEEP Dec. Roach count; GOSUB
"SCORE/HIScore"(33);
GOSUB "FULL CUP"(40);
Blank next roach; reset
"dead" indicator (ID) CK
for no more roaches. If so
then CK BONUS (41) else 9
(New Roach)
*31 SPRAY ON Turn spray on
*32 SPRAY OFF Turn spray off
*33-39 SCORE/ Prints current score; CKs
HI SCORE for Hi Score
*40 FILL CUP Fills up coffee cup
41-42 BONUS PLAY CKs for Bonus Play (current
score) a multiple of 5,000
pts; Awards new roaches
and a bonus game; If not
bonus then end (43)

```

*Indicates a subroutine

43 END OF GAME Game over: Belts rotate rapidly waiting on <spacebar>

*44-63 SET UP ROUTINE Dim's; define character set (45-49); define vert. JMP coordinates & horiz. rates (50) set up some graphics (51-53); POKE ML (54-56); 2nd HEADER: Rest of graphics (57-63)

64 INITIAL WAIT Introductory display; Belts rotate rapidly waiting on spacebar then return

65 REMARKS Credits

DESCRIPTION OF VARIABLES

Regular Variables

- I — counter used to determine the time to spray the floors (I>34) otherwise a general purpose counter outside the animation loop.
- J — Jump position counter (0-9; Floors = 0,3,6,9; Belts = 1,2,4,5,7,8)
- K — counter used to determine the time to rotate the belts (K>=KD)
- KD — the number of K counts necessary to cause the belts to rotate (a function of difficulty level, DF)
- N — general purpose counter
- ID — "dead" flag — 1 died on belt/0 — died on floor
- IH — High score flag (IH=1 → High score achieved IH=0, not)

```

$(0); XL$(0); XL$(0); BM210, 14; XL$(
0); XL$(0); XL$(0); XL$(0); XL$(0); "
: PMODE4, 1: DRAW"BM93, 3; C0S7; XL$(2
8); XL$(25); XL$(11); XL$(13); BM+0,
-1; XL$(18); C1S4": CIRCLE(54, 22), 5
, 1, 1, .25, .75: CIRCLE(54, 22), 3, 1, 1
, .25, .75
54 DATA 142, 12, 31, 166, 132, 16, 142
, 0, 31, 230, 31, 231, 132, 48, 31, 49, 63
, 38, 246, 167, 132, 48, 136, 63, 140, 14
, 63, 47, 230, 142, 14, 96, 166, 132, 16,
142, 0, 31, 230, 1, 231, 128, 49, 63, 38,
248, 167, 128, 140, 16, 160, 47, 235, 14
2, 12, 0, 236, 129, 237, 137, 5, 254, 237
55 DATA 137, 11, 254, 140, 16, 160, 38
, 241, 57
56 FOR I=16310 TO 16381: READ J: P
OKE I, J: NEXT I: LINE(0, 66) - (255, 66
), PSET: LINE(0, 84) - (255, 84), PSET:
CLS6: PRINT@237, "roach"; : SCREEN0,
1
57 DRAW"BM98, 32; C1; G2E2F2H2; BM+0
, -2; G3E3F3H3; BM+0, -2; G3E3F3H3; BM
+2, -1R1; BM-5, 0; L1": GET(95, 26) - (1
01, 34), R, G: LINE(92, 25) - (92, 36), P
RESET: GET(91, 26) - (105, 34), RW, G: L
INE(92, 25) - (92, 36), PSET: GET(105,
26) - (111, 34), RX, G: LINE(0, 48) - (25
5, 48), PSET

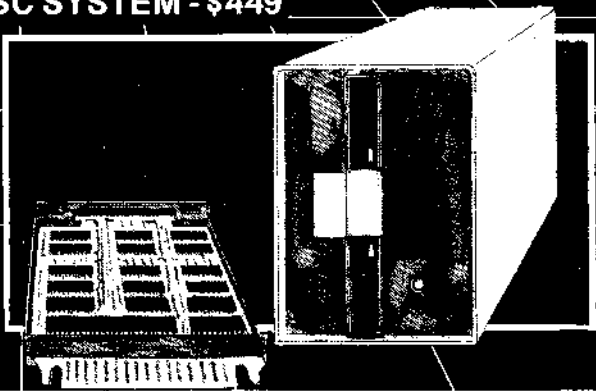
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```

58 FORI=108TO158 STEP10:PUT(I-3,
26)-(I+3,34),R,PSET:NEXTI:LINE(0
,0)-(255,0),PRESET:LINE(255,0)-(
255,40),PRESET:LINE(0,36)-(255,3
6),PSET:LINE(22,17)-(22,34),PSET
:LINE(56,16)-(72,16),PSET:LINE(8
7,1)-(87,15),PSET
59 FORI=17TO34:LINE(56,I)-(72,I)
,PSET:NEXTI:CIRCLE(15,53),4,1,1,
.5,1:CIRCLE(19,57),4,1,1,.75,.25
:CIRCLE(15,61),4,1,1,0,.5:CIRCLE
(11,57),4,1,1,.25,.75:CIRCLE(15,
57),4,1,1:CIRCLE(15,57),2,1,1:CI
RCLE(32,51),1,1:CIRCLE(32,63),1,
1
60 CIRCLE(45,54),3,1,1:CIRCLE(45
,60),3,1:PAINT(45,54),1,1:PAINT(
45,60),1,1:CIRCLE(130,57),7,1,1,
.125,.875:DRAW"BM130,57;NESNF5":
PAINT(125,57),1,1:CIRCLE(129,54)
,1,0:CIRCLE(200,57),7,1:CIRCLE(2
00,57),3,1:PAINT(196,57),1,1
61 DRAW"BM215,63;NE9R10NU10LBNE7
R1NE7R2E4;BM238,50;NF9R10ND10G4"
:PMODE3,1:DRAW"BM55,50;C3R10;BM6
0,63;C4R10;BM90,50;C3R20D12L20U1
2;BM147,50;C2R13D14L13U14;BM168,
50;R12BD2L8BD2C3D6BR3U6BR3D6BR2B
D2C2L8BD2L3R12":PAINT(100,57),3,
3:PAINT(155,57),2,2
62 PMODE4,1:PAINT(223,61),5,5:LI
NE(55,50)-(60,63),PSET:LINE(65,5
0)-(60,63),PSET:LINE(65,50)-(70,
63),PSET:PAINT(65,55),5,5:DRAW"B
M200,57;C0;NE4NF4NG4NH4C1"
63 DRAW"BM97,53;C0;XL$(2);BM151,
54;XL$(2);C1":GET(6,49)-(138,64)
,P1,G:PUT(123,67)-(255,82),P1,OR
:GET(146,49)-(248,64),P1,G:PUT(9
,67)-(111,82),P1,PSET:PCOPY2TO3:
PCOPY2TO4:SCREEN1,1:FORI=0TO1000
:NEXTI
64 EXEC16310:PLAY"V31T255L25503A
":IFINKEY#=CHR$(32)THEN RETURN E
LSE64
65 REM RAINBOW ROACH BY J. FRAYS
SE 1983

```

X — current horizontal position of roach
XX — previous horizontal position of roach
JX — horizontal rate of travel on floors (0, -4, +4 pixels)
S — score of current player
SX — previous high score
SR — number of safe roaches
RC — roach count (remaining roaches minus 1)
LX — length of strings for initials and scores
RS — reference score used in a test for an increment of 5,000 in the current score

Strings

B\$ — string used to graphically display initials
NX\$ — initials of previous high score player
N\$ — initials of the current player
S\$ — string used to store the score converted to a string

Arrays

L\$ (36) — character set (A-Z/0-9)
R (2) — roach image used on belts
RX (2) — reference roach graphics (background graphics around roach)
RW (3) — "wide" roach image used on floors
P1 (54) — array used to transfer pastry graphics
XM (20) — multi-purpose eraser array (a blank)
DX (9) — rate-of-travel in the horizontal direction for roaches on belts
Y (9) — vertical jump coordinates of roach on belts and floors

PROGRAMMING TECHNIQUES

General Discussion

Rainbow Roach was designed with the features listed in the Program Features section in mind. While the techniques used may not all be optimum, they do achieve (I believe) the desired result. Where there was a choice between speed and memory, memory was sacrificed, but not to the point of using more than 16K. Although the program is reasonably structured (that is, separate functions are restricted to specific areas in the listing) it is admittedly not very "clear" due to the lack of *REM* statements and multiple statements on a single line (a substantial memory saving method). It is hoped that the discussions of this article will clarify and highlight some of the unequalled capabilities of CoCo and that in doing so will sharpen your skills and spark new ideas of your own.

Graphics

The philosophy behind the graphics is "single synthesis." This means that the vast majority of all the graphics are generated *once*. Animation was designed never to cause the destruction of any graphic elements. Objects should be allowed to be on top of each other (such as a roach on a pie) and then apart leaving the background elements totally intact. This is done by the use of two *GET/PUT* arrays which I will refer to as the *reference* array and the *object* array. The object array contains the object you are moving (say a roach). The reference array has the identical dimensions as the object array and is used to *GET* the elements in the area of an impending *PUT* of the object array. When the object array is *PUT* with a logical *OR*, the roach appears *with* its surroundings. These old positions are then stored and a new position calculated.

When it is time to move the object array, the reference array is *PUT* with a logical *AND* in the now "old" position. Next the new position is "GOTTEN" by the reference array and the object array *PUT(OR)* in the new position etc. Since the reference array did not contain the object; a logical *AND* of the reference array on top of the object array and its background will leave only background. This technique is exemplified by the unsuccessful belt-to-belt jump of lines 16 to 17 to 18 to 26 to 27. Line 16 (Put ref. (RX) INC. JUMP COORDINATE (J); Get designation Ref. (RX); to Line 17 to Line 18 (Put OBJ (R)) to Line 26 to line 27 (Put OBJ (R); Put Ref. (RX) in a loop back to line 27 for N=0 to 10). Thus the roach disappears from its previous belt (Line 16) and reappears on top of a pastry (Line 18) only to blink rapidly 11 times and disappear (Line 28) leaving the pastry intact.

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This same method is used whenever the belts are rotated since the ML routine actually rotates only the top belts (Page 2). The lower belts (Pages 3 and 4) are *COPIES* of Page 2. Note Lines 20 to 21 (save old position; $xx=x$); INC. position) to Line 23 (Put "RX" (*AND*) at "old" position; Rotate belt (EXEC 16310; Put "R" (*OR*) at new position; Go back to 20).

While on the floor (which does not rotate) smooth left-right motion can be programmed using the "RW" (Wide Roach) array. This array has a blank area on either side of the roach figure equal to the maximum left-right rate ($+/-4$ pixels per loop). Thus repeatedly *PUT*ing the "RW" array will automatically erase the previous roach image. The resulting animation is excellent and non-blinking but can only be used when in an area where no other graphic elements exist which is precisely the case when on the floors between the belts.

But aren't there some things that you would like to erase? Yes, there are. Here are two methods: 1) Preset the old object or figure and then redraw (*PSET*) its replacement (which requires keeping track of what was there), or 2) *PUT* a blank array over it and then draw the new figure. Specifically, the items needing these methods are the difficulty level box, the "remaining roaches" box, the "safe roach" box and the current and high score boxes. The beauty of method (2) is that you can get away with using one multi-purpose blank array which you may *PUT* any place with any dimension so long as you do not *GET* it, otherwise the dimension of the *GET* must equal the dimension of the *PUT*. In *Rainbow Roach* this array is XM (eraser, multi-purpose). It is used to blank the high and current scores (78 x 6 — Lines 35 & 36), the safe roach box (78 x 6 — Line 42) and the remaining roaches (6 x 8 — Line 9). As long as XM is dimensioned to accommodate the largest blank, things will be "cool." Remember, DON'T EVER *GET* THIS ARRAY.



The graphics screen is laid out with the first page being the header and safe area. This is where all the non-animation takes place. The remaining pages each contain two 18-pixel-tall, counter-rotating belts, a separating line and one 11-pixel-high floor area (a total of 48 lines/page). This allows relatively large detailed objects on the belts thus improving the quality of the graphics.

Rainbow Roach contains a 9 x 6 capital letter and number set (letters A-Z; numbers 0-9 and a space). This allows "on screen" score keeping with the player's initials. For convenience, the L\$(36) array uses the elements 0-9 to represent the numbers 0-9. That is L\$(2) draws a "2." L\$(10) is the space. The letter "A" is L\$(11) which is its ASCII code minus 54. Thus, any letter may be displayed on the screen by *DRAW* "BMX, Y,CIS4;XL\$(ASC(ZZ)—54);" where "ZZ" is the letter you wish to create.

Finally the "PI" array is used to move large blocks of graphics from belt #1 on Page 2 to belt #2. This avoids the reproduction of the code for the lower belt and most importantly reduces the program set-up time (see Line 63). You never see this set-up because CoCo has two separate screen areas for text and graphics. By displaying the text screen headers initially and at the half-way point in the set-up routine (see Lines 0 and 56) and delaying the screen command until the set-up is complete, one is able to give the appearance of "instant" hi-res graphics. Since the graphics are "Single synthesis" subsequent games are always set up. People hate to wait, but will tolerate an occasional header or two.

Sound Effects

The sounds used in *Rainbow Roach* come from a good deal of experimentation. The *PLAY* command is one of the most versatile functions of CoCo but it's extremely hard to sit down and think of a sound you would like to make and then go program it. All I can say is that arcade-like sounds are possible and are best discovered by experimenting with combinations of high or low octaves, adjacent notes, short notes and tempos, and rapid volume changes. You'll find some examples on Lines 9, 14, 16, 29 (Sound), and 42. Try these by themselves, the *POKE* 65495,0 and notice the higher octaves.

Basic Speed

The eye-to-hand reaction time of the average individual is usually between .1 and .2 seconds. Therefore any control loop which updates between 5 and 10 times per second will seem like almost instantaneous response to almost everybody. The objective then is to design a loop that samples the joystick at these speeds. Some real "drags" to loop speed include *GOSUBS*, multiplications, divisions, multiple logic tests, "ON-GOTOS" and large *GET* or *PUT* arrays ($>10 \times 10$). One should also try to minimize the line numbers in the loop or use multiple statements per line. Logic statements should be at the end of a line unless you are absolutely sure you know how ECB will handle those jumble-up branches (I'm not sure I do). The fire button is also slow requiring a *PEEK* and then at least one logic test. Loops should be as close to the beginning line in the program as possible, and I always like the *POKE* 65495,0 speed up.

Note the relative simplicity of the floor animation loop (Lines 11 to 14) and the belt animation loop (Lines 20 to 21 to 23). Also note that the "K" belt timer counter is incremented by 1 in the floor loop and by .25 in the belt loop. This is done to slow down the belt rotations in the belt loop to that of the floor loop. At level 4, $KD=0$ and because of the logic test in Line 20 on KD , the program always branches to a rotation (assuming that you have not hit a wall) and the .25 increment stops slowing the loop. Consequently at Level four, the belts move 33 percent faster when the roach is on them than when he is on the floor, (an added complication to the player!).

Two arrays help speed the overall animation loop. They

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FIGURE 2

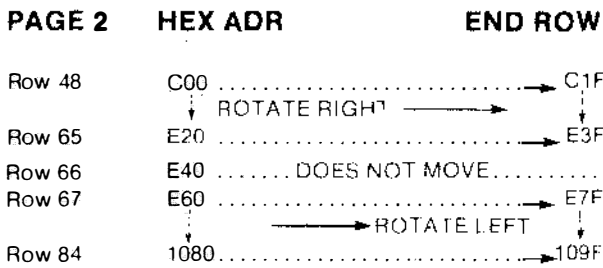
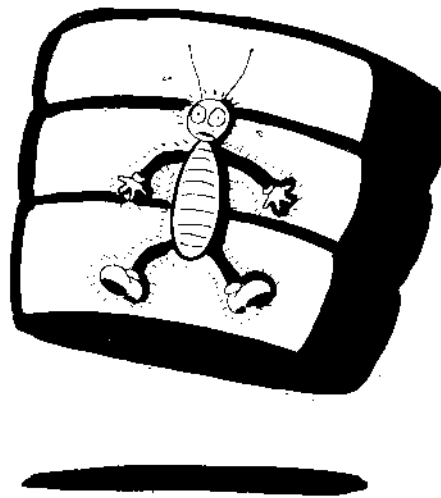


Figure 2 is a detailed layout of the screen memory locations of interest. A listing of the assembly code is figure 3. The following references to *lines* will refer to assembly listing line numbers. Rows, columns and addresses (in Hex) will describe the screen locations.

0001 0902	ORG 16310	START ADR
0002 3FB6 8E0C1F	LDX #C1F	LD ADR END 48
0003 3FB9 A684	LOOP1 LDA ,X	SAVE END COL
0004 3FBB 108E001F	LDY #001F	COLS/ROW-1
0005 3FBF E61F	LOOP2 LDB -1,X	LD X-1 VAL
0006 3FC1 E784	STB ,X	STORE X-1 @ X
0007 3FC3 301F	DEX	DECREASE X REG
0008 3FC5 313F	LEAY -1,Y	DECREASE Y REG
0009 3FC7 26F6	BNE LOOP2	DO TIL LT COL
0010 3FC9 A784	STA ,X	LAST COL=FIRST
0011 3FCB 30883F	LEAX \$3F,X	END NEXT ROW
0012 3FCE 8C0E3F	CMPX #E3F	AT END ROW 65?
0013 3FD1 2FE6	BLE LOOP1	DO TIL TRUE
0014 3FD3 8E0E60	LDX #E60	LD ADR 1STCOL67
0015 3FD6 A684	LOOP3 LDA ,X	SAVE 1STCOL
0016 3FD8 108E001F	LDY #001F	COL/ROW-1
0017 3FDC E601	LOOP4 LDB 1,X	LD X+1 VAL
0018 3FDE E780	STB ,X+	STORE X+1 @ X
0019 3FE0 313F	LEAY -1,Y	DEC Y
0020 3FE2 26F8	BNE LOOP4	DO TIL RT COL
0021 3FE4 A780	STA ,X+	1STCOL=LAST
0022 3FE6 8C10A0	CMPX #10A0	@ END ROW 84?
0023 3FE9 2FE8	BLE LOOP3	DO TIL TRUE
0024 3FEB 8E0C00	LDX #C00	ADR ROW 48
0025 3FEE EC81	LOOP5 LDB ,X++	GET 2 BYTES
0026 3FF0 EDB905FE	STD \$5FE,X	OFFSET TO PG3
0027 3FF4 EDB90BFE	STD \$BFE,X	OFFSET TO PG4
0028 3FF8 8C10A0	CMPX #10A0	END ROW 84?
0029 3FFB 26F1	BNE LOOP5	DO TIL TRUE
0030 3FFD 39	RTS	BACK TO BASIC

Well, how do we do it? If you want to rotate a row to the right you must start at the right-most byte of the row. If you want to rotate to the left, you must start at the left-most byte. Otherwise, you will copy your initial byte through every column in the row. Now, referring to Figure 2 and the listing, let's go through the "rotate right" portion. Line 2 loads the address of the last byte in row 48 into the X index register. Line 3 loads the contents of the X address into the A

accumulation for safekeeping until after all the bytes have moved right. Line 4 uses the Y index register as a counter and loads the number of columns in a row minus 1 into Y. Thus we will use the value in Y to tell us when we have reached the end of the row. Line 5 loads the B accumulator with the contents of the address pointed to by the X register minus one; or just to the left of the X address. Line 6 puts the contents of the B accumulator into the X position or in BASIC $N(X)=N(X-1)$. In words, the byte on the right is given the value of the byte on the left. Line 7 moves the index pointer (X) to the left (decrements X). Line 8 subtracts one from the times you've been through the loop. Line 9 checks to see if Y is zero. If it is you are through with the row, if not then you go back to Line 5 (loop 2). Assuming that you are through with the row, Line 10 stores the A accumulator (remember what's in there?) in the X position or at this point in the program at the left-most byte of the row. Therefore, the right-most byte has now become the left-most... you've wrapped it around! Line 11 increments X to the end of the next row. Line 12 checks to see if you are at the end of row 65. If not, Line 13 branches back to a new row. If so, then continue to Line 14 (rotate left).



Lines 14 through 23 rotate rows 67-84 to the left in a very similar fashion. Lines 24 through 30 do a selective PCOPY from page 2 (rows 48 through 84) to pages 3 and 4. Use of the double accumulator $D(A+B)$ speeds the copying by a factor of almost two. The key is Lines 26 and 27 where the store command is used in its extended, indexed/offset mode of operation. After the double X increment, Line 26 writes every two-byte element on page 2 to the corresponding two bytes on page 3. ($5FE+2=600$ =the page to page distance). Line 27 does the same thing except with a 2 page offset ($BFE+2=COO$). Lines 28 and 29 test to see if you have gotten to the end of row 84. If you have, then you are ready to return to BASIC (Line 30-RTS).

Well, that's all for now, folks! If you still have problems or questions call (703) 775-7018 after 6:00 p.m., write John Fraysse, Box 822, Dahlgren, VA 22448, or come see me. We'll go sailing on the Chesapeake and discuss it! (We race every Monday afternoon!)

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Instrument Flight Simulator is a real-time representation of an instrumented light plane. The instrument indications fairly accurately represent the responses and reactions of a typical light plane, handled gently. The navigation is based on an X-Y plot and can be considered accurate within the range of the aircraft (earth curvature disregarded). Some of the more realistic responses are:

- Gradual increases in rpm, airspeed, and vertical velocity.
- Correct response of airspeed versus climb/descent (i.e. if you are flying straight and level and pull back the throttle, the aircraft will descend; or forward on the throttle, the

(Editor's Note: We believe Instrument Flight Simulator to be a first-rate program of special interest to pilots or, at the very least, those with some knowledge of instrument flying. It is not an arcade type game, but a serious exercise that requires some brain-busting decisions, even for an experienced pilot. It is an excellent example of a computer simulation, but it is not for the uninitiated.)

aircraft will climb).

- A lagging response on the vertical velocity indicator.
- For fixed throttle and up pitch, a decreasing rate of climb to the maximum 10,000 feet altitude.
- An outstanding navigational package which can be positionally applied to a real map or a hypothetical map for practice.

The program will run on 16K Extended Color. To do this, it is necessary to chop the input prompts. Explanation of the abbreviations follows.

- BRG—angular position of 0-360 degrees (0 at top and clockwise rotation) of a nav-aid or the aircraft.
- DISTANCE—distance in miles of the nav-aid or aircraft from the reference position.
- RWY HDG—runway heading of an ILS airfield.
- HDG—heading, or direction of travel, of the airplane.
- WIND DIR—wind direction 0-360 degrees.
- VEL—velocity of wind in miles per hour.
- FUEL—fuel amount in gallons; maximum 24.

I have provided two examples of how stations may be input, and a sketch to help understand the ILS system. Once the station input system is understood, it is relatively easy to re-input the data on subsequent flights, perhaps changing only the aircraft position if you are starting from a different point.

To use *Instrument Flight Simulator*, load and *RUN*. If you wish you may enter "0" in all the input prompts to get to the instrument panel for the familiarization phase.

The aircraft is a single engine, light plane. It is not aerobatic and will not stall unless you are gliding down out of gas; then, if you allow airspeed to go below 50 mph, look out! Fuel capacity is 24 gallons and use rate is six gallons per hour at 2,000 rpm. Absolute ceiling is 10,000 ft. It will cruise at 120 mph at 2000 rpm straight and level.

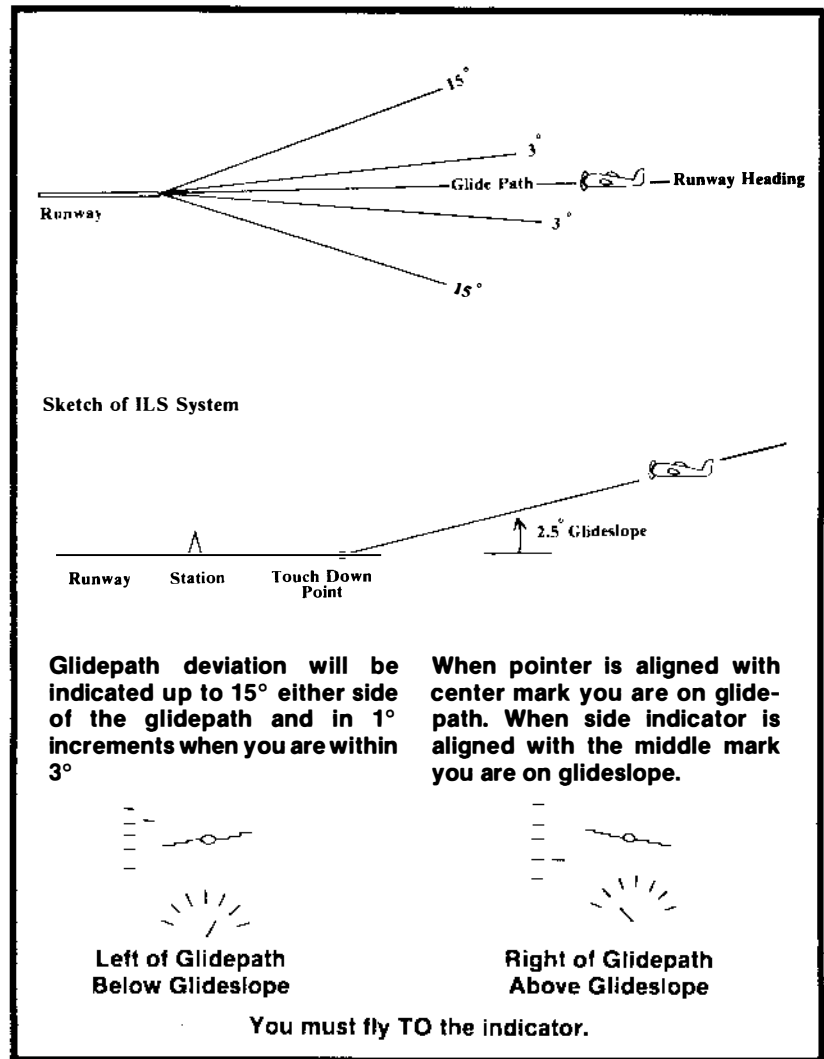
The Instruments

Starting from the top left and going counterclockwise the instruments and their function will be described.

- 1) Top left: Air Speed Indicator. Scale reads in miles per hour x 100.
- 2) Middle left: rpm indicator. Scale reads engine revolutions per minute x 1,000.
- 3) Lower left: D/F Dial (direction finding). Scale calibrated in 30 degree increments for direction. Pointer will indicate bearing to station selected. Dot indicates heading of the aircraft.
- 4) Lower left box: DME (distance measuring equipment). Gives miles and tenths to station selected (up to 99.9 miles for a TACAN or 9.9 miles for ILS).
- 5) Lower middle box: Station selected. Gives number of the navigational aid station selected.
- 6) Lower right box: Elapsed time clock. Reads hours and minutes of elapsed time.
- 7) Lower right: Fuel gauge. Capacity 24 gallons. Aircraft uses six gallons per hour at 2,000 rpm.
- 8) Middle right: VVI (vertical velocity indicator). Indicates in feet per minute x 1000 the rate of climb or descent. This instrument does not indicate an immediate response, but lags actual vertical velocity and will "catch up."
- 9) Upper right: Altimeter. Short pointer indicates altitude in feet x 1,000; long pointer is a vernier and is feet x 100.
- 10) Top center: Course readout. Indicates the heading of the aircraft in degrees. This is a more precise indication than the dot on the D/F dial.
- 11) Middle: Flight director. Scale at bottom indicates turn rate. Left side scale is for aircraft pitch. Scale at top is deviation from glide path in one-degree steps. Scale at right is deviation from glide slope in 1/2-degree increments. Aircraft representation in center represents pitch and bank of the aircraft.

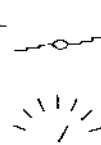
Navigation

While it is beyond the scope of this article to teach flying and navigation, a short explanation will help in understanding the navigational instruments and indications.

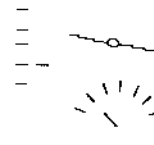


Glidepath deviation will be indicated up to 15° either side of the glidepath and in 1° increments when you are within 3°

When pointer is aligned with center mark you are on glidepath. When side indicator is aligned with the middle mark you are on glideslope.



Left of Glidepath Below Glideslope



Right of Glidepath Above Glideslope

You must fly TO the indicator.

At the beginning of the program, you must input the locations of the stations you will be using to navigate by. Stations 1, 2, and 3 are ILS (instrument landing system); stations 4, 5, and 6 are TACAN (tactical air control and navigation); stations 7, 8, and 9 are ADF (automatic direction finding).

ADF. When an ADF station is selected, the pointer on the D/F dial will indicate the bearing to that station.

TACAN. When a TACAN station is selected, the pointer on the D/F dial will indicate the bearing to that station and the distance to that station will be indicated in the DME box. The range limit for a TACAN is 99.9 miles.

ILS. When an ILS station is selected, to get instrument readings you must be within 9.9 miles of the station and within ± 15 degrees of the runway heading, otherwise the signal cannot be received. The bearing to the station will be indicated on the D/F dial and the distance indicated in the DME box. In addition, you will have deviation from glide path indicated at the top of the flight director and deviation from glide slope indicated on the right side of the flight director. In both cases, the indicator shows where the proper position is and you must fly toward that position (i.e. chase the indicator). At this point remember that the "0" deviation mark is the position of your aircraft—do not confuse the pitch and bank indicator with readings on these indicators—especially the glide slope indicator.

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The positions of the various navigational aid stations are input at the beginning of the program. All input bearings and distances are referenced to a "0" point on a map, and this point does not necessarily have to be one of your stations. Stations 1, 2, and 3 are ILS stations and require a bearing (BRG) and distance from the reference point and a runway heading (RWY HDG). Stations 4, 5, and 6 which are TACAN stations, and 7, 8, and 9 which are ADF stations require only bearing and distance inputs.

While ILS stations are obviously the locations of airports, the TACAN and ADF stations may be located elsewhere, and frequently are. This can present a navigational challenge to the CoCo flyer.

As you enter the station, location information bearing is in degrees (0-360), distance is in miles, and runway heading is in degrees (0-360). If you make an error while entering position information, simply punch on through and re-enter on the next station prompt. Do not try to enter more than one station position per station number, as only the last information entered is valid. When you have entered all your desired information, on the "STATION #" prompt enter "0" and the program will advance to the next input routine. Any stations that you have not entered data for will reflect the position of the reference spot.

After you have exited the navigational input routine, you will have prompts to position the airplane. These inputs are identical to an ILS station input. Presumably, you will want to place the airplane on one of your ILS airports and headed (HDG) in the same direction as the runway. Next input is fuel, 1-24 gallons.

The next prompt will ask for a wind direction and then a wind velocity (and you thought this wasn't real?). Direction is in degrees, 0-360, and velocity in miles per hour. Remember, wind direction is the compass heading that the wind is coming from.

Flying

The right joystick is the throttle; left joystick controls the elevators and ailerons/rudder. The joysticks are a little touchy, especially on the turn rate, however, this is a compromise between having a turn rate that won't take all day for a turn and having gentle control for straight and level. For best simulation the joysticks should be moved slowly and smoothly (you probably wouldn't be violent in an actual airplane, either).

The throttle should be pulled back all the way prior to starting, else you may already have airspeed by the time the panel appears. On start up, there will be no figures in the course readout at top center. However, as soon as the aircraft moves, course heading will appear. If the aircraft is not moving the navigational aids will not be updated. Therefore, you cannot use the different stations to determine your position if you are sitting still on the runway.

To select a navigational aid simply press the key (1-9) of the station you wish to use. If you are within range, 9.9 miles and ± 15 degrees for an ILS, or 99.9 miles for a TACAN the instruments will indicate accordingly. There is a 200-mile range limit for the ADF. If you are out of range of an ILS or TACAN station you will lose all pointers and mileage indications. When you come back in range the information will again be displayed. To turn off your navigational aid receiver press "0" and all indicators will disappear.

To navigate with any degree of accuracy, you should use some sort of map, actual or homemade, so that bearings and

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distances can be correlated to flight path and position. If you only want to practice approaches you may bypass the station inputs (in which case all entries for them are "0"), set your airplane at "0" bearing, "0" miles, "0" heading, fill up with fuel and go. You can then practice touch-and-go ILS approaches without having to set up a more elaborate station network.

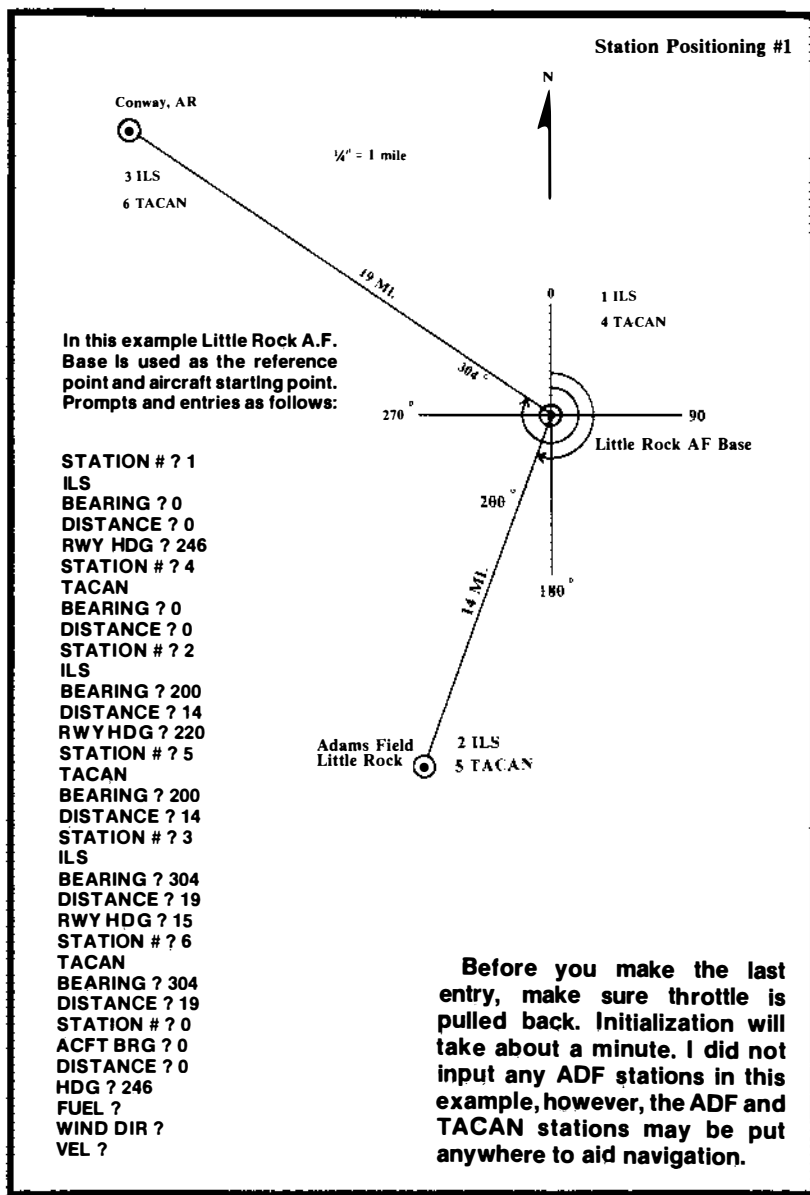
As you near touchdown on an ILS approach, you don't have to be many feet off the glide path and glide slope for the indicators to show quite a departure. This is normal and if you are on glide path and glide slope you should be around 200 feet altitude at one mile on the DME. At this point you are required to proceed visually. Since we have no visual, if you proceed on and touch down at approximately 0.2 DME with no more than ± 2 degrees glide path error, you may walk away from this landing.

Although you only have approximately four hours of fuel, no matter where you land you can still input the same station locations and continue on. The only change would be your aircraft position if you wanted to continue from whatever cow pasture you landed in (and could estimate its bearing and distance from the original reference point). If you are looking for a whiz-bang fighter plane with lots of action, then this is not for you. The *CoCo Instrument Flight Simulator* does present many parameters of flight in a fairly realistic display. It can present an interesting challenge in getting from point A to point B by spacing the navigational aids sparingly, and by using a wind input. Just as in flying there are periods where there won't be much "controlling" to do if you are going a long distance.

The instruments are not labeled as to function, but their appearance is close to the real thing and recognition can be quickly learned.

The program originally went slightly over 16K, but to make it available to a wider group of users some of the "nice to have" parts were trimmed (i.e. instrument labels and more lengthy input prompts). I hope this will satisfy some of the calls for a CoCo airplane (Scott, are you there?). So file your flight plan and "Off we go..."

Instrument Flight Simulator runs on a 16K machine; however, you must execute a CLEAR 100 prior to running. If you have a 32K machine first type in the *Instrument Flight Simulator* program, then type in the supplemental listing. This listing gives the following improvements: 1) Input prompts are more descriptive and those stations that already have inputs are listed. 2) A reminder to retard the throttle and a short message on the screen during initialization. 3) Any station for which you have not input coordinates *does not* revert to the reference position as in the basic program. 4) The XX.X in the DME box will blink if you select a station but are out of range; however, it will not blink if you



select a station for which you have not input a position.

Supplemental Listing for those with 32K. The following lines should be added, or altered as indicated, once the 16K main listing has been typed in. That listing begins on page 60.

```

30 FOR S=1 TO 9:N(S)=0:NEXT
40 GOTO 55
50 CLS:PRINT"YOU HAVE ENTERED CO
ORDINATES FOR THE FOLLOWING STATI
ONS:"
53 PRINT$(1);:PRINT$(2);:PRINT
S$(3);:PRINT$(4);:PRINT$(5);:P
RINT$(6);:PRINT$(7);:PRINT$(8
);:PRINT$(9)
55 PRINT:INPUT"WHAT STATION NUMB
ER (0-9)";S:IF S>9 THEN 50
70 PRINT:PRINT"STATION";S;" IS AN
ILS":INPUT"STATION BEARING (0-3

```

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

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

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

— Color Computer News, Jan. 1982

TELEWRITER-64

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

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

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

Since short lines are the reason for the large spaces often found in standard right justified text, and since 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, Terminus, etc).

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

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

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

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

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

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

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

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

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

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outstanding in every respect.

— The RAINBOW, Jan. 1982

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add \$2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter-compatible spelling checker (Spell 'n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

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.



```

60) "I A: A=A/57.29: INPUT "STATION D
ISTANCE (MILES)"; D: D=D*5280: SX (S
)=D*COS(A): SY (S)=D*SIN(A): INPUT "
RUNWAY HEADING (0-360)"; X: RB (S)=
INT(X)/57.29: S*(S)=STR*(S): N(S)=
1: GOTO 50
80 PRINT: PRINT "STATION"; S; "IS A
TACAN": GOTO 100
90 PRINT: PRINT "STATION"; S; "IS AN
ADF": GOTO 100
100 INPUT "STATION BEARING (0-360
)"; A: A=A/57.29: INPUT "STATION DIS
TANCE (MILES)"; D: D=D*5280: SX (S)=
D*COS(A): SY (S)=D*SIN(A): S*(S)=ST
R*(S): N(S)=1: GOTO 50
110 CLS: PRINT: INPUT "AIRCRAFT BEA
RING (0-360)"; A: A=A/57.29: INPUT "
AIRCRAFT DISTANCE (MILES)"; D: D=D
*5280: TX=D*COS(A): TY=D*SIN(A): IN
PUT "AIRCRAFT HEADING (0-360)"; X:
CS=INT(X)
120 INPUT "GALLONS OF FUEL (MAX 2
4, USES 6 GPH @ 2000 RPM)"; X: IF
X>24 THEN FR=12 ELSE IF X<0 THEN
FR=-12 ELSE FR=X-12
130 PRINT: INPUT "WIND DIRECTION (
0-360)"; X: WA=INT(X)+180: INPUT "WI
ND VELOCITY (MPH)"; X: WS=INT(X)
135 CLS: PRINT: PRINT
140 Z=JOYSTK(0): X=JOYSTK(1): IF X
<63 THEN PRINT@64, "PLEASE PULL T
HROTTLE BACK": GOTO 140
145 CLS
150 PRINT: PRINT: PRINT "PLEASE STA
ND BY. AIRCRAFT IS BEING SERV
ICED."
1640 IF S=0 OR N(S)=0 THEN GOSUB
1710 ELSE GOSUB 1810
1710 IF D7=15 AND N(S)=0 THEN RE
TURN ELSE LINE(30, 160)-(SX, SY), P
RESET: DRAW C0; BM03, 170; XA*(D7); B
M-10, 0; XA*(D6); BM-7, 0; XA*(D5); C1
; XA*(15); BM+7, 0; XA*(15); BM+10, 0;
XA*(15); ": LINE(128, 40)-(IX, IY), P
RESET: CIRCLE(162, 92+BX), 1, 0, .1: D
7=15: D6=15: D5=15
8025 IF AL<5 THEN AL=0

```

FLIGHT SIMULATOR

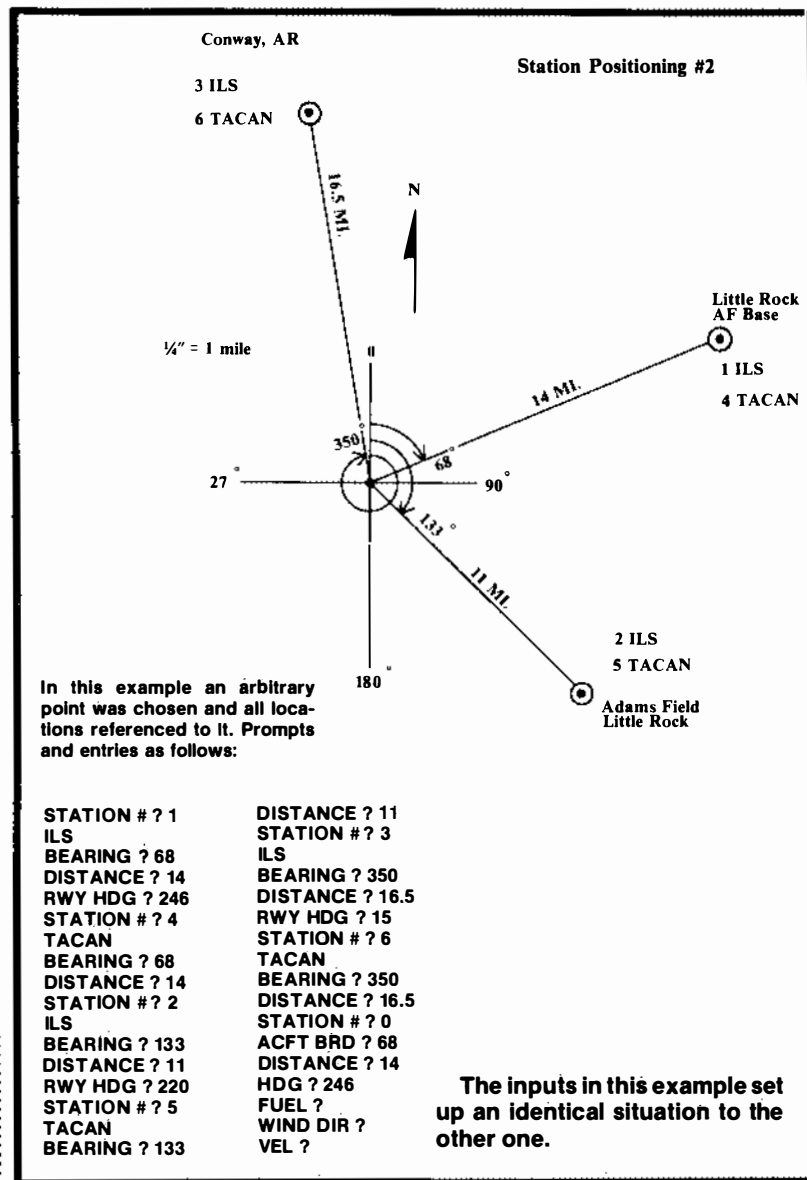
380	041F
1200	0841
1650	0867
1960	0FA2
5200	132C
5800	1924
END	1D47

The listing:

```

1 PRINT "COPYRIGHT WILLIAM G. FRA
NKLIN 1982"
50 PRINT: INPUT "STATION #"; S: IF S
>9 THEN 50
60 ON S+1 GOTO 110, 70, 70, 70, 80, 8
0, 80, 90, 90, 90
70 PRINT "ILS": INPUT "BEARING"; A: A
=A/57.29: INPUT "DISTANCE"; D: D=D*5
280: SX (S)=D*COS(A): SY (S)=D*SIN(A
): INPUT "RWY HDG"; X: RB (S)=INT(X)/
57.29: GOTO 50
80 PRINT "TACAN": GOTO 100
90 PRINT "ADF": GOTO 100
100 INPUT "BEARING"; A: A=A/57.29: I

```



```

INPUT "DISTANCE"; D: D=D*5280: SX (S)=
D*COS(A): SY (S)=D*SIN(A): GOTO 50
110 INPUT "ACFT BRG"; A: A=A/57.29:
INPUT "DISTANCE"; D: D=D*5280: TX=D*
COS(A): TY=D*SIN(A): INPUT "HDG"; X:
CS=INT(X)
120 INPUT "FUEL"; X: IF X>24 THEN X
=-24 ELSE IF X<0 THEN X=0 ELSE FR
=-X-12
130 INPUT "WIND DIR."; X: WA=INT(X)
+180: INPUT "VEL"; X: WS=INT(X)
170 DIM A*(15): FOR X=0 TO 15: READ
A*(X): NEXT X
210 PMODE 4, 1: PCLS 0: GOSUB 5000
300 Q7=1: Q6=1: Q5=1: Q8=.01: H=0: AL
=0: C7=9: C6=9: C5=9: LR=40: P1=1: TIM
ER=0
320 H=TIMER: TIMER=0: TH=TH+H
330 Z=JOYSTK(0): R=63-JOYSTK(1): B
=JOYSTK(2)-31: EP=(JOYSTK(3)-31)/

```



ENDICOTT SOFTWARE

JOYSTICKS

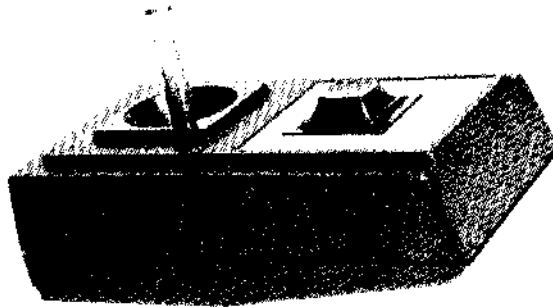
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188

340 IF B<>B1 OR EP<>PE THEN GOSU
B 8000

360 IF AL>0 OR R>12 THEN R=1260+
R*20 ELSE R=R*116

365 IF FR=-12 AND AL>0 THEN R=70
0 ELSE IF FR=-12 AND AL=0 THEN R
=0

367 IF R1<30 THEN R1=0

370 R=R1+((R-R1)*.6):R1=R:X=30+(
SIN(R/636.6)*15):Y=100-(COS(R/63
6.6)*15):LINE(30,100)-(RX,RY),PR
ESET:LINE(30,100)-(X,Y),PSET:RX=
X:RY=Y

380 AP=(SIN(6*((R-2000)/4488)+.5
7)-.54)/6

390 AS=(R*(1-AP)*(1-EP))/16.66:A
S=A1+((AS-A1)*.1):IF AS<10 THEN
AS=0

400 X=30+(SIN(AS/39.46)*15):Y=40
-(COS(AS/39.46)*15):LINE(30,40)-
(AX,AY),PRESET:LINE(30,40)-(X,Y)
,PSET:AX=X:AY=Y:A1=AS

405 IF AS<50 THEN EP=-1

410 IF SGN(VV)=-1 THEN VV=((AP+E
P)*AS)/15 ELSE VV=(1-AL/10000)*(
(AP+EP)*AS)/15

420 IF AL=0 AND SGN(VV)=-1 THEN
VV=0

430 V1=V5+((VV-V5)*.3):X=224-(CO
S(V1)*15):Y=100-(SIN(V1)*15):LIN
E(224,100)-(VX,VY),PRESET:LINE(2
24,100)-(X,Y),PSET:VX=X:VY=Y:V5=
V1

440 Z=JOYSTK(0):B=JOYSTK(2)-31:E
P=(JOYSTK(3)-31)/188:P=INT(100*(
EP+(SIN(6*AP-.57)+.54)/6)):IF B<
>B1 OR EP<>PE OR P<>P1 THEN GOSU
B 8000

450 AL=AL+(VV*H)/4.6:IF AL<=0 TH
EN AL=0

460 X=224+(SIN(AL/159)*15):Y=40-
(COS(AL/159)*15):LINE(224,40)-(L
X,LY),PRESET:LINE(224,40)-(X,Y),
PSET:LX=X:LY=Y

470 X=224+(SIN(AL/1592)*8):Y=40-
(COS(AL/1592)*8):LINE(224,40)-(L
1,L2),PRESET:LINE(224,40)-(X,Y),
PSET:L1=X:L2=Y

560 FR=FR-((R*H)/720000000):IF FR
=<-12 THEN FR=-12

570 X=224+SIN(FR/25.2)*26:Y=180-
COS(FR/25.2)*26:LINE(224,180)-(F
X,FY),PRESET:LINE(224,180)-(X,Y)
,PSET:FX=X:FY=Y

580 Z=JOYSTK(0):B=JOYSTK(2)-31:E
P=(JOYSTK(3)-31)/188:IF B<>B1 OR
EP<>PE THEN GOSUB 8000

1190 IF AS<=0 THEN 1310

1200 BC=-10*(COS((B/31)+1.570796
3)):CS=CS+BC:IF CS>360 THEN CS=C
S-360 ELSE IF CS<=0 THEN CS=CS+3
60

1310 C=INT(CS+.5):IF C=C1 THEN 1
350 ELSE C2=INT(C/100):C3=INT(C/
10)-(10*C2):C4=C-(100*C2)-(10*C3
):C1=C:DRAW"C0;BM134,23;XA\$(C7);
C1;XA\$(C4);":C7=C4

1320 IF C3=C6 THEN 1350 ELSE DRA
W"C0;BM126,23;XA\$(C6);C1;XA\$(C3)
;":C6=C3

1330 IF C2=C5 THEN 1350 ELSE DRA
W"C0;BM118,23;XA\$(C5);C1;XA\$(C2)
;":C5=C2

1350 X=30+SIN(C/57.2)*10:Y=160-C
OS(C/57.2)*10:CIRCLE(CX,CY),1,0:
CIRCLE(X,Y),1,1:CX=X:CY=Y

1360 Z=JOYSTK(0):B=JOYSTK(2)-31:
EP=(JOYSTK(3)-31)/188:IF B<>B1 O
R EP<>PE THEN GOSUB 8000

1510 IF AS=0 THEN 1610 ELSE CD=(
AS*5.28*H)/216:A=CS/57.29:X=CD*C
OS(A):Y=CD*SIN(A):TX=TX+X:TY=TY+
Y

1520 IF AL=0 OR WS=0 THEN 1610 E
LSE WD=(WS*5.28*H)/216:A=WA/57.2
9:X=WD*COS(A):Y=WD*SIN(A):TX=TX+
X:TY=TY+Y



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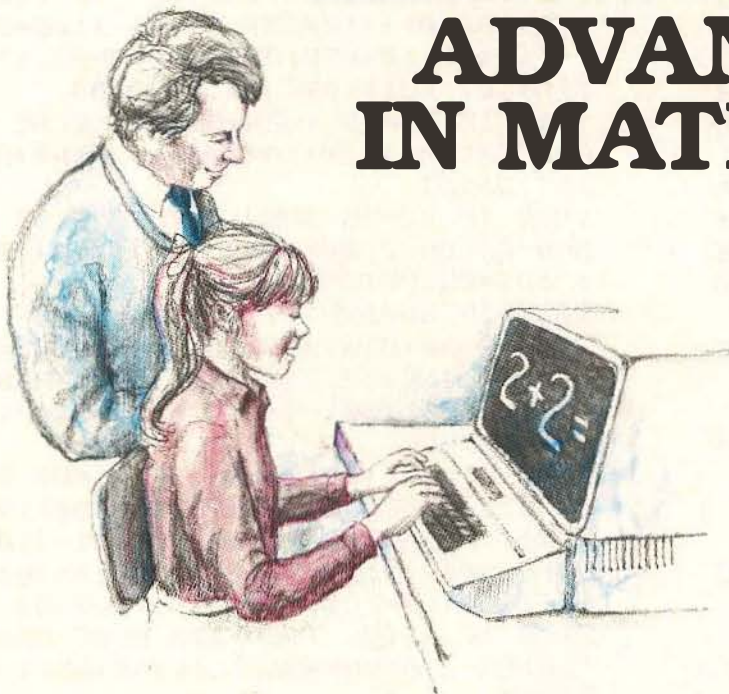
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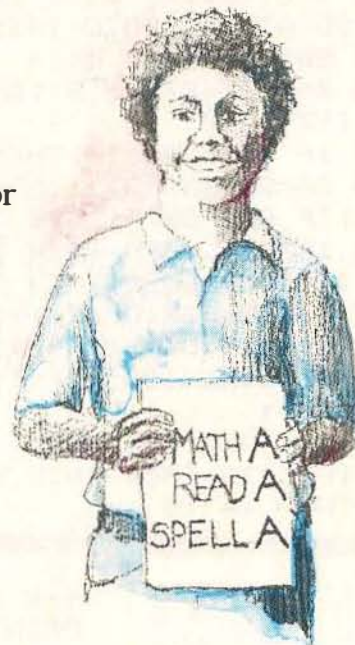
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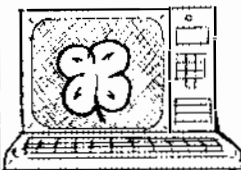
1610 S$=INKEY$:IF S$="" THEN 164
0
1620 X=VAL(S$):IF X>10 THEN 1640
ELSE GOSUB 1710
1630 DRAW"C0;BM126,170;XA$(S);C1
;XA$(X);":S=X
1640 IF S=0 THEN GOSUB 1710 ELSE
GOSUB 1810
1645 Z=JOYSTK(0):B=JOYSTK(2)-31:
EP=(JOYSTK(3)-31)/188:IF B<>B1 0
R EP<>PE THEN GOSUB 8000
1650 GOTO 2100
1710 IF D7=15 AND S<7 THEN RETUR
N ELSE LINE(30,160)-(SX,SY),PRES
ET:DRAW"C0;BM83,170;XA$(D7);BM-1
0,0;XA$(D6);BM-7,0;XA$(D5);C1;XA
$(15);BM+7,0;XA$(15);BM+10,0;XA$
(15);":LINE(128,40)-(IX,IY),PRES
ET:CIRCLE(162,92+GX),1,0,.1:D7=1
5:D6=15:D5=15
1720 IF PPOINT(38,17)=0 THEN GOS
UB 5000
1730 SCREEN1,0:RETURN
1810 BX=SX(S)-TX:BY=SY(S)-TY:SD=
SQR(BX^2+BY^2)
1811 IF BX=0 THEN BX=.001
1812 IF BY=0 THEN BY=.001
1820 X=BY/BX:IF BX<0 THEN 1830 E
LSE SB=ATN(X):GOTO 1835
1830 SB=ATN(X)-3.1416
1835 X=INT((S/3)+.9):ON X GOTO 1
839,1939,2039
1839 IF SD/5280>10 THEN 1710
1840 CA=SB-(RB(S)-1.5708):DB=COS
(CA):IF ABS(DB)>.2588 THEN 1710
ELSE IF DB>.0523 THEN DB=.0523 E
LSE IF DB<-.0523 THEN DB=-.0523
1850 X=128-SIN(DB*20)*15:Y=40+CO
S(DB*20)*15:LINE(128,40)-(IX,IY)
,PRESET:LINE(128,40)-(X,Y),PSET:
IX=X:IY=Y
1860 X=((AL/(SD-1000))-0.4366)*1
000:IF X>18 THEN X=18 ELSE IF X<
-18 THEN X=-18

```

```

1870 CIRCLE(162,92+GX),1,0,.1:CI
RCLE(162,92+X),1,1,.1:GX=X:GOTO
1940
1939 IF SD/5280>999 THEN 1710
1940 X=30+SIN(SB)*15:Y=160-COS(S
B)*15:LINE(30,160)-(SX,SY),PRESE
T:LINE(30,160)-(X,Y),PSET: SX=X:S
Y=Y
1950 SD=INT(SD/528):IF SD=D1 THE
N RETURN ELSE D2=INT(SD/100):D3=
INT(SD/10)-(10*D2):D4=SD-(100*D2
)-(10*D3):D1=SD:DRAW"C0;BM83,170
;XA$(D7);C1;XA$(D4);":D7=D4
1960 IF D3=D6 THEN RETURN ELSE D
RAW"C0;BM-10,0;XA$(D6);C1;XA$(D3
);":D6=D3
1970 IF D2=D5 THEN RETURN ELSE D
RAW"C0;BM-7,0;XA$(D5);C1;XA$(D2)
;":D5=D2:RETURN
2039 IF SD/5280>1999 THEN 1710
2040 X=30+SIN(SB)*15:Y=160-COS(S
B)*15:LINE(30,160)-(SX,SY),PRESE
T:LINE(30,160)-(X,Y),PSET: SX=X:S
Y=Y:RETURN
2100 Q1=INT(TH/3600):IF Q1=Q8 TH
EN 320 ELSE Q2=INT(TH/216000):Q3
=INT(TH/36000)-(6*Q2):Q4=Q1-(10*
Q3)-(60*Q2):Q8=Q1:DRAW"C0;BM184,
170;XA$(Q7);C1;XA$(Q4);":Q7=Q4
2130 IF Q3=Q6 THEN 320 ELSE DRAW
"C0;BM-7,0;XA$(Q6);C1;XA$(Q3);":
Q6=Q3
2140 IF Q2=Q5 THEN 320 ELSE DRAW
"C0;BM-10,0;XA$(Q5);C1;XA$(Q2);"
:Q5=Q2:GOTO 320
5000 FOR X=30 TO 224 STEP 194:FO
R Y=40 TO 160 STEP 60:CIRCLE(X,Y)
,25,1:NEXT Y:NEXT X
5010 CIRCLE(128,92),55,1
5020 LINE(84,92)-(88,92),PSET:FO
R X=74 TO 110 STEP 6:LINE(86,X)-
(88,X),PSET:NEXT X
5030 LINE(168,92)-(172,92),PSET:
FOR X=74 TO 110 STEP 9:LINE(168,

```



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ARIZIN
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Scottsdale, AZ 85252


```

X)-(170,X),PSET:NEXT X
5040 FOR Z=1 TO 3:GOSUB 5060:NEX
T Z
5050 FOR Z=5 TO 7:GOSUB 5060:NEX
T Z:GOTO 5100
5060 X=SIN((6.2832/10)*Z):Y=COS(
(6.2832/10)*Z)
5070 XA=30+(20*X):XB=30+(24*X):Y
A=40-(20*Y):YB=40-(24*Y)
5080 LINE(XA,YA)-(XB,YB),PSET:RE
TURN
5100 DRAW"BM28,24;XA$(0);BM39,58
;XA$(1);BM10,36;XA$(2);"
5200 FOR Z=1 TO 9 STEP 2
5210 X=SIN((6.2832/10)*Z):Y=COS(
(6.2832/10)*Z)
5220 XA=224+(20*X):XB=224+(24*X)
:YA=40-(20*Y):YB=40-(24*Y)
5230 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5250 DRAW"BM222,24;XA$(0);BM239,
36;XA$(2);BM233,58;XA$(4);BM210,
58;XA$(6);BM204,36;XA$(8);"
5300 FOR Z=2 TO 8 STEP 2:X=COS((
6.2832/10)*Z):Y=SIN((6.2832/10)*
Z)
5320 XA=224+(20*X):XB=224+(24*X)
:YA=100+(20*Y):YB=100+(24*Y)
5330 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5340 DRAW"BM237,113;XA$(2);BM215
,121;XA$(1);BM203,102;XA$(0);BM2
15,85;XA$(1);BM237,92;XA$(2);"
5350 LINE(114,15)-(142,25),PSET,
B:CIRCLE(128,19),18,1
5400 FOR Z=1 TO 5 STEP 2
5410 X=SIN((6.2832/8)*Z):Y=COS((
6.2832/8)*Z)
5420 XA=30+(20*X):XB=30+(24*X):Y
A=100-(20*Y):YB=100-(24*Y)
5430 LINE(XA,YA)-(XB,YB),PSET:NE
XT Z
5450 DRAW"BM28,84;XA$(0);BM47,10
3;XA$(1);BM28,122;XA$(2);BM9,103

```

```

;XA$(3);"
5500 FOR Z=2 TO 11 STEP 3:GOSUB
5510:NEXT
5505 FOR Z=1 TO 10 STEP 3:GOSUB
5510:NEXT:GOTO 5540
5510 X=SIN((6.2832/12)*Z):Y=COS(
(6.2832/12)*Z)
5520 XA=30+(20*X):XB=30+(24*X):Y
A=160-(20*Y):YB=160-(24*Y)
5530 LINE(XA,YA)-(XB,YB),PSET:RE
TURN
5540 DRAW"BM28,144;XA$(12);BM47,
163;XA$(10);BM28,182;XA$(13);BM9
,163;XA$(14);"
5600 FOR Z=-1 TO 1
5610 X=SIN((6.2862/24)*Z):Y=COS(
(6.2862/24)*Z)
5620 XA=224+(30*X):XB=224+(33*X)
:YA=180-(30*Y):YB=180-(33*Y)
5630 LINE(XA,YA)-(XB,YB),PSET:NE
XT
5650 DRAW"BM206,154;XA$(10);BM23
8,154;XA$(11);"
5660 CIRCLE(128,0),140,1,1,.23,.
29
5670 DRAW"BM128,135;ND5;BM+12,0;
ND3;BM+12,0;ND2;BM-36,0;ND3;BM-1
2,0;D2;"
5680 LINE(62,161)-(91,172),PSET,
B:LINE(163,161)-(192,172),PSET,B
:LINE(122,161)-(134,172),PSET,B:
DRAW"BM80,169;U1;BM+94,0;N;D1;BU
2;U1;"
5705 FOR Z=-3 TO 3:A=Z/57.29:X=S
IN(A*20):Y=COS(A*20):XA=128-(19*
X):XB=128-(21*X):YA=40+(19*Y):YB
=40+(21*Y)
5710 LINE(XA,YA)-(XB,YB),PSET:NE
XT
5800 DRAW"BM126,170;XA$(5);"
5900 RETURN
7000 DATA BU1;U4;E1;R2;F1;N;G4;D
4;G1;L2;H1;BD1,BU6;BR2;N;G1;D6;R
1;L2;BL1,BU5;E1;R2;F1;D1;G1;L1;G

```

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This *Stagecoach* No Oscar Winner

When the bumpy lettering of the *Stagecoach* title screen came up, I thought of young John Wayne in the classic 1939 western of that name.

When the instruction page of the 16K Extended Color BASIC program told me that my mission was to drive my stagecoach over 250 miles of burning sand to deliver the gold and the judge's pretty daughter, Annabelle, I put on my best Gabby Hayes hat, thumbed a couple of No. 1 buckshot rounds into my Greener and climbed up on the box, ready for any kind of trouble, be it maraudin' injuns or a band of thievin' skonk outlaws.

What I got when I went to the command screen was a series of six commands, such as "drink from canteen," and "ahead at a full gallop." Command number five was for "graphic display-status check." Good enough. Might as well look over the terrain before starting out.

The terrain, as shown on screen, is a straight line with a couple of mountainous bumps on either side, culminating in what may represent the town. In one corner of the screen, a canteen shows its water level, while another corner shows possession of Annabelle and the gold. If Annabelle looks anything like her screen picture, the judge may not want her back!

No matter. Onward, says the crusty old stage driver.

The idea of *Stagecoach* is to use the various commands to make best use of your water and horses, and to cope with sandstorms, Indians and the James Gang. To win, you must travel the 250 miles and retain both Annabelle and the gold.

The first time I played this kind of game, I found it in "Basic Computer Games, Vol. II," a 1979 Creative Computing release. In that publication, the game was *Camel Stagecoach* is very similar—to the point that many of the reply phrases are the same except for the use of "horses" for "camel" and "indians" instead of "pygmies."

Camel's tragic flaw was that it was too random. Seemingly logical play might get you halfway through, then a random number would wipe you out. *Stagecoach* shares the same flaw—there seems to be no reliable strategy. The play is too simple to be intellectually involving and too frustrating and repetitive to be mindless fun. The graphics used in *Stagecoach* are for naught—the pictures are crude and add nothing to the play of the game. Instead of making use of CoCo's varied sound repertoire, the authors settled for a few standard beeps and boops, with a couple of out-of-time and out-of-tune ditties at the end of play.

Disk users have to disconnect before loading the program from tape, because it uses a low-memory auto run routine that writes over disk controller memory.

Stagecoach, had it been out in early 1980, when CoCo users were hungry for any software, would have been welcome. Today, it's sadly behind state-of-the-art. There was no price on the review copy, but if *Stagecoach* sells for anything more than a real bargain basement price, your money would be better spent elsewhere.

(Petrocci Freelance Associates, 651 N. Houghton Road,
Tucson, AZ 85748)

—Bruce L. Sublett

```
2;D1;N;R4,BU5;E1;R2;F1;D1;G1;N;L
1;F1;D1;G1;L2;H1;BD1,BU2;N;R4;U1
;E3;D6;BL3
7010 DATA BU6;N;R4;D3;E1;R2;F1;D
2;G1;L2;H1;BD1,BU6;BR2;N;R2;G2;D
3;U2;R3;F1;D1;G1;L2;H1;BD1,BU6;R
4;D1;G3;D2;BL1,BU1;U1;E1;N;R1;H1
;U1;E1;R2;F1;D1;G1;N;L1;F1;D1;G1
;L2;H1;BD1,BU4;N;F1;U1;E1;R2;F1;
D2;N;L3;D1;G2;L2
7020 DATA U6;R4;BD3;BL1;L3;D3;N;
R4,U6;R4;BD3;BL1;L3;D3,U6;D1;F4;
N;U5;D1;BL4,BU5;BR4;H1;L2;G1;D1;
F1;R2;F1;D1;G1;L2;H1;BD1,N;U6;E2
;N;U1;F2;N;U6;BL4,BU6;D1;F2;E2;N
;U1;BD4;N;D1;H2;G2;D1
8000 TR=INT(B*COS(B/41)+.5):IF T
R=LR THEN 8020
8010 LINE(126+LR,130)-(130+LR,13
0),PRESET:LINE(128+LR,130)-(128+
LR,133),PRESET:LINE(126+TR,130)-
(130+TR,130),PSET:LINE(128+TR,13
0)-(128+TR,133),PSET:LR=TR
8020 P=INT(100*(EP+(SIN(6*AP-.57
)+.54)/6)):IF P>20 THEN P=20 ELS
E IF P<-20 THEN P=-20
8030 IF AL=0 AND AS<50 OR AL=0 A
ND SGN(P)=-1 THEN P=0
8040 IF P=P1 AND B=B1 THEN RETUR
N
8050 BB=B/93:IF AL=0 THEN BB=0
8060 X=INT(COS(BB)*25):Y=SIN(BB)
*25
8070 LINE(128+PX,92-P1+PY)-(128-
PX,92-P1-PY),PRESET:CIRCLE(128,9
2-P1),5,0
8080 LINE(128+X,92-P+Y)-(128-X,9
2-P-Y),PSET:CIRCLE(128,92-P),5,1
:P1=P:PX=X:PY=Y:B1=B:PE=EP:RETUR
N
```



Hint...

Disk Display

While working on a program to put a direct file access on a disk, I ran into the usual problems when writing a program and found myself wondering just exactly what my program had put into the file. After about 15 minutes of typing DSKI\$0 etc., I came up with the following little program which will display the entire contents of the disk on the screen and shows the track and the sector which it is on. Maybe someone else could benefit by this.

—George Quellhorst

```
1 ' "DISKSEEK" BY Q-SOFT
2 ' FOR USE BY RAINBOW READERS
3 CLEAR 500
4 FOR T=0 TO 34: FOR Y= 1 TO 18
5 DSKI$0,T,Y,A$,B$
6 PRINT A$, B$
7 PRINT "[ SECTOR "T" ] [ TRAC
K "Y" ]
8 NEXT Y: NEXT T
```

- COMPUTER SHACK -

COLOR DFT (Direct File Transfer) Disk or Tape

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by Tom Rugg and Phil Feldman

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Here are 37 fully documented programs ready to type into your color computer. These programs promise to be educational, practical, and in almost all cases, fun. 332 pages.

COLOR COMPUTER GRAPHICS

by Ron Clark

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The complete handbook on how to do color videographics, with ready to run programs. Learn all about low, medium and high-resolution graphics, and how to create each. 138 pages.

TRS-80 COLOR BASIC

by Bob Albrecht

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With this book you can teach yourself BASIC, the language of the TRS-80 and many other computers. Packed with games, experiments, programming problems and solutions, this entertaining self-instructional book is the ideal introductory aid for kids, parents and teachers. 378 pages.

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by Don Inman

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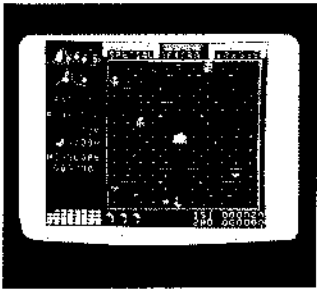
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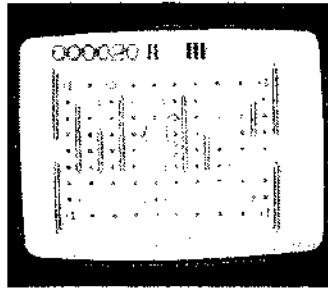
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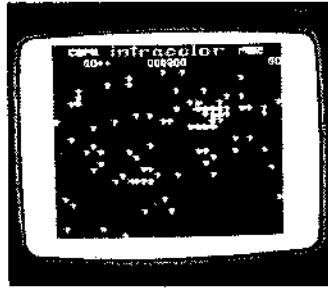
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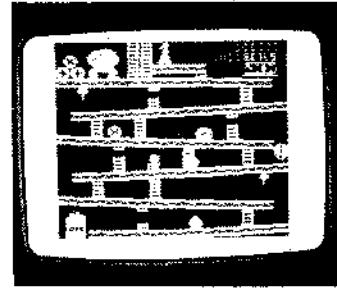
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DONKEY KING

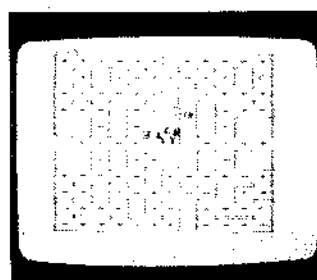
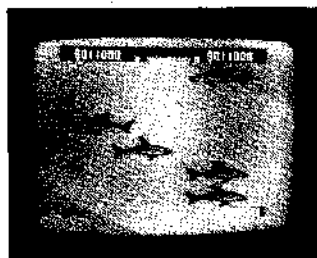
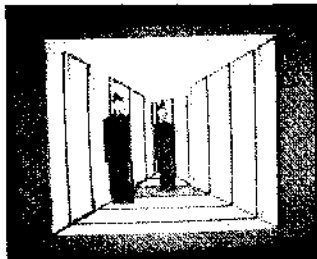
Using the four stages from the original arcade game, with your joystick in hand try to jump the barrels, collect the pins, maneuver your way past the falling jacks, and figure out the crazy conveyor belts. Written by Tom Mix, this ones sure to become a classic! 32K. Tape... \$24.95 Disk... \$27.95

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- 7)..... ASTRO BLAST
- 8)..... PLANET INVASION
- 9)..... SPACE RACE
- 10)..... GHOST GOBLER



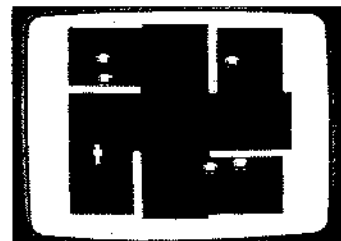
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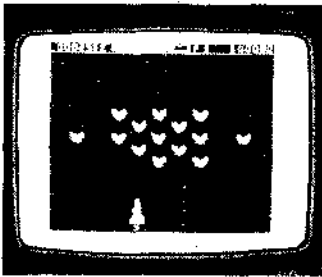


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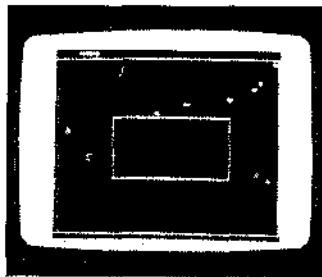
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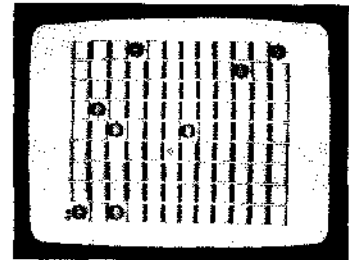
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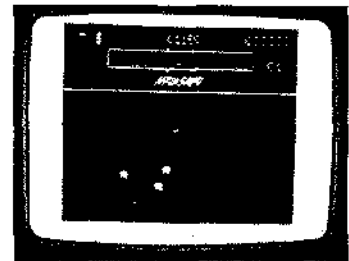
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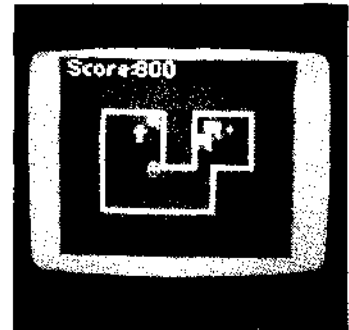
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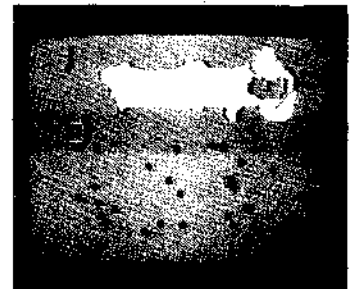
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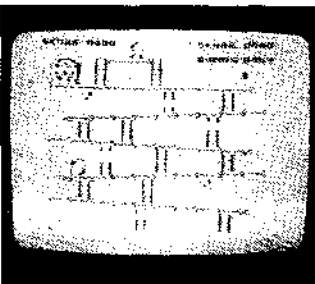
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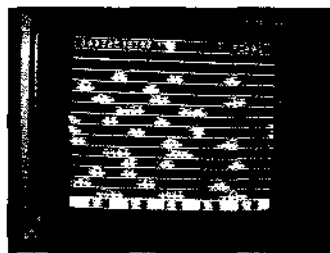
MONKEY KONG

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Memories Of The PROM

By Tony DiStefano
Rainbow Contributing Editor

This month I would like to take a close look at *memory*. What is a ROM? What is RAM? Or PROM? Or EPROM? Or EEPROM? They are all forms of memory chips, I think that before I go on, I'd better cough up a little background on memory chips. For those of you who know all about memory chips. I think that before I go on, I'd better cough up a little background on memory chips. For those of you who know all about memory chips, bear with me while I explain the concept of *memory* to those who are not quite up on the subject.

The first thing I'll look at is memory chips in general. A memory chip is a device which holds a certain amount of information. How much information it holds depends on the chip itself. It can be anywhere from 1K by 1 to 6K by 8 and more. (1K=1024) More on this later. A memory chip is

much like a telephone book. You look up a name and it gives you a telephone number. The name (in the phone book) is equivalent to the address lines of a memory chip. The telephone number (in the book) is equivalent to the data lines of a memory chip. Your fingers are equivalent to the CPU (Central Processing Unit), in this case the MC6809.

Let's take a look at the address lines first. A typical memory chip has between 10 and 14 address lines. This depends on how much memory the chip has. Address lines on a chip form a binary number (quick, look up binary numbers in your nearest math book). Each number is one memory location. One memory location is one byte. If the chip has 10 address lines then it has 2 to the power of 10 different combinations. That is $2*2*2*2*2*2*2*2*2*2$ and that is equal to 1024. (Is my math right?) In this chip (or phone book) there are 1024 bytes (or names). The CPU (or figures) can ask to look at any one of these bytes by giving the memory chip a binary number. This number, in the form of address lines then, tells the memory chip, what byte of information the CPU wants. This is the function of address lines.

The CPU gives the memory chip a binary number that corresponds to the address of where the byte is to be found. The memory chip then reacts by giving the CPU the information that is stored at that location, with the data lines. Data lines (like address lines) form a binary number. Memory chips can have from 1 to 16 data lines. Each line is known as one bit. Four bits make one nibble. Two nibbles or eight bits make one byte. Two bytes or 16 bits make one word. Most microprocessors work with 8 bits or 1 byte. Some work with 16 bits or one word. The Color Computer works with 8 bits. That means the CPU in the computer has 8 data lines or an 8-bit data bus. A bus is no more than wires that connect all of the chips together.

The last set of lines that are associated with the memory chip are control lines. Two of these lines include power and ground to the chip. The rest of the control lines are quite invisible to the user. The only one that is of interest is the chip select. This line tells the memory chip when to activate. Since there are usually more than one memory chip in a computer system, there must be a way of controlling which chip is to be giving or taking data from the CPU. This is where the chip select line comes in. A memory chip will not give or take data unless this line is activated. Well, that's enough on memory chips in general.

ROM stands for Read Only Memory. In this type of memory, the information that is in it cannot be changed, erased or lost. ROM memory is non-volatile. As soon as power is applied to a ROM, the data is available. The data in these chips was entered into it when the chip was made at the

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factory. Anyone can have a ROM made with their own data in it, but there is usually a minimum order of about 1000 pieces. It also takes a long time for delivery. Not practical for a home user. A ROM is said to be masked with the data when produced. All computers need at least some ROM memory in order to function. The Color Computer has Color Basic in ROM. Without ROM the computer would not be able to do anything.

RAM stands for Random Access Memory. This is quite different from ROM. RAM memory can be changed, erased and lost. When power is applied to a RAM chip, there is nothing in it. The computer can put any data it wants in it and change the data that is in it whenever it wants. One thing about RAM is that as soon as the power is removed from the chip, the data that was there is lost forever. RAM memory is volatile.

PROM stands for Programmable Read Only Memory. This chip is much like the ROM. The difference is that a PROM is blank. It has no data in it. All of the bits in a PROM are HI. With the proper accessories a user can put any data into a PROM. Once the data is entered or programmed into the chip, it becomes just like a ROM. It has all the properties of a ROM. It cannot be changed, erased, or lost. The only exception to that is, if a PROM is programmed more than once, the data can become very scrambled and totally useless.

EPROM stands for Erasable Programmable Read Only Memory. This chip is very much like a PROM. The major difference is that (like the name says) it can be erased. An EPROM is like a PROM but has a little window in the chip that exposes the internal circuits. When an EPROM is exposed to ultraviolet light it is erased. To protect an EPROM from being erased, a small sticker is placed over the window. All the bits return to their original state of HI. An EPROM can then be re-programmed with different data. It can be re-used over and over again.

EEPROM stands for Electrically Erasable Programmable Read Only Memory. This chip is much like the EPROM. The difference is that, instead of using a window and ultraviolet light to erase the memory, an electrical pulse is used. There is no need for a window or an ultraviolet light to erase an EEPROM.

How are memory chips used in the Color Computer? The CPU in the Color Computer is a MC6809E. It has 16 address lines. That means it is capable of addressing (or looking at) 65535 different bytes of memory. Normally it is said that this CPU can access 64K of memory. That is like having a phone book with 65535 names in it. A 32K Disk Color BASIC computer has many memory chips. First, it has 32K or RAM. Then it has 8K BASIC ROM, 8K Extended BASIC ROM and 8K Disk ROM. There is also 8K memory not being used. That totals up to 64K of memory. That is our full 65535 telephone book. But what if you had another phone book? What if you could switch between two phone books? That could give you much more memory. Or could it? In the Color Computer there is a chip called the SAM chip. SAM stands for Synchronous Address Multiplexer. This chip has the ability to switch between two phone books. EHH!? I mean between different memory chips. This gives the computer the capability to access a total of 96K bytes of memory. In a full blown Color Computer there is 96K of memory. Not all of this memory can be accessed at one time (especially with Radio Shack BASIC), but with the SAM chip in action and the right software, all of the 96K of memory can be used.

This brings me to the most asked question about the

Color Computer. "How come, when I put 64K memory chips in my computer, I do not get any more free memory when I type in *PRINTMEM*, than with 32K memory?" The answer is that the BASIC INTERPRETER was not written to handle more than 32K of RAM. It is possible however, to use all the available RAM by using the right software. As soon as more companies realize that the extra memory is there, more and more programs will be written to take advantage of the full 64K memory.

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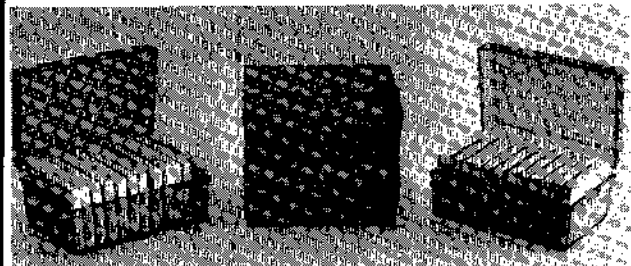
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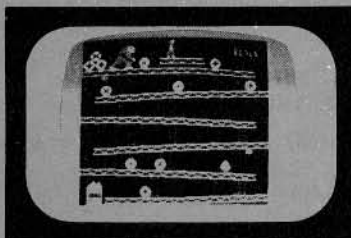
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32K Machine Language
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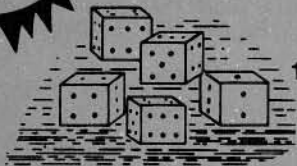
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"YAAZEE"

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16K MACHINE LANGUAGE
EXT. BASIC

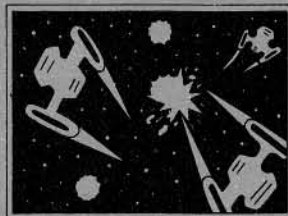


Yaazee is a 2 player game using five dice to get the best poker hand. After game is loaded flashing digit below player number determines which player rolls dice at the start of the game.

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EDUCATIONAL SOFTWARE For The Color Computer and TDP 100

STORY PROBLEMS is a program that is designed to give practice in solving STORY PROBLEMS (sometimes called STATEMENT, THOUGHT or WORD PROBLEMS) on the COLOR COMPUTER. It is suitable for use in either a home or school environment. It is also a tool that will allow you to create new story problems to suit your children's needs and ability levels. It has many features that make it particularly attractive: Story problems involving addition, subtraction, multiplication, division or a combination of the four are presented to the student by slowly scrolling each letter of each problem onto the screen. Up to 5 students may use the program at the same time. There are 4, user modifiable, skill levels. 16K Ext. Basic **TAPE \$19.95**

CLOCK-With the ever increasing use of digital clocks, more and more young people are unpracticed in the use of the "ANALOG" clocks. You remember those, the ones with the hands. This program will attempt to teach the relationship between the two types of clocks. **REQUIRES 16K EXT. BASIC \$14.95**

SPELLING TEST is designed to give a standard oral spelling test using the audio track of the computer's tape recorder to dictate test words and sample sentences. Student responses are typed on the keyboard and checked by the computer. Results are displayed on the screen and (if connected) on a printer. **REQUIRES 16K EXT. BASIC \$19.95**

MATH DRILL is a program designed to help children to practice addition, subtraction, multiplication, and division skills on the COLOR COMPUTER. It has several features that make its use particularly attractive.

- Up to 6 students may use the program at the same time.
 - Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
 - Commas may be included in the answers.
 - Partial products for the multiplication problems may be computed on the screen.
 - Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
 - There are ten, user modifiable, skill levels.
 - A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
 - Skill levels automatically adjust to the student's ability.
 - A timer measures the time used to answer each problem and the total time used for a series of problems.
 - After a problem has been answered incorrectly the correct answer appears under (above in division) the incorrect answer.
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WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero.

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SEARCH-A-WORD This Program generates a word search puzzle to your specifications. You specify the size of the puzzle and the number of words that it is to hide within the puzzle. 16K or 32K Ext. Basic. **TAPE \$17.95** **FLEX VERSION \$27.95**

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

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

16K EXT. BASIC \$19.95

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

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
- Data displayed during a sort may be printed on a printer or saved on disk or cassette as a new file.
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- Student test scores may be weighted. **32K EXT BASIC TAPE \$39.95**
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Be Nice To Your Printer— Give It This AL Word Processor

By D. S. Lewandowski
Rainbow Contributing Editor

This month has been a month for surprises. The original topic was going to be a clock for the 80C. However, last month (page 20) I see that Mr. Trevor beat me to the punch. Rather than being redundant, I tried to think of another topic. Burning much of the midnight oil I came up with a simple word processing program. It's written in two parts; this month we will be able to enter, look at and print the text. Next month we will add edit, tape save, and tape load features. I realize that there must be a hundred word processing programs out there, yet I haven't seen any in print except for BASIC listings. I feel that this may break some new ground and get us to use some ROM routines we would normally overlook.

When entering the program *please* use the same line numbers, as next month we shall delete the ones concerning the additional functions. This listing has been entered using the R/S EDTASM+, rather than the Micro-Works SDS80C. The reason is quite simple—I grabbed the one closest to the computer. By the way, the booklet called "USING an EDITOR/ASSEMBLER" is now available, just send your name and address with a 37 cents stamp (two 20 cent stamps will do) to DSL Computer Products, P.O. Box 1113, Dearborn, MI 48121 for a copy. Requests without return postage enclosed will not be honored.

The program is fairly straight forward. In line 120 the text buffer is defined, the location is then stored within the program at BUFST, for buffer start, and BUFEN, for buffer end. The screen is then cleared. In 160 the X register is pointed at a sign-on message. Then we branch to PRINT, the reason for calling it as a sub-routine is so we may reuse it. Line 180 branches around our reuseable routine to another routine at \$A393. I like to call this routine *LINE INPUT*, as you may enter any keypress, it will terminate with either an *ENTER* or a *BREAK* key. This routine will make use of a buffer at \$02DD. It will also reset X to the start location of the buffer -1. For this reason we must take the text from this buffer and move it to our buffer prior to reusing the routine. This is what is happening at line 250. We load the Y register with our current buffer location. As I just mentioned, X is pointing at the text just typed in -1, so we need to increment X. Since there is no command such as INCX, we load A with the contents of X, and increment X, in line 260. Now X is pointing at the text we typed in, so we can move it to our buffer. Before we do, we will check the contents of A to see if

either an up arrow, (end text input) or a zero, (end of line) is there. Once all the text has been moved, a zero will be encountered which will branch us to MORE, in line 360. Here a \$0D, which is an *ENTER* key, will be stored in our buffer to signal the end of a line. The contents of the Y pointer is stored at BUFEN, and the text input is resumed.

Once an up arrow is encountered, end of input. We branch to FIN, for finish. A zero is stored in our text buffer to mark end of file. The screen is cleared, and a menu of options is displayed, which brings us to WAIT. Using the routine at \$A1C1, we scan the keyboard for a keypress. Once a key is pressed, the valid options are compared to the value of the keypress. If a match is found, that routine will be executed. If no match is found, line 600 will bring us back to WAIT.

The only options that will function are: C—Continue, P—Printer, and X—Exit to BASIC. Pressing E, L, or S will refer you to next month's *RAINBOW*. See you there.

The listing:

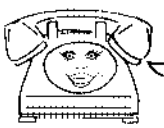
```

00100      ORG      $E00
00110 * A SIMPLE TEXT PROCESSOR IN ASSEMBLY LANGUAGE
00120 START  LDY    #BUFF  GET BUFF LOC.
00130      STY    BUFST
00140      STY    BUFEN
00150      JSR    $A928  CLS
00160      LDX    #MES1  PRINT INTRO
00170      BSR    PRINT  DISPLAY ON SCREEN
00180      BRA    CONT  GO AROUND ROUTINE
00190 PRINT  LDA    ,X+   GET BYTE
00200      BEQ    DONE  IF ZERO EXIT
00210      JSR    $A30A  OUTPUT A TO SCREEN
00220      BRA    PRINT  LOOP TILL DONE
00230 DONE  RTS    RETURN FROM SUB
00240 CONT  JSR    $A393  ROM INPUT ROUTINE
00250      LDY    BUFEN  TEXT POINTER
00260      LDA    ,X+
00270 LOOP  LDA    ,X+   POINT AT INPUT BUFFER
00280      CMPA  #$5E   UP ARROW?
00290      BEQ    FIN
00300      CMPA  #0     END OF LINE?
00310      BEQ    MORE  GET ANOTHER LINE
00320      STA    ,Y+
00330      BRA    LOOP
00340 BUFST  FDB    0     BUFF POINTER
00350 BUFEN  FDB    0
00360 MORE  LDA    #$0D  ENTER BYTE
00370      STA    ,Y+
00380      STY    BUFEN  SAVE LOC.
00390      BRA    CONT  GET TEXT
00400 FIN   LDA    #$00  END OF TEXT
00410      STA    ,Y
00420      STY    BUFEN  UPDATE POINTER
00430 FIN1  JSR    $A928  CLS
00440      LDX    #MES3
00450      JSR    PRINT  DISPLAY OPTIONS
00460 WAIT  JSR    $A1C1  INKEY$
00470      BEQ    WAIT
00480      CMPA  #$43  ASCII C
00490      BEQ    REST  RESTART

```

00500	CMPA	##45	ASCII E
00510	LBEQ	EDIT	
00520	CMPA	##4C	ASCII L
00530	LBEQ	LOAD	
00540	CMPA	##50	ASCII P
00550	BEQ	PAPER	
00560	CMPA	##53	ASCII S
00570	LBEQ	SAVE	
00580	CMPA	##58	ASCII X
00590	BEQ	EXIT	
00600	BRA	WAIT	
00610	REST	JSR	##A928 CLS
00620	LDX	##MES2	POINT AT PROMPT
00630	JSR	PRINT	
00640	LDX	BUFST	POINT AT TEXT
00650	JSR	PRINT	PRINT TEXT
00660	JMP	CONT	ENTER MORE TEXT
00670	PAPER	LDY	BUFST POINT AT START
00680	LOOP2	LDA	,Y+ GET TEXT
00690	BEQ	FIN1	ALL TEXT PRINTED
00700	JSR	##A2BF	SEND TO PRINTER
00710	BRA	LOOP2	
00720	EXIT	JMP	##A027
00730	SAVE	NOP	
00740	EDIT	NOP	
00750	LOAD	LDX	##TMES
00760	JSR	PRINT	

00770	BRA	WAIT	
00780	TMES	FCC	/NOT AVAILABLE TILL JULY ISSUE OF RAINBOW/
00790	FDB	##0D00	
00800	MES1	FCC	/ A SIMPLE TEXT/
00810	FCB	##0D	
00820	FCC	/	HANDLING PROGRAM/
00830	FCB	##0D	
00840	FCC	/	by D.S. LEWANDOWSKI/
00850	FDB	##0D00	
00860	MES2	FCC	/ ENTER TEXT TERMINATE EACH LINE
WITH AN enter. PRESS ^ KEY AND PRESS ENTER TO STOP./			
00870	FDB	##0D00	
00880	MES3	FCC	/ C - CONTINUE/
00890	FDB	##0D00	
00900	FCC	/	E - EDIT/
00910	FDB	##0D00	
00920	FCC	/	L - LOAD FROM TAPE/
00930	FDB	##0D00	
00940	FCC	/	P - SEND TEXT TO PRINTER/
00950	FDB	##0D00	
00960	FCC	/	S - SAVE ON TAPE/
00970	FDB	##0D00	
00980	FCC	/	X - EXIT TO BASIC/
00990	FDB	##0D00	
01000	BUFF	*	
01010	END	START	



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PRINT #-2,

(continued from page 12)

For you poster fans, we have bowed to your letters and are pleased to be able to announce that we now have a full-size poster available of the January, 1983, cover. That's the fine acrylic by Fred Crawford of the wizard, dragons, crawly creatures and other things that graced our special Adventure Issue. Cost is \$5 plus \$1.50 for postage and handling. We *do* have only a limited supply, so when they're gone, they're gone. This poster is really nice and features the full artwork plus a *Rainbow* logo. But, no cover lines, mailing information and the like on the poster! It is designed to be a worthy addition to your computer room.

I don't want to get into the Second Anniversary Column early, but I really *have* to say thanks to the countless thousands of you who have taken the time to call and write and say nice things about us. And, too, to thank you for mentioning us when contacting our advertisers when you have occasion to buy or inquire about a product.

By far, we are the largest selling Color Computer magazine in the world — both in terms of size and of circulation. We've been able to achieve that distinction because of your fantastic support of what we have been trying to do.

I hope you will continue to support us. We intend to keep your interests paramount. And, although there are a lot of people here right now, we make sure that anyone who is associated with *the Rainbow* knows that you, our readers and subscribers, are the most important of all.

The Rainbow started as a two-page photocopied newsletter to serve a few people who had just bought something new called a TRS-80 Color Computer. And, while we've grown pretty big by now, I like to feel we have done so simply because we keep one word consistently in mind — service. Service to you and to the Color Computer. Frankly, we're not out to make big bucks and we do not see the CoCo as a mechanism to make money. Instead, we see *the Rainbow* as an opportunity to serve you and the CoCo Community.

We hope you'll help us continue.

—Lonnie Falk

Submitting Material To the Rainbow

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

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

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

For the benefit of those who wish more detailed information on making submissions, please send a SASE to: Submissions Editor, *the RAINBOW*, P.O. Box 209, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

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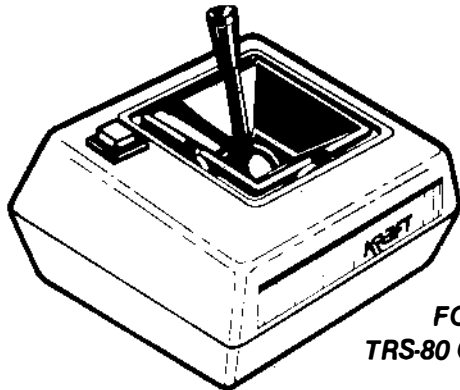
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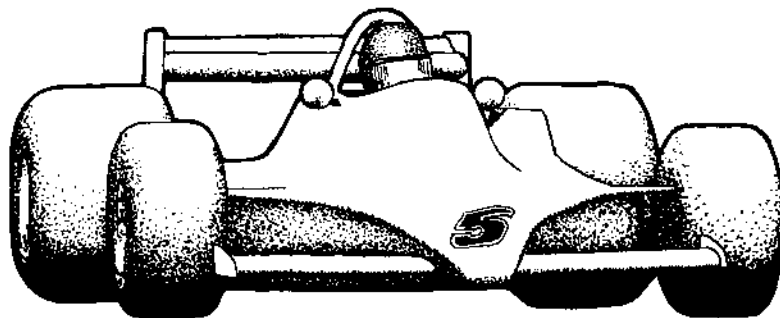


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YOUR COLOR COMPUTER JUST GOT WHEELS!



REVOLUTION!

You accelerate hard down a long straightaway, braking heavily at the end for a hard corner. You slice smoothly through the esses, and then boldly keep the power on for a fast sweeper. The Ferrari drifts dangerously near the edge, but you make a tiny correction in the steering, and you are through.

The finish line flashes by, and suddenly you are in the pits. The car falls silent. You see your lap times being held up. Your final lap was a new lap record! At last, you permit yourself a small smile.

You have mastered this powerful car on a difficult track, driving with the assurance and precision that comes only from long hours of practice.

You are driving an authentic race car. You are playing *Revolution!*

FANTASTIC ACTION

Revolution uses high resolution, machine language graphics for action that is smooth and fast. The emphasis is on authenticity in the control and motion of your car. As in driving a real race car, accuracy and precision in your driving are what counts. Frills and non-essentials have been left out.

PURE COMPETITION

Like a real race driver in practice and qualifying sessions, you compete against the clock and against the existing lap record for that track. *Revolution* records the lap records and the name of the person who set the record, so you always know who reigns supreme on your favorite track!

DESIGNED WITH YOU IN MIND

Revolution is menu-driven, and self explanatory. Information screens tell you what you need to know. When you're ready to play, a menu of the names of all your tracks is displayed, along with the lap record for each track and the name of the person who set that lap record. You select a track with a single keystroke, and *Revolution* takes you there.

A NEW CONCEPT

Revolution is a unique game, because it allows you to create the most important part of any race game: the track itself.

The first time you run *Revolution*, you will be able to choose from several tracks and cars which are included with the game.

But, with *Revolution*, this is only the beginning! You can create as many tracks as you like. You can make each new track as difficult or as easy as you wish. You can make easy ones to begin with, and tougher ones as you become more skilled. You may find creating tracks to be almost as much fun as driving on them!

You can save your favorite tracks to run on again whenever you wish. *Revolution* will automatically add these new tracks to the menu. And you can exchange your favorite tracks with other *Revolution* owners.

Be careful, though, about letting your friends play this game. They may not want to let you have your computer back!

THE EARLY REVOLUTION

A prototype version of *Revolution* was published in the September, 1982 issue of *Rainbow* magazine, under the name *The Track*. The response to *The Track* has been terrific.

Revolution has all the features that have made *The Track* a favorite, and *Revolution's* fast, high-resolution machine language graphics are dramatically improved over the prototype's.

REVOLUTION NOW!

The original *Revolution* for the TRS-80™ Color Computer requires 32K and one disk drive. A new cassette version has action just like the disk version, and similar track-saving features excluding a menu of available tracks. The cassette version will run on a 32K Color Computer or TDP-100. You can upgrade to the disk version later, too, for a nominal fee.

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This Will Program Your Keys On *Professional Keyboard*

People who have bought the *Professional Keyboard* for CoCo may want to program the four function keys, F1-F4, that appear on the keyboard. One way to do this is with the following program, which will assign the following functions to the keys:

- F1** — When pressed with the shift key will make a screen dump of the contents of your screen to a printer.
- F2** — When held down will function as a repeat key. Any key pressed along with this key will repeat.
- F3** — If you have a lowercase kit, pressing this key will “flip” between the upper case and lower case display.
- F4** — A Control key. When used like a shift, it will subtract 64 from the ASCII value. For example, pressing Control and the “H” key will give you a backspace.

To make this program work, type it in and then *RUN* it. It will *EXECute* automatically. Because it *POKEs* information into high memory, it will not interfere with your BASIC programs.

The listing:

```
1 A=PEEK(116)*256+PEEK(117)
2 CLEAR200,A—226:A=PEEK(116)*256+PEEK(117):
```

```
FOR X=A—226 TO A: READ A$: POKE X, VAL(-
"&H"+A$):NEXT:EXEC A—226:NEW
10 DATA BE, 01, 6B, 0F, FD, 9F, F8, BE, 01, 68, BF, 7C,
E1, 31, 8D, 00, 15, 10, BF, 01, 6B, 86, 7E, B7, 01, 6A, B7, 01,
67, 31, 8D, 00, B1, 10, BF, 01, 68, 39, 32, 62, AD, 9F, 0F, 70,
0D, 6F, 27, 03, 7E, A1, 7F, BD, A1, B1, 81, BD, 27, F9, 81,
04, 27, F5, 81, 67, 27, 45, 81, 13, 10, 27, 00, 4E, 34, 02, B6, 01,
56, 85
20 DATA 40, 26, 1F, 86, FF, B7, 01, 52, B7, 01, 53, B7, 01,
54, B7, 01, 55, B7, 01, 57, B7, 01, 58, B7, 01, 59, 86, BF, B7,
01, 56, 35, 02, 39, B6, 01, 58, 85, 40, 26, 0D, 35, 02, 81, 41, 25,
06, 81, 5B, 24, 02, 80, 40, 39, 35, 02, 39, 34, 02, B6, 01, 57, 85,
40, 26, BA, 35, 02, 03, FD, 4F, 39, 34, 36, B6, 01, 55, 85, 40,
26
30 DATA 2F, 8E, 04, 00, C6, 20, A6, 80, 81, 60, 26, 04, 86,
20, 20, 0E, 81, 20, 24, 04, 8B, 60, 20, 06, 81, 60, 25, 02, 88, 40,
84, 7F, BD, A2, BF, 5A, 26, E0, 86, 0D, BD, A2, BF, 8C, 06,
00, 26, D4, 35, B6, 0D, 6F, 26, 0A, 0D, FD, 27, 06, 81, 41, 25,
02, 88, 20, 7E, CB, 4A
```

—Bob Rosen

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SYSTEMS SOFTWARE

MACRO-80C

This is a **disk-based editor, macro assembler and monitor**, written for Color Computer by Andy Phelps. **THIS IS IT** — The ultimate programming tool!

The powerful 2-pass macro assembler features conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. There are no changes, constraints or shortcuts in the source language definition. Incorporating all of the features of our Rompack-based assembler (SDS80C), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility.

The screen-oriented text editor is designed for efficient and easy editing of assembly language programs. The "Help Key" feature makes it simple and fun to learn to use the editor. As the editor requires no line numbers, you can use the arrow keys to position the cursor anywhere in the file. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which are longer than 32 characters.

DCBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

The editor, assembler and monitor — as well as sample programs — come on one Radio Shack compatible disk. Extensive documentation included. **MACRO-80C Price: \$99.95**

SOFTWARE DEVELOPMENT SYSTEM

The Micro Works Software Development System (SDS80C) is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack! Vastly superior to RAM-based assemblers/editors, the SDS80C is non-volatile, meaning that if your application program bombs, it can't destroy your editor/assembler. Plus it leaves almost all of 16K or 32K RAM free for your program. Since all three programs, editor, assembler and monitor are co-resident, we eliminate tedious program loading when going back and forth from editing to assembly and debugging!

The powerful screen-oriented Editor features finds, changes, moves, copies and much more. All keys have convenient auto repeat (typematic), and since no line numbers are required, the full width of the screen may be used to generate well commented code.

The Assembler features all of the following: complete 6809 instruction set; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile monitor is tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: \$89.95**

MICRO WORKS COLOR FORTH

- Forth is faster to program in than Basic
- Forth is easier to learn than Assembly Language
- Forth executes in less time than Basic

Forth is a highly interactive language like Basic, with structure like Pascal and execution speed close to that of Assembly Language. The Micro Works Color Forth is a Rompack containing everything you need to run Forth on your Color Computer.

Color Forth consists of the standard FORTH Interest Group (FIG) implementation of the language plus

most of FORTH-79. It has a super screen editor with split screen display. Mass storage is on cassette. Color Forth also contains a decompiler and other aids for learning the inner workings of this fascinating language. It will run on 4K, 16K, and 32K computers. Color Forth contains 10K of ROM, leaving your RAM for your programs! There are simple words to effectively use the Hi-Res Color Computer graphics, joysticks, and sound. The 112-page manual includes a glossary of the system-specific words, a full standard FIG glossary and complete source listing. **COLOR FORTH ... THE BEST!** From the leader in Forth, Talbot Microsystems. **Price: \$109.95**

MICROTEXT: COMMUNICATIONS VIA YOUR MODEM!

Make your Color Computer an intelligent printing terminal with off-line storage! The Microtext module is just what you'll need for:

- Talking to a timeshare system or information service
- Printing out what is received as it is received
- Saving received text to cassette tape
- Re-displaying the received text even while on-line
- Communications with other computers
- Using your computer as a general-purpose 300-baud terminal
- Downloading programs from other computers

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' PI80C parallel interface.

For those of you with special terminal applications, Microtext has selectable parity; it sends odd, even, mark or space. With mark parity (which is default) you can send to computers requiring either seven or eight bits. All 128 ASCII codes can be sent. Exchange programs with other Color Computer users! Basic programs may be downloaded from other computers or timesharing systems.

You'll find many uses for this versatile module! Available in ROMPACK, ready-to-use, for **\$59.95**.

MACHINE LANGUAGE

MONITOR TAPE: A cassette tape which allows you to directly access memory, I/O and registers with a formatted hex display. Great for machine language programming, debugging and learning. It can also send/receive RS232 at up to 9600 baud, including host system download/upload. 19 commands in all. Relocatable and reentrant. **CBUG Tape Price: \$29.95**

MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or the Romless Pak I. **CBUG ROM Price: \$39.95**

SOURCE GENERATOR: This package is a disassembler which runs on the color computer and generates your own source listing of the BASIC interpreter ROM. Also included is a documentation package which gives useful ROM entry points, complete memory map, I/O hardware details and more. A 16K system is required for the use of this cassette. **80C Disassembler Price: \$49.95**

BOOKS

6809 Assembly Language Programming, by Lance Leventhal, **\$16.95**

TRS-80 Color Computer Graphics, by Don Inman, **\$14.95**

Assembly Language Graphics for the TRS-80 Color Computer, by Don Inman, **\$14.95**

Starting Forth, by L. Brodie, **\$19.95**

GAMES

Star Blaster — Blast your way through an asteroid field in this action-packed Hi-Res graphics game. Available in ROMPACK; requires 16K. **Price: \$39.95**

Pac Attack — Try your hand at this challenging game by Computerware, with fantastic graphics, sound and action! Cassette requires 16K. **Price: \$24.95**

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

Dunkey Munkey — Arcade excitement awaits those who dare to conquer the Munkey! Joystick and 32K required, by Intellectronics. Cassette: **\$24.95**

Colorpede — Great graphics, two-player option, and pause control in this exciting game by Intracolor Communication. Cassette requires 16K: **\$29.95**

Adventure — *Black Sanctum* and *Calixto Island* by Mark Data Products. Each cassette requires 16K: **\$19.95** each.

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

Starfire — Fly around the planet defending Earthlings from being snatched up by aliens in this challenging game from Intellectronics. Cassette requires 16K: **\$21.95**

Doodle Bug — Joystick-controlled Doodle Bugs must move quickly through mazes while being chased by enemy bugs in Hi-Res game by Computerware. Cassette requires 16K: **\$24.95**

Astro Blast — You'll need to act fast as you protect Earth from wave after wave of alien invaders in this Hi-Res game by Mark Data. Cassette requires 16K: **\$24.95**

HARDWARE

PARALLEL PRINTER INTERFACE — Serial to parallel converter allows use of all standard parallel printers. PI80C plugs into the serial output port, leaving your Rompack slot free. You supply the printer cable. **PI80C Price: \$69.95**

MEMORY UPGRADE KITS: Consisting of 4116 200ns, integrated circuits, with instructions for installation. **4K-16K Kit Price: \$39.95. 16K-32K Kit** (requires soldering experience) **Price: \$39.95.** For Rev. level E, ET, NC and TDP-100s, we carry 64K chips; upgrading is easy! Eight prime 64K chips and instructions: **\$64.95**

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☆ Last Month's Number One

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92,000	★ Harry Sawyer, Watchung, NJ	427,160	Chantal Delorme, Actonvale, Quebec, Canada
75,314	Mike Hall, Hartland, WI	388,060	Michelle Thompson, Milipitas, MS
63,000	☆ Cameron Amick, Reisterstown, MD		COLOUR PAC ATTACK
53,000	Peter Niessen, Carlisle, MA	193,000	☆ Cameron Amick, Reisterstown, MD
31,600	David Rosicky, Pittsburgh, PA	27,500	David Rosicky, Pittsburgh, PA
	AVENGER		CONQUEST OF KZIRGLA
11,560	☆ Peter Niessen, Carlisle, MA	10,399	☆ Scott Sehlhorst, Columbia, SC
5,345	Craig Schubert, Newfoundland, NJ		DEFENSE
5,000	Cameron Amick, Reisterstown, MD	58,900	★ Greg Scott, Orlando, FL
	BERSERK		DOUBLEBACK
10,250	★ Mike Anheluk, Fall Creek, OR	48,160	★ Mary H. Thomas, Louisville, KY
10,070	Harry Sawyer, Watchung, NJ		DUNKEY MUNKEY
6,150	Steve Skrzyniarz, Tacoma, WA	1,099,400	☆ Andrew Herron, High Point, NC
	BUSTOUT	1,000,500	Wendy Johnson, San Jose, CA
25,510	☆ Andy Klingler, San Diego, CA	1,000,001	Grant Gillott, Calgary, Alberta, Canada
	CATCH 'EM	626,400	Peter Niessen, Carlisle, MA
91,000	★ Dean Bouchard, Kingston, Nova Scotia, Canada	512,300	Harry Sawyer, Watchung, NJ
65,768	Laura Sandman, Louisville, KY		FROG TREK
	CAVE HUNTER	7,160	★ Mike Anheluk, Fall Creek, OR
42,600	★ Gary Ritchie, Bellevue, Alberta, Canada		GALACTIC ATTACK
	CLOWNS & BALLOONS	34,350	★ Murray Schechter, New York, NY
61,700	★ Dan Dowling, San Bruno, CA	31,780	☆ Andy Klingler, San Diego, CA
	COLOR HAYWIRE	30,350	Mark Raphael, Englishtown, NJ
10,250	☆ Pat Downard, Louisville, KY	28,000	Nathan Miller, Portland, OR
9,750	Andy Klingler, San Diego, CA	26,040	Warren Schubert, Newfoundland, NJ
9,550	Alan Lewis, Ridgefield, CT	24,680	Hans Haimberger, Milton Freewater, OR
9,550	Murray Schechter, New York, NY	18,360	Doug Toombs, Rochester, NY
9,200	Dean Bouchard, Kingston, Nova Scotia, Canada		GHOST GOBBLER
9,200	Peter Stumpf, McHenry, IL	825,250	☆ Randy Gerber, Wilmette, IL
	COLOR INVADERS	103,590	Harry Sawyer, Watchung, NJ
83,000	☆ Cameron Amick, Reisterstown, MD	49,880	Steven Picone, Leomister, MA
	COLOR METEORIDS		INVADERS REVENGE
149,000	☆ Cameron Amick, Reisterstown, MD	32,600	★ Harry Sawyer, Watchung, NJ
148,600	Harry Sawyer, Watchung, NJ		INVASION
72,000	Herb Little, Fredericton, NB, Canada	82,000	★ Harry Sawyer, Watchung, NJ
	COLORPEDE		KATERPILLAR ATTACK
2,005,227	★ Jennifer Maxey, Kalamazoo, MI	12,703	★ Warren Schubert, Newfoundland, NJ
1,329,868	Russ Eubanks, Jay, ME	12,100	Peter Stumpf, McHenry, IL
1,104,029	Gary Ritchie, Bellevue, Alberta, Canada	10,249	☆ Cameron Amick, Reisterstown, MD
	Larry Seida, University of MN	7,556	Peter Niessen, Carlisle, MA
590,000	Mike Anheluk, Fall Creek, OR		THE KING
495,669	Andy Potter, Crofton, MD	805,700	★ Dave Mercer, Marissa, IL
489,684	Balinda Fortman, Flagstaff, AZ	486,500	Frank Bottino, St. Louis, MO
448,723	Mike Hall, Hartland, WI	448,900	Alan Mack, Penn Yan, NY
377,749	Danny Burch, Louisville, KY	346,000	Miles C. Langmacher, Minco, OK
163,863		319,000	☆ Steve Skrzyniarz, Tacoma, WA
	COLOR SCARFMAN	316,700	Brad Scoffin, Encinitas, CA
506,560	★ Russ Eubanks, Jay, ME	185,700	Larry Seida, University of MN
448,860	James Quadarella, Brooklyn, NY		

SCORE	PLAYER	SCORE	PLAYER
145,500	Michael Rothman, Solon, OH	358,514	☆ Cameron Amick, Reisterstown, MD
126,900	Alan Cox, Roseville, CA	94,000	Gerry Schechter, Yonkers, NY
	KOSMIC KAMIKAZEE		ROBOTTACK
49,900	★ Mark Raphael, Englishtown, NJ	405,900	★ Joseph Priso, Oswego, NY
	MEGA-BUG		SHUTTLE SIMULATOR
12,236	★ Claude Malepart, Montreal, Quebec, Canada	565	★ John W. Fraysse, Dahlgren, VA
9,901	Beverly Cremer, Kempton, W. Germany		SKIING
9,546	Gary Ritchie, Bellevue, Alberta, Canada	1:04.17	☆ Andy Klingler, San Diego, CA (No Errors)
8,942	Russ Eubanks, Jay, ME	1:13.16	Doug Toombs, Rochester, NY
8,781	Ken Miller, Yardley, PA	1:13.25	Cameron Amick, Reisterstown, MD
7,801	Jen Teeter, Hawley, PA		SKY DEFENSE
7,235	Dick Teeter, Hawley, PA	6,700	★ Mike Anheluk, Fall Creek, OR
6,732	Julie Teeter, Hawley, PA	6,120	Steve Skrzyniarz, Tacoma, WA
	MICROBES	5,200	☆ Cameron Amick, Reisterstown, MD
259,700	★ Sheila Coleman, Griffin, GA		SOLO POOL
80,400	Ken Miller, Yardley, PA	103	★ John W. Fraysse, Dahlgren, VA
63,570	Greg Scott & Greg Shields, Orlando, FL		SPACE ASSAULT
15,620	Russ Eubanks, Jay, ME	156,650	★ Nathan Miller, Portland, OR
	MR. MUNCH	124,660	Alan Mack, Penn Yan, NY
24,680	★ Alan Mack, Penn Yan, NY	120,880	Murray Schechter, New York, NY
	MONKEY KONG	97,500	Alan Lewis, Ridgefield, CT
963	★ Mark Dowling, San Bruno, CA	53,030	Warren Schubert, Newfoundland, NJ
	MONSTER MAZE		SPACE INVADERS
30,000	★ Claude Malepart, Montreal, Quebec, Canada	62,300	☆ Peter Niessen, Carlisle, MA
	PAC ATTACK		SPACE RACE
30,650	☆ Peter Niessen, Carlisle, MA	31,525	★ Greg Scott, Orlando, FL
	PAC DROIDS		SPACE SHUTTLE
48,640	★ Murray Schechter, New York, NY	594	★ Steve Schweitzer, Sewell, NJ
45,000	James Quadarella, Brooklyn, NY		SPACE WAR
17,000	☆ Peter Niessen, Carlisle, MA	116,000	☆ Peter Niessen, Carlisle, MA
	PACET-MAN		STARBASE ATTACK
5,000	☆ Cameron Amick, Reisterstown, MD	21,628	★ Mark Raphael, Englishtown, NJ
	PHANTOM SLAYER		STARBLASTER
180	★ Mike Hall, Hartland, WI	408,245	★ Mark Dowling, San Bruno, CA
	PINBALL	325,790	Mike Anheluk, Fall Creek, OR
66,650	★ Ken Miller, Yardley, PA	126,135	Mike Hall, Hartland, WI
	PLANET INVASION	80,001	Alan Lewis, Ridgefield, CT
225,400	Chris Sweet, Harvard, MA		STARFIRE
67,240	Alan Mack, Penn Yan, NY	2,102,450	★ Dean Bouchard, Kingston, Nova Scotia, Canada
59,480	Steve Skrzyniarz, Tacoma, WA	1,320,150	☆ Joy Bailey, Lexington, NC
57,600	Brian Bates	618,400	Peter Stumpf, McHenry, IL
42,300	Greg Scott, Orlando, FL	464,700	Cameron Amick, Reisterstown, MD
	POLARIS		STARSHIP CHAMELEON
101,000	★ James Quadarella, Brooklyn, NY	68,500	☆ Cameron Amick, Reisterstown, MD
69,455	☆ Alan J. Weiss, Summitt, NJ	64,800	David Rosicky, Pittsburgh, PA
61,000	Dan Dowling, San Bruno, CA		STORM
57,892	Sheila Coleman, Griffin, GA	723,335	★ Chris Sweet, Harvard, MA
54,370	David Rosicky, Pittsburgh, PA	380,000	☆ Cameron Amick, Reisterstown, MD
46,000	Doug Toombs, Rochester, NY	69,710	Steve Skrzyniarz, Tacoma, WA
45,462	Tom Disch, Brookfield, WI	60,265	Peter Niessen, Carlisle, MA
39,688	Matthew Breneugen, Lake Elmo, MN		VENTURER
	POLTERGEIST	2,152,150	★ Greg Scott, Orlando, FL
4,956	★ Mark Dowling, San Bruno, CA	1,526,200	☆ Peter Niessen, Carlisle, MA
4,455	Ken Miller, Yardley, PA	344,550	Steve Skrzyniarz, Tacoma, WA
	POPCORN	313,250	David Glovinsky, Staten Island, NY
110,570	☆ Cameron Amick, Reisterstown, MD		ZAXXON
56,000	James Quadarella, Brooklyn, NY	81,800	★ Matt Cox, Roseville, CA
		78,190	Steve Skrzyniarz, Tacoma, WA

How To 'Zonk Proof' Your Disk Directories

By Thomas F. Szlucha

If you own a Radio Shack disk drive for your Color Computer, you will be interested in the following disk utility program. If you are contemplating a disk drive in the future for your Color Computer, you may also be interested in this article because it may influence your choice of a disk system.

A disk drive represents one of the ultimate peripherals which can be added to the Color Computer. It allows almost instant recall of program files and gives the ability to do real data file handling on this computer. Although there are several competing operating systems available, the Radio Shack disk system represents a logical choice. It is the only configuration that is supported by Tandy, but, perhaps more important, the vast majority of independent software developers support this operating system.

I have learned several things about the Radio Shack Color Disk Drive after having made the *logical choice* of this system. It features the advantage of having the operating system stored on ROM rather than taking up valuable RAM space. Also, the operating system is very "user friendly;" you hardly know it is there until you need it to store or retrieve a program. That is enough platitudes for the Radio Shack Color Disk Drive, because this article is not about what is right with this system but what is wrong with it. This disk system has an inherent reliability shortfall related to a random loss of the Directory. Track 17, the middle track on the disk, contains vital information that the operating system needs in order to access or save programs and data files. This information is referred to as the Directory. The loss of information on this track which I and many others using the Radio Shack drive system have experienced is not completely understood. It appears that it may be due to loose or dirty contacts in the interface connector. Since the drive head rests over track 17 most of the time, spurious signals to the drive controller can scramble the information written in the Directory. Again, these failures are random but when they do occur, they are fatal. The disk cannot be accessed by normal means. All programs and data become lost. The accompanying program can be used to eliminate

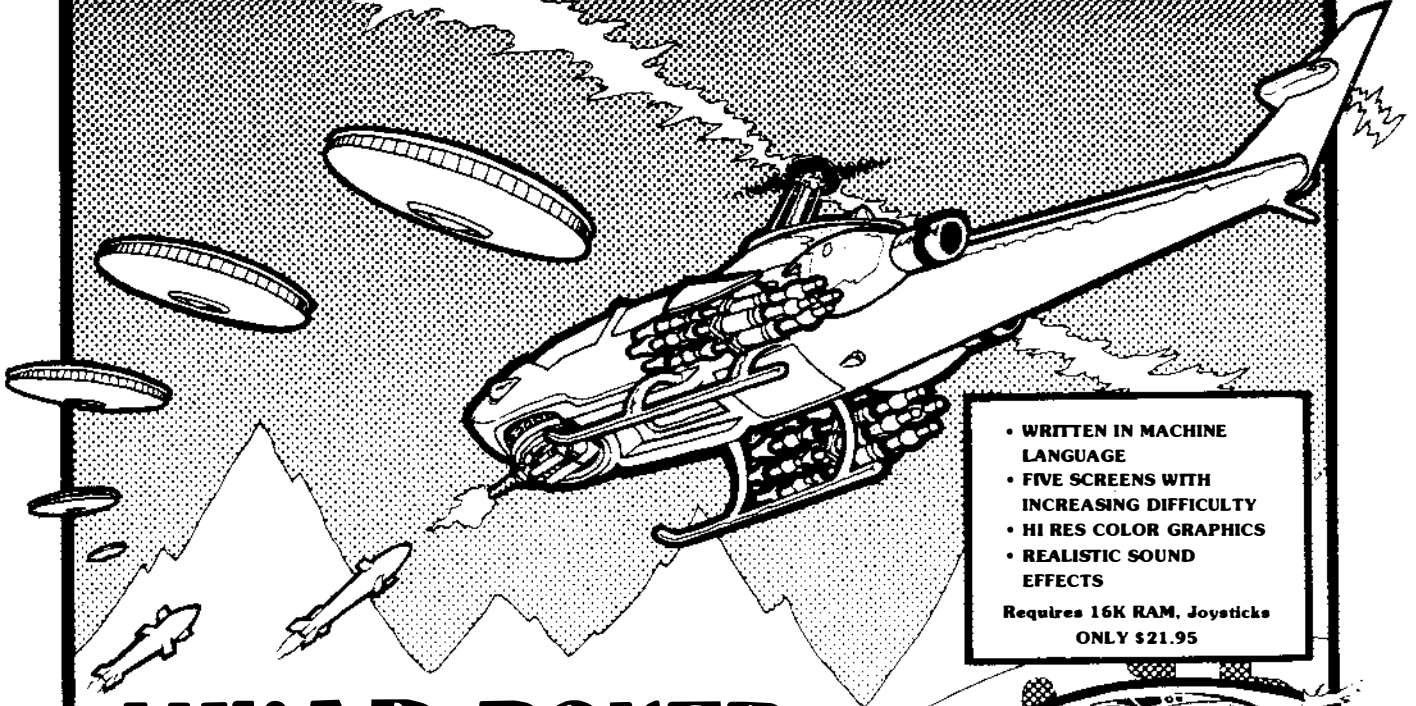
this problem by making a spare copy of the information in the Directory ready for instant recovery of a zonked Directory.

COPYDIR is written in Extended Color BASIC. It makes a backup copy of track 17 onto track 0. When you run the program, the computer first checks to see if track 0 is being used from program storage. If the disk is only partially full, it probably is not in use, because track 0 is one of the last tracks written on as you fill a disk. If the track is not in use, a special code (CHR\$ 191) is put into byte 0 of sector 2 in track 17 to reserve track 0 for the backup Directory. This sector in the Directory is referred to as the File Allocation Table. You can read about this in more detail in the Color Disk System Owners Manual—Chapter 11.

After reserving track 0, you are presented with a short menu asking whether you want to copy track 17 or restore the Directory. Before you run the program to copy track 17, consider if there is any data on track 0 from a previous Directory copy run that you may have deleted from the present Directory with a Kill command. *COPYDIR* can be used to restore a previously deleted program if the data relating to this program exists in the Directory copy. To aid in this decision process, the program will scroll the information on track 0 onto the screen. If you are not interested in trying to restore a deleted program, then simply select (C)opy 17. If you note a deleted program, be sure to examine the normal Directory to see if there are any new programs not listed in the backup copy of the Directory. If so, copy them onto another disk for temporary storage or you will lose them in the process of restoring the old Directory.

You will want to keep a copy of *COPYDIR* on all your working disks and run it occasionally to keep your backup up-to-date. When you need to restore a wrecked Directory you will have to load *COPYDIR* from another disk. A typical symptom of a wrecked Directory is an I/O error response after issuing a *DIR* command. My experience with the R.S. Color Disk system is that, with moderate use, disk failures occur at the rate of about one to two a month. Greater than 95 percent of these failures are caused by the

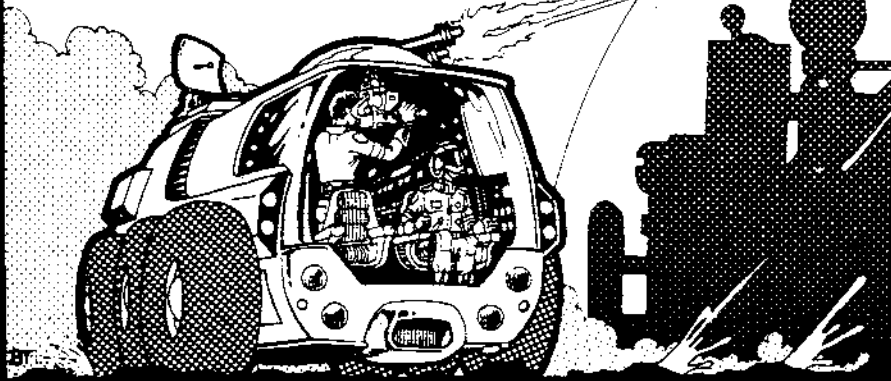
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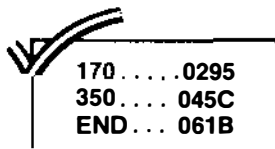
DEALER INQUIRIES INVITED

loss of the Directory track. This disk insurance comes at the small penalty of requiring two out of 68 granules on the disk needed for the program and Directory backup storage.

Type in this program very carefully. It would be a good idea to practice on a scratch disk to assure that the program is working error free. The *DSKO\$* command used in this program is very powerful and will destroy everything in its track if its parameters are set incorrectly. To intentionally wipe out the Directory in debugging the program, type in and run:

```
10 A$ = " "
20 B$ = " "
30 DSKO$ 0, 17, 2, A$, B4
```

After debugging this program and using it to backup the directories, your confidence in program and data storage on the Color Computer Disk system should be restored. After applying this fix you should continue the normal practice of maintaining backup copies of all your disks but triple or quadruple backups (which I understand some frustrated Color Computer owners are doing because of this disk problem) are no longer needed.



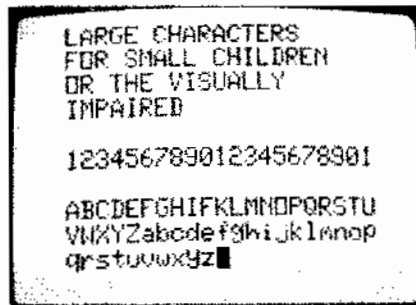
The listing:

```
10 ' DIRECTORY PROTECTION PROGRAM
20 ' REV 1.1 02/07/83
25 ' THOMAS SZLUCHA - PERSONAL CO
MPUTER CONSULTING - 14 GREAT GAR
LAND RISE, FAIRPORT, N.Y. 14450
40 CLEAR4000
50 CLS:PRINT@200,"<C>OPY TRACK 1
7 <R>ESTORE DIRE
CTORY <E>ND
WHICH";:INPUTR
$
60 IF R$="C" THEN GOSUB 150
70 IF R$="R" THEN GOSUB 550
75 IF R$="E" THEN 90
80 GOTO 50
90 CLS:PRINT@202,"FINISHED":END
110 CLS:PRINT@195,"SOMETHING ALR
EADY ON TRACK 0 RUN ABORTED":
END
120 CLS:PRINT@195,"CANNOT RESTOR
E DIRECTORY TRACK 0 IS NO
T A COPY!! RUN ABORTED":
```

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```
END
140 ' ROUTINE TO LOCK OUT TRACK
0 (GRANULE 0)
150 DSKI$ 0, 17, 2, A$, B$
160 IF LEFT$(A$, 1)=CHR$(255) OR
LEFT$(A$, 1)=CHR$(191) THEN 200
170 GOTO110
200 A$=CHR$(191)+RIGHT$(A$, 127)
210 DSKO$ 0, 17, 2, A$, B$
215 ' ROUTINE TO VIEW TRACK 0
220 CLS:PRINT@193,"THIS IS WHAT
IS PRESENTLY ON TRACK 0"
225 FOR T=1TO800:NEXT
230 FOR SN=1 TO 9
240 DSKI$ 0, 0, SN, D1$, D2$
250 PRINTD1$;D2$
260 FOR T=1 TO 300:NEXT T
270 NEXT SN
280 CLS:PRINT@195,"DO YOU WANT T
O COPY TRACK 17 TO TRACK 0 <
Y>/<N>";:INPUT R$
290 IF R$="Y" THEN 320
300 IF R$="N" THEN 50
310 GOTO 280
315 ' ROUTINE TO COPY TRACK 17 T
O TRACK 0
320 VERIFY ON
330 FOR SN=2 TO 10
340 DSKI$ 0, 17, SN, D1$(SN-1), D2$(
SN-1)
350 NEXT SN
360 FOR SN=1 TO 9
370 DSKO$ 0, 0, SN, D1$(SN), D2$(SN)
380 NEXT SN
390 VERIFY OFF
400 RETURN
500 ' ROUTINE TO SEE IF TRACK 0
IS A DIRECTORY COPY
510 DSKI$ 0, 0, 2, A$, B$
520 IF LEFT$(A$, 1)<>CHR$(191) TH
EN 120
540 ' ROUTINE TO RESTORE DIRECTO
RY
550 CLS:PRINT@195,"READY TO REST
ORE DIRECTORY <Y>/<N>";:INP
UT R$
560 IF R$="N" THEN 50
570 IF R$="Y" THEN 590
580 GOTO550
590 VERIFY ON
600 FOR SN=1 TO 9
610 DSKI$ 0, 0, SN, D1$(SN), D2$(SN)
620 NEXT SN
630 FOR SN=2 TO 10
640 DSKO$ 0, 17, SN, D1$(SN-1), D2$(
SN-1)
650 NEXT SN
660 VERIFY OFF
670 RETURN
```



Congratulations

SOLUTION ON CARTRIDGE

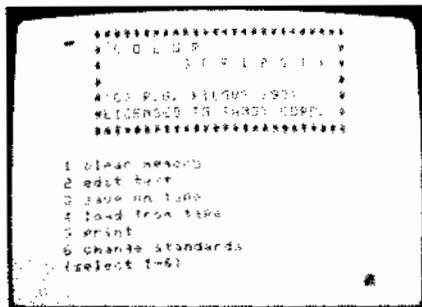
The cartridge version of **THE SOLUTION** has all of the features of the tape version and more. It works with all of the graphic modes (including 4 colors). It includes a 51 characters per line feature and the ability to define a text window on the screen. All of this and much more at the low price of — **\$34.95**

ROM-PAKS \$9.95

This is an empty Rom-Pak with a PC board. It will hold either a 2716, 2732 or a 2764. The case looks very similar to Radio Shack's Rom-Pak. Comes complete with instructions.

CUSTOM PROGRAMING

We will put your program in a Rom-Pak for you for a very reasonable fee. The program can be either Basic or machine language. Prices start at \$19.95 for programs up to 4K in length. \$29.95 for programs up to 8K. **Volume discounts** are available. Send for a **free submittal form**.



SCRIPTFX \$9.95

Are you tired of the upper case display of Color Scripsit? Well then **SCRIPTFX** is for you. This is a program which converts the display of Color Scripsit over to a real display of upper and lower case letters with descenders. The program allows all of the features of Scripsit to function and comes with a money back guarantee if it does not work. Please specify machine type when ordering. Extended Basic is not required.

SUPER PILOT \$9.95

An enhanced version of Pilot for use with Extended Basic. Includes features for math, graphics, and sound. Has a feature that makes it easy to create flash card type drill programs. Programs are pseudo compiled for faster execution. Comes with as 24 page tutorial manual and demo programs. Sample program included on tape to get you started.

All programs for 16K, 32K Extended Basic machines unless otherwise noted. All programs on cassette. Add \$4.00 per order for disk.

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you made the right choice when you purchased a Color Computer. It is a very powerful machine.

However the standard display format does not do the machine justice. The machine is capable of much more than 16 lines of 32 all capital characters. Now you can give your Color Computer the display it deserves. **THE SOLUTION** gives the Color Computer a much better display than it normally has, and really makes the machine shine. Its features include:

- provides a screen of **42 characters** by 21 lines displayed
- linked directly to basic — program is transparent to the user
- prints all 96 ASCII characters, lowercase characters have descenders, has a slashed **zero** to avoid confusion when programming
- prints characters on any two-color graphic screen
- graphics and text may be intermixed on the same screen
- special mode with 4 lines of text at the bottom of the screen (just like some other famous color machines) — great for working with graphics
- large character mode for small children or the visually impaired
- character set may be reversed
- written in machine language, program is relocatable
- fast — prints at over 600 characters per second
- works with both cassette and disk
- includes a 20 page manual with demo programs (a lunar lander program is included)

SOLUTION \$19.95

EXTENDER \$ 7.95

Still want more than 42 characters per line from your computer. Then the **EXTENDER** is for you. This program when used with **THE SOLUTION** will give a display of 51 characters per line by 21 lines displayed. Please include your program serial number when ordering.

GRAPH LABEL \$8.95

Have you ever wanted to place characters on a graphic screen but couldn't find an easy way to do it. Well then **GRAPH LABEL** is for you. This program will enable you to place characters anywhere on a graphic screen. It will place any of 96 ASCII characters on the screen or you may create your own characters. It features a cursor that may be moved anywhere around the screen with out rubbing out what it goes over. Superscripts and subscripts may be used since the cursor may be moved vertically and horizontally in steps as small as one pixel. Lowercase characters have descenders. **GRAPH LABEL** is written in Basic and is therefore easy to modify. It may be used by itself or as a subroutine.

SCREEN PRINT PACKAGE \$8.95

A package of 2 programs for use with the LPVII, LPVIII, DMP100, DMP200, DMP400, DMP500. The programs will print an image of what is on a graphic screen to the printer. Both programs work with all the standard PMODEs. The programs are written in machine language and may be moved anywhere in memory. The two programs are:

- 1) **SCREEN PRINT** — will produce a regular size print. The image may be located anywhere on a page.
- 2) **DOUBLE SIZE SCREEN PRINT** — this program will produce a full size image that will fill up a sheet of paper. The finished product is 8 by 6.5 inches in size. Your computer graphics look really good when they are printed out with this program.

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This Board Makes It Easy To Use A Parallel Printer

So you're thinking about buying a printer, but the one you *really* have your eye on is parallel only and the serial interface converter the company sells costs a couple of hundred bucks?

If that printer is an Epson MX-80, then this plug-in serial to parallel interface board is just the ticket. After all, it only costs \$49.95, which is a whole lot less than what the manufacturer wants for *his* board that, essentially, does the same thing.

The Color Computer sends out serial signals from its RS-232 port in the rear. The "basic" Epson accepts only parallel signals. So, what is needed is a way to marry the two.

Enter this board. It will convert the serial signals to parallel and, while it is at it, also allow you to set the baud rate on the printer at anything between 300 (slow) and 4800 (fast).

This is a well-built piece of equipment which plugs into the Epson without any problem. As a nice touch, it also includes a plug which will fit right into the back of CoCo — so there is no need to buy a special cable of any kind. There are several DIP switches which need to be set before operating the new board, but these are a bonus rather than a drawback, since they allow you the flexibility to operate your printer no matter whether you have the basic Epson, Epson with GRAFTRAX or with GRAFTRAX-PLUS.

In short, installation is easy and the product performs perfectly. That, plus the ability to change the baud rate, makes this a fine buy at considerable savings over the official Epson board's price.

One final note: If you operate the printer at a speed either greater or less than 600 baud, you will have to POKE the new baud rate into your CoCo as well. No great difficulty — a simple POKE will do it.

(Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, \$49.95)

Zarconian Marble: Ultimate Strategy Game?

Have you parents out there ever found your children couldn't play a strategy game because they couldn't understand it? Do you get tired of complicated wargames or games of destruction? If you like simple-to-learn games such as chess, checkers, and tic-tac-toe, you will enjoy *Zarconian Marble*.

I enjoy strategy games, but I usually either get bored because they are too easy, or frustrated because they are too complex. When I received *Zarconian Marble* and saw the "Ultimate Strategy Game" advertisement, I thought, "Oh, oh, sounds like a toughie!" I was soon proven completely wrong.

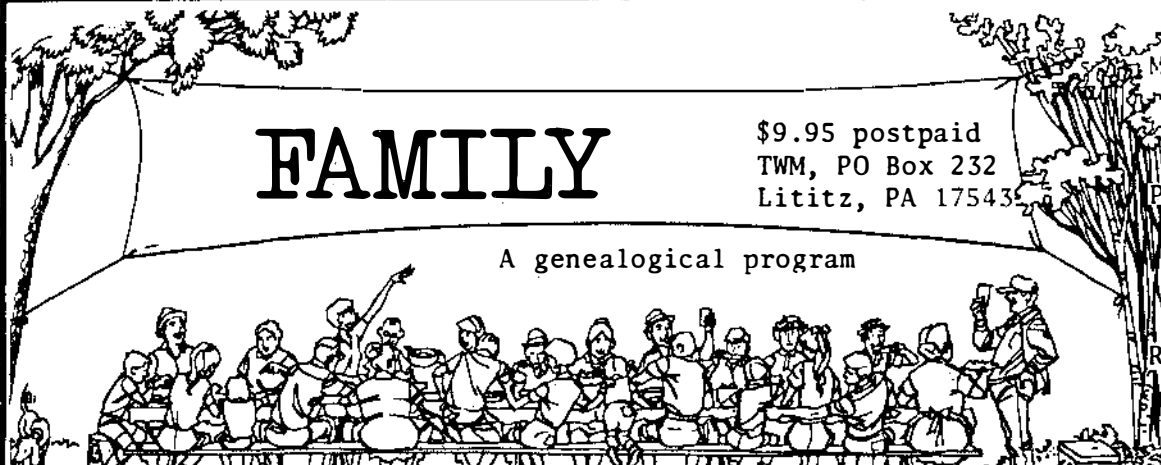
Zarconian Marble is a graphic game made up of a combination of chess, checkers, and tic-tac-toe. There are three levels of difficulty, and you can either play against a friend, against the computer, or have the computer play against itself. The game board resembles a checkers or chess board with the exception that you move (place) your game pieces, a blue or red dot, to any board space which is not already occupied. A player moves his *marbles* with the right or left joystick. The right joystick selects what game and skill level will be used. Joystick control is a little shaky at first, but you will easily become accustomed to it.

The game is won when you or your opponent line up five marbles or make five captures. I won't reveal the "secret" of a capture. You can find out for yourself.

The program has very good sound effects for a "capture" and pretty good graphics. While the game is easy enough for young children to play, it is still challenging enough for most adults. I personally found this game to be most enjoyable.

(CoCoHut, P.O. Box 24451, Houston, TX 77015, cassette \$19.95, disk \$24.95, 16K ECB)

—Dave Mercer



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1

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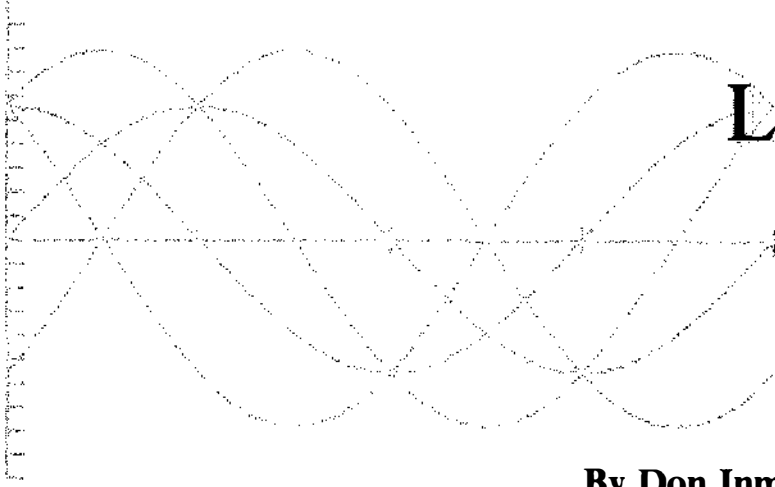
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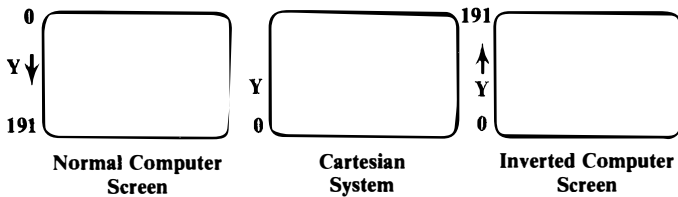
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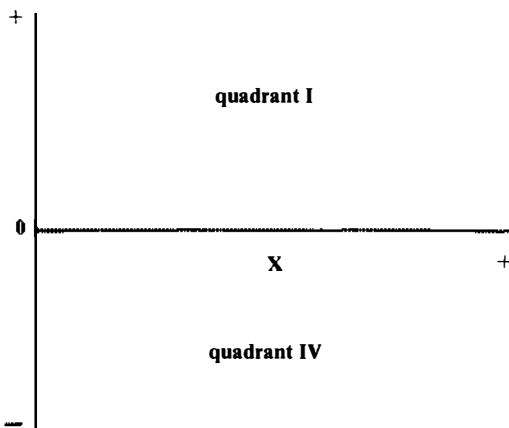
Let's Get Serious— Shifting Axes In Quads I And IV

By Don Inman
Rainbow Contributing Editor

For those of you who are concerned with the serious side of computer graphics, we will consider some applications to trigonometry this month. In the past few articles in this series, we have been working in the first quadrant of the Cartesian coordinate system. The normal origin of the screen's Y-axis was inverted so that the two systems would correspond visually.



In this article, we'll consider the first and fourth quadrants of the Cartesian system. The Y-axis will have its origin near the center of the screen with positive values upward and negative values downward.



I'll choose a screen value of Y=90 for the Cartesian Y origin. This is reasonable since 90 is a nice round number that is approximately one-half the full screen value of 191. The normal screen value of Y=0 will be +90 for the Carte-

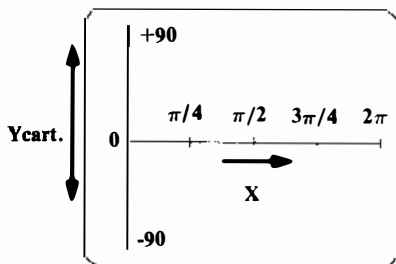
sian system, the screen value of Y=180 will become 0 Cartesian, and the screen value of Y=191 will become -90 Cartesian. A table of Cartesian Y values can be calculated from the screen values by the equation:

$$Y_{cart} = 90 - Y_{screen}$$

Screen	Cartesian Y
0	+90
10	+80
20	+70
30	+60
40	+50
50	+40
60	+30
70	+20
80	+10
90	0
100	-10
110	-20
120	-30
130	-40
140	-50
150	-60
160	-70
170	-80
180	-90

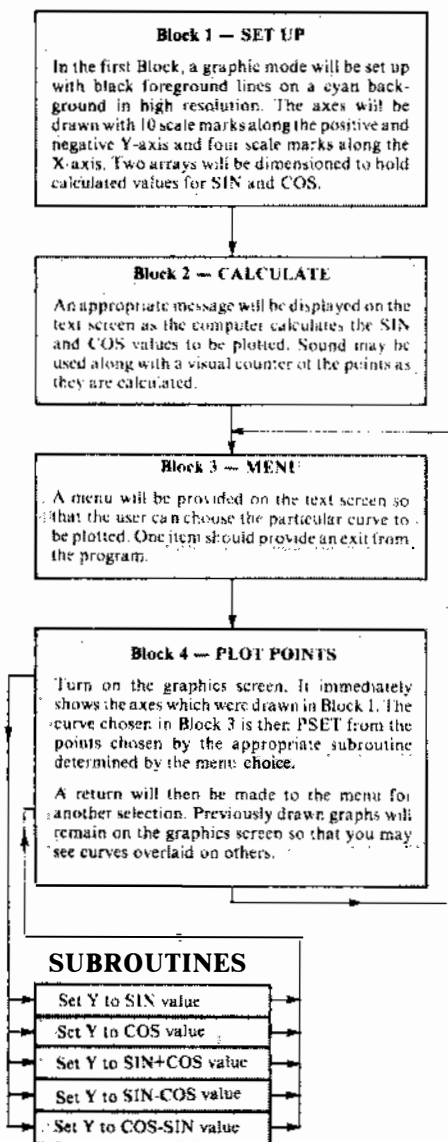
The two Cartesian quadrants will be used to graphically display trigonometric functions such as sine and cosine. The X-axis will be used to represent angle rotation from 0 through 2π radians. The Y-axis will be scaled to represent multiples of the magnitude of the trigonometric function.

You may remember your high school or college math courses that required calculating and plotting such functions by hand. The Color Computer can be used to take all the drudgery and detail out of such chores.



Planning the Program

It is helpful to think of such a program as a series of short fundamental blocks, or modules, before starting haphazardly into writing program statements. Such thought also results in a more orderly program that others can understand. I call mine a "Sloppy Joe" diagram to avoid an open attack by flowchart purists.



Writing The Program

Now that the blocks have been defined, the program becomes much easier to write.

Block 1

```

99 REM * SET UP *
100 PMODE 4,1
110 PCLS1:COLOR 0
120 DIM YA(240),YB(240)
130 LINE(0,0)-(0,180),PSET
140 LINE(0,90)-(240,90),PSET
150 FOR Y=0 TO 180 STEP 9
160 LINE(0,Y)-(5,Y),PSET
170 NEXT Y
180 FOR X=0 TO 240 STEP 60
190 LINE(X,95)-(X,95),PSET
200 NEXT X
210 '

```

Comments

hi-res
black on cyan
arrays
Y-axis
X-axis

Y scale marks

X scale markers

allow space between
blocks

Block 2

```

299 REM * CALCULATE *
300 CLS:PRINT@38,"PLEASE WAIT"
310 PRINT@102,"I'M THINKING"
320 FOR X=0 TO 240
330 PRINT@203,X
340 PLAY"L255;3"
350 TH=X/38.2
360 YA(X)=90-50*SIN(TH)
370 YB(X)=90-50*COS(TH)
380 NEXT X
390 '

```

message on text screen

point number (0-240)

play note

angle in radians

2 / 240 38.2

scale by 50; convert
to Cartesian; store

Block 3

```

399 REM * MENU *
400 CLS
410 PRINT @13,"MENU"
420 PRINT@39,"CHOOSE BY NUMBER"
430 PRINT@103,"1. PLOT SIN"
440 PRINT@135,"2. PLOT COS"
450 PRINT@167,"3. PLOT SIN+COS"
460 PRINT@199,"4. PLOT SIN-COS"
470 PRINT@231,"5. PLOT COS-SIN"
480 PRINT@263,"6. QUIT"
490 A$=""
500 A$=INKEY$:IF A$="" THEN 500
510 IF A$="6" THEN END
520 '

```

clear text screen

print menu

make choice
THE END if 6 is
chosen

Block 4

```

599 REM * PLOT POINTS*
600 SCREEN 1,0
610 FOR X=0 TO 240
620 ON VAL(A$) GOSUB 1000,1100,1
200,1300,1400
630 PSET(X,Y,0)
640 NEXT X
650 A$=""
660 A$=INKEY$:IF A$="" THEN 660
ELSE 400
670 '

```

turn on graphics

get points and PSET

any key returns to menu

Subroutines	Comments
999 REM ** SIN **	
1000 Y=YA(X)	pick Y from array
1010 RETURN	
1020 '	
1099 REM ** COS **	
1100 Y=YB(X)	pick Y from array
1110 RETURN	
1120 '	
1199 REM ** SIN+COS **	
1200 Y=YA(X)+YB(X)-90	modify sum for screen
1210 RETURN	
1220 '	
1299 REM ** SIN-COS **	
1300 Y=YA(X)-YB(X)+90	modify difference
1310 RETURN	
1320 '	
1399 REM ** COS-SIN **	
1400 Y=YB(X)-YA(X)+90	modify difference
1410 RETURN	

Program Operation

It should be remembered that you can shift back and forth between the text and graphics screens without destroying either one since they are located at different places in memory. The X and Y axes are drawn in Block 1 even though you don't see it being done. The graphics screen is

not displayed until you give the *SCREEN* command.

The sine and cosine values are all calculated and placed in separate arrays in Block 2. You could calculate them at the time that they are plotted, but the plots are drawn more quickly if the points have been pre-calculated. The value of 50 in lines 360 and 370 are merely scale factors and can be changed to produce whatever magnitude you desire to display. The value 90 is the conversion factor used to make the Y origin appear to be near the center of the screen.

The menu in Block 3 allows you to choose the curve of your choice. Other combinations could be used with an appropriate change in the related subroutine. Since Block 4 will always return you to the menu, choice number 6 gives you a chance to stop when you have seen enough.

Block 4 plots the points by going to the subroutine corresponding to your menu choice. If you wish to plot fewer points, add a *STEP* value to line 610. For example:

```
610 FOR X = 0 TO 240 STEP 2
```

would plot only the even numbered points (0,2,4 . . . 240). After the curve has been plotted the graphic screen stays on until you press a key. A return is then made to the menu. The plots that you have previously made stay on the screen. Keep in mind that *CLS* clears only the text screen, and *PCLS* clears only the graphics screen.

The subroutines supply the Y values to be plotted by picking the appropriate values from the arrays. The SIN subroutine uses array YA, and the COS subroutine uses array YB. The others perform the appropriate arithmetic and necessary screen adjustments.

$$\begin{aligned} \text{SIN+COS} &= \text{YA} + \text{YB} - 90 \\ &= [90-50*\text{SIN}(\text{TH})] + [90-50*\text{COS}(\text{TH})] - 90 \\ &= 90 - 50*(\text{SIN}(\text{TH})+\text{COS}(\text{TH})) \end{aligned}$$

$$\begin{aligned} \text{SIN-COS} &= \text{YA} - \text{YB} + 90 \\ &= [90-50*\text{SIN}(\text{TH})] - [90-50*\text{COS}(\text{TH})] + 90 \\ &= 90-50(\text{SIN}(\text{TH})-\text{COS}(\text{TH})) \end{aligned}$$

$$\begin{aligned} \text{COS-SIN} &= \text{YB} - \text{YA} + 90 \\ &= [90-50*\text{COS}(\text{TH})] - [90-50*\text{SIN}(\text{TH})] + 90 \\ &= 90-50*(\text{COS}(\text{TH})-\text{SIN}(\text{TH})) \end{aligned}$$

Other Options

If you have a printer and a screen dump program, you can make hard copies of various combinations of the trigonometric functions. If you would like to see the values for each point for the various functions you can add the appropriate print statements. You might want to add a print option to the menu, as:

7) PRINT FUNCTIONS

Line 620 would then need another GOSUB value (1500), and a subroutine that would print the data in the desired format.

The SIN/ COS plots shown with this article were dumped to an Epson MX-80 printer by a program from Custom Software Engineering, which carries the *Rainbow* Certification Seal. The following listing includes lines 10 through 30 and 700 through 720 to handle the screen dumps. I modified line 510 (the QUIT selection) of the original program to call a screen dump after the appropriate functions had been plotted. Therefore, a QUIT selection from the menu actually sends the computer to the screen dump before ending.

The machine language screen dump is loaded from the BASIC program by lines 10-30. Line 710 deletes lines 10 and

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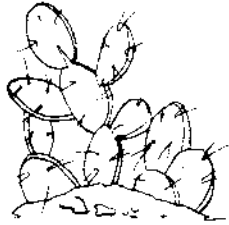
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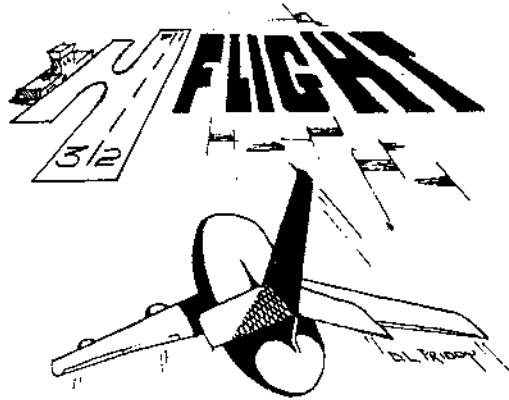
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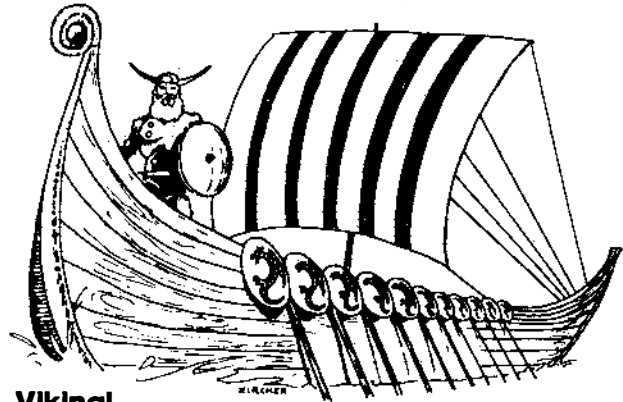
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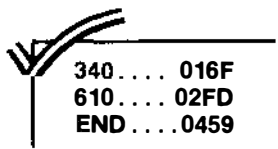
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20 after the program runs the first time. In this way, the program will not try to load the machine language program on subsequent runs. Once it is in memory, there is no need to load it again.



The Listing:

```

89 REM *** SIN/COS PLOT ***
90 '
99 REM * SET UP *
100 PMODE 4,1
110 PCLS1:COLOR 0
120 DIM YA(240),YB(240)
130 LINE(0,0)-(0,180),PSET
140 LINE(0,90)-(240,90),PSET
150 FOR Y=0 TO 180 STEP 9
160 LINE(0,Y)-(5,Y),PSET
170 NEXT Y
180 FOR X=0 TO 240 STEP 60
190 LINE(X,85)-(X,95),PSET
200 NEXT X
210 '220
220 '
299 REM * CALCULATE *
300 CLS: PRINT@38,"PLEASE WAIT"
310 PRINT@102,"I'M THINKING"
320 FOR X=0 TO 240
330 PRINT@203,X
340 PLAY"L255;3"
350 TH=X/38.2
360 YA(X)=90-50*SIN(TH)
370 YB(X)=90-50*COS(TH)
380 NEXT X
390 '
399 REM * MENU *
400 CLS
410 PRINT @13,"MENU"
420 PRINT@39,"CHOOSE BY NUMBER"

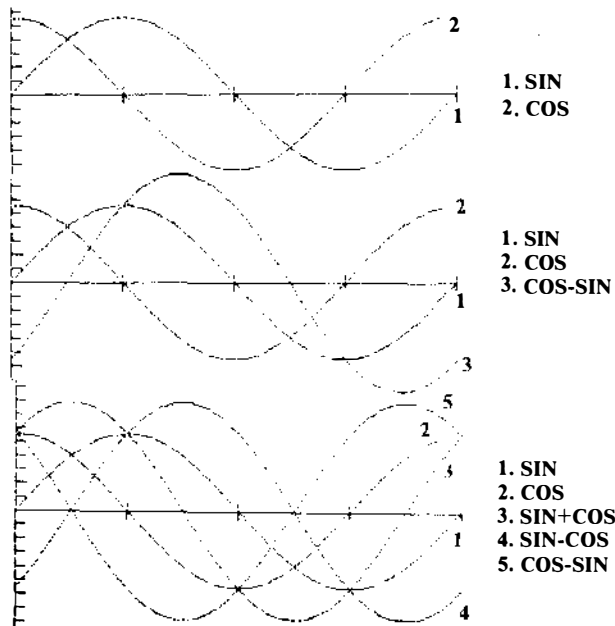
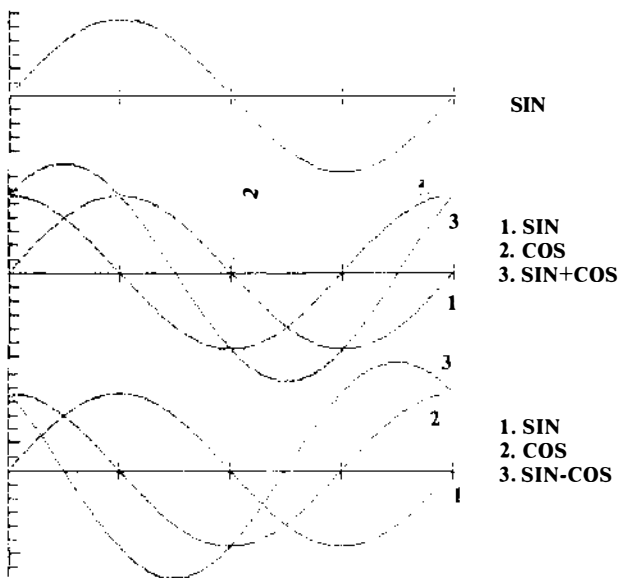
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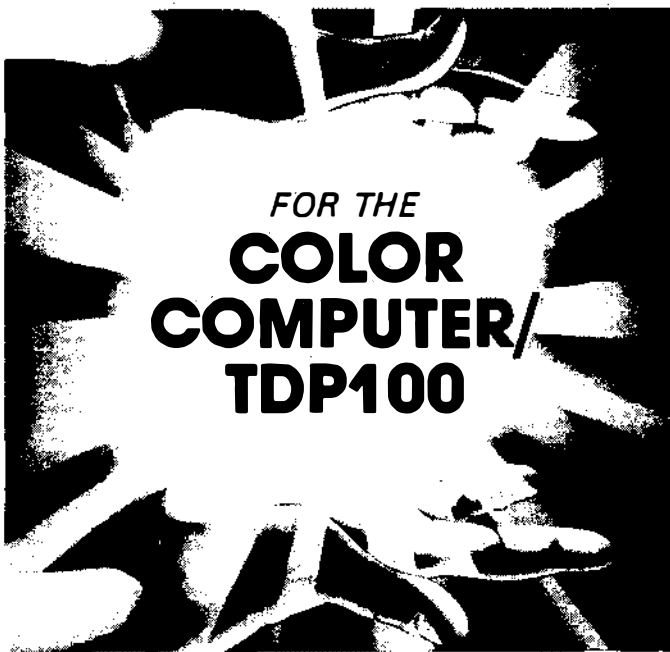
```

430 PRINT@103,"1. PLOT SIN"
440 PRINT@135,"2. PLOT COS"
450 PRINT@167,"3. PLOT SIN+COS"
460 PRINT@199,"4. PLOT SIN-COS"
470 PRINT@231,"5. PLOT COS-SIN"
480 PRINT@263,"6. QUIT"
490 A$=""
500 A$=INKEY$:IF A$="" THEN 500
510 IF A$="6" THEN END
520 '
599 REM * PLOT POINTS*
600 SCREEN 1,0
610 FOR X=0 TO 240
620 ON VAL(A$) GOSUB 1000,1100,1
200,1300,1400
630 PSET(X,Y,0)
640 NEXT X
650 A$=""
660 A$=INKEY$: IF A$="" THEN 660
ELSE 400
670 '
999 REM ** SIN **
1000 Y=YA(X)
1010 RETURN
1020 '
1099 REM ** COS **
1100 Y=YB(X)
1110 RETURN
1120 '
1199 REM ** SIN+COS **
1200 Y=YA(X)+YB(X)-90
1210 RETURN
1220 '
1299 REM ** SIN-COS **
1300 Y=YA(X)-YB(X)+90
1310 RETURN
1320 '
1399 REM ** COS-SIN **
1400 Y=YB(X)-YA(X)+90
1410 RETURN

```

Sample Runs with Screen Dump





FOR THE COLOR COMPUTER/ TDP100

COLOR CATERPILLAR by the Rugby Circle, Inc. ©1983

An ecological system out of control; the last survivors ban together in the valley. Of the predator insects, the caterpillar remains as the worst menace because of its amazing ability to reproduce. From your mobile post, your guns are aimed at the moving target: a raging caterpillar splits in two with each half going in opposite directions. Even if, in your persistence, you manage to destroy the creature, another one appears one segment longer than the previous caterpillar. Adopting to its hostile environment, if the caterpillar reaches the valley below without attacking you, he transforms into a killer moth. Your survival instincts are not nearly so advanced as those of your foe.

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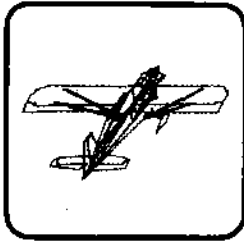
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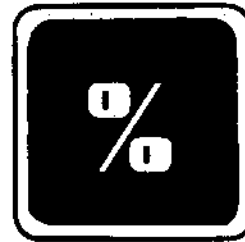
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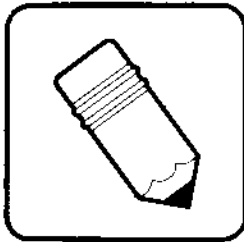
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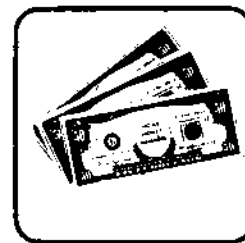
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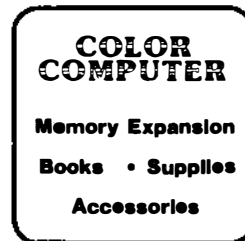
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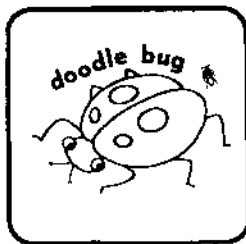
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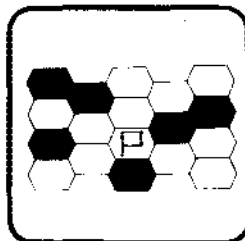
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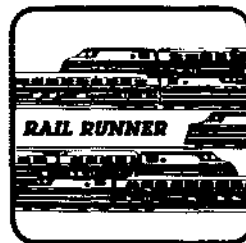
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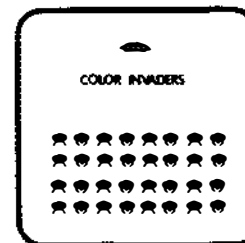
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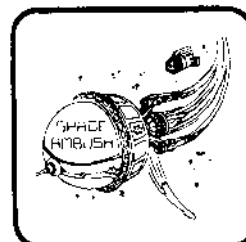
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X10 Protocol Theory Home Power Control Part 3

By A. B. Trevor
and Charles Yahn

Unfortunately, my prediction about Radio Shack discontinuing the Plug 'n Power Controller has come true. Apparently, there aren't enough people in the marketplace (or Tandy Towers) who appreciate the potential of this little device. However, many of you were perceptive enough to buy a P 'n P Controller, and if you weren't, some can still be found (at only \$19.95) in assorted Radio Shack stores. The first article in this series showed how this modest little device allows your Color Computer to control all kinds of lights and appliances with simple BASIC programs. The second pointed out how to use it as an inexpensive but quite accurate time base. In this installment we will explain the protocol used to communicate from the controller to remote devices through ordinary house wiring. An understanding of this protocol will enable you to better appreciate the potential and limitations of the Plug 'n Power system so you can use it more effectively with your Color Computer in your own unique situation.

Modulation

All X10 devices such as Radio Shack's Plug 'n Power units use "carrier current" modulation on your household power wiring similar to "wireless" intercoms. While intercoms generally use amplitude modulation (AM) or frequency modulation (FM) to transmit analog signals (voices), X10 systems use a form of pulse coded modulation to transmit digital messages from a control unit to remote receiving units. The pulses are synchronized with the power line frequency, and consist of short "bursts" of 120KHz ultrasonic tones and "pauses." In the absence of any official documentation on this subject from BSR or Radio Shack, we have developed the following definitions to aid in our quest.

(Alexander Trevor is Executive Vice President of computer resources at CompuServe. Charles Yahn is a design engineer at CompuServe's Research and Development Center in Tucson, Arizona.)

Burst:

A period of time during which the 120 KHz tone is transmitted over the power line. The length of the burst is slightly less than 1/2 tick (1/120 sec.). (See Figure 1.)

Pause:

A period of time during which no tone is transmitted. A pause is 1/2 tic (1/120 sec.).

Bit:

Binary digits are encoded as follows:

- 0) (PAUSE) (BURST)
- 1) (BURST) (PAUSE)

In normal data transmission the combinations (PAUSE) (PAUSE) or (BURST) (BURST) never occur. When no transmission is taking place, the controller idle state is (PAUSE) . . . (PAUSE).

Listing 1 details how "bursts" and "pauses" are generated on the CoCo. Line synchronization is achieved at BUR2 by

"An understanding of this protocol will enable you to better appreciate the potential and limitations of the Plug 'n Power system so you can use it more effectively with your Color Computer in your own unique situation."

watching the cassette input bit, followed by a 210 microsecond wait at BUR3. The ultrasonic tone is set on or off at BUR4+1 via the 6 bit D/A and timed for 1 millisecond at BUR5. If this has been done three times, the "burst" is complete; otherwise it is repeated after a two millisecond delay at BUR8.

Packet Format

As in asynchronous data communications over telephone lines, a "start" signal is needed to properly synchronize remote units with the incoming data. In the X10 world, data is transmitted in "packets" consisting of several bits preceded by a header. A special sequence is used as the header:

(BURST) (BURST) (BURST) (PAUSE) (rest of packet)
 There are two distinct kinds of packets: address packets and command packets. The structure of each is as follows:

Address Packet:

(header) (house code) (unit code) (0)
 4 bits 4 bits

Command Packet:

(header) (house code) (command) (1)
 4 bits 4 bits

Notice that the house code is repeated in the command packet. The reason for this is to prevent accidental activation of units operating on a different house code. Once a device has recognized its own house code and unit code in an address packet, the device remains ready to receive commands until:

- 1) an address packet is received for a different unit (but same house code),
 - 2) or, a universal command is received (such as clear).
- Thus, if the house code were not included in command packets, addressed devices in another house might respond.

Data Mapping

The binary codes used in X10 packets to represent house codes and unit numbers are not simply the corresponding

hex values. House and unit numbers must be encoded according to Table 1 before being used in a packet. Table 2 lists the values used for all X10 commands.

The "X10 Low Level Routines" given in Listing 1 presume that the mapping is the responsibility of the calling program. This point was well illustrated by the sample program included in Part 1 of this series on page 163 of the February 1983 issue of *the Rainbow*.

Table 1. X10 Encoding Table

House Code	Unit Code	4 bit hex Value
A	1	6
B	2	E
C	3	2
D	4	A
E	5	1
F	6	9
G	7	5
H	8	D
I	9	7
J	10	F
K	11	3
L	12	B
M	13	0
N	14	8
O	15	4
P	16	C

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Table 2. X10 Commands

Code	Command
0	All off (clear)
1	All on
2	On
3	Off
4	Dim
5	Bright

Example

To summarize, let us look at an example. Suppose we wish to turn on light 5 with house code B. By looking in Table 1 for house code "B" and unit 5; and in Table 2 for "ON," we find the following values:

	Hex	Binary
House "B"	E	(1110)
Unit 5	1	(0001)
Command "ON"	2	(0010)

If we let "b" represent a (BURST) and "." represent a (PAUSE), we can depict the resulting address packet as follows:

.....bbb.b.b.b..b.b.bb..b.....
idle (hd) 1 1 1 0 0 0 1 0 idle

This packet is repeated three times to insure that the device is properly addressed. The command packet follows:

.....bbb.b.b.b..b.b.bb..bb.....
idle (hd) 1 1 1 0 0 0 1 0 1 idle

The command packet is also repeated three times, unless it is a "dim" or "bright" command, which is repeated 2n+1 times, where "n" is a repeat count that determines the degree of dimming or brightening to be done.

Real World Considerations

After you have played around with the Plug 'n Power controller on your computer for awhile and you start to consider using this system to control your home or office, the following concerns will probably come to mind: 1) Can I really leave my computer powered up for days or weeks without doing any harm? 2) What about power failures? 3) How reliable is this set-up?

There are probably as many opinions on the first question as there are Color Computer owners, but in my opinion, if you use your computer nearly everyday anyway, then leaving it on continuously probably is actually less stress on your computer's components than cycling it on and off. I know people who have left their CoCos on for a year; I regularly leave mine on for a week or more when I am out of town. Since heat is the main thing that could damage the components in your computer, you may wish to remove the top cover during extended use to reduce the operating temperature of the I.C.'s. If you have "piggyback" memory, then this is especially important, and you should have a heat sink on the SAM chip. As long as all the chips in your machine run cool enough to touch, then it should be OK. Of course, you should turn off your TV when running the CoCo unattended—otherwise you could damage the screen and will waste a lot of power.

Although the CoCo will tolerate a respectable amount of small power glitches, any power failure of more than a few cycles duration will cause your CoCo to lose memory, or at the very least, will stop program execution. If you want to be sure that your CoCo stays on the job (especially during the summer when power outages are most common), then you should use a small "UPS" (Uninterruptable Power Supply). These devices include a battery to provide backup power, an inverter to generate 120 V.A.C., and some kind of battery charger. Since the CoCo draws less than 25 watts, a very small UPS will be adequate. I use a Topaz 2645, which is really overkill, since it has a 300VA capacity.

A cool running, UPS equipped CoCo is a very reliable device, but there are other hazards that should be considered: lightning, power surges, and interference. Unfortunately, the only way to provide total protection from lightning strikes on the power line is to unplug your computer. The next best thing is to use a good surge protector, which, although not perfect, will greatly reduce the danger of frying your computer. Note that only the computer (and disk drive, if applicable) should be plugged into the UPS and surge suppressor; the Plug 'n Power controller must be plugged directly into a wall outlet. Otherwise, the ultrasonic tone may be filtered out by one of these devices.

Operation of FM intercoms on the same power transformer will interfere with the operation of the Plug 'n Power unit; even if the intercom is in a neighbor's house. Most other forms of interference are dealt with adequately by the fact that X10 packets are transmitted three times.

X10 Routines

Sources of the Color Basic callable machine language routines used to generate X10 packets by all the programs in this series of articles are available on CompuServe in the public ACCESS data base in X10.M69[70000,130]. These routines are in MAC69 format, but are easily convertible to

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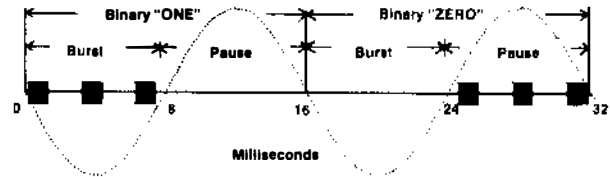
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the syntax of other assemblers.

The next and final installment in this series will present a Disk BASIC program incorporating all the techniques presented so far that will allow you to generate, save and execute simple or complex Plug 'n Power control programs

Figure 1. X10 Timing Diagram



```

1      ;Low Level Routines for BSR X-10 Controller
2      ;   Translated from Charles Yahn's 6502 version
3      ;   To 6809 by Sandy Trevor, 8 Nov 1981
4      ;   Modified to PC relative 30 Oct 1982
5      ;
6      ;   Calling Sequence for Color Basic
7      ;
8      ;   DEF USRn = &H3000
9      ;   USRn(arg1)      to send an address or command
10     ;
11     ;   arg1 is a 16 bit integer
12     ;
13     ;   -----
14     ;   ! !F!   COUNT ! HC   ! U/C !
15     ;   -----
16     ;   14   11-8   7-4   3-0
17     ;
18     ;   where:
19     ;   F - Address/command flag
20     ;       = 0   address packet
21     ;       = 1   command packet
22     ;
23     ;   COUNT - Repeat count
24     ;
25     ;   HC - House Code (0 thru $F)
26     ;
27     ;   U/C - Unit number or Command
28     ;
29     ;   Code   Command
30     ;   0     All off (clear)
31     ;   1     All on
32     ;   2     On
33     ;   3     Off
34     ;   4     Dim
35     ;   5     Bright
36     ;
37     ;   House and Unit codes must be translated by the calling routine as follows:
38     ;
39     ;   House   Unit   4-bit value
40     ;   Code   Code   (hex)
41     ;   A     1     6
42     ;   B     2     E
43     ;   C     3     2
44     ;   D     4     A
45     ;   E     5     1
46     ;   F     6     9
47     ;   G     7     5
48     ;   H     8     D
49     ;   I     9     7
50     ;   J    10    F

```



Auto Run is a utility program for the TRS-80* Extended Basic Color Computer. It is used to add convenience and professionalism to your software.

Auto Run will help you create your title screen with the graphics editor. The graphics editor allows you to choose a background color and border style. Using the arrow keys and several other commands you can draw pictures, block letters and also include text.

Auto Run will generate a machine language loader program to precede your program on the tape. Then, to start up your program, simply type CLOADM to load in the Auto Run loader program, which will then automatically start itself up, display your title screen, load your program and then RUN or EXEC it.

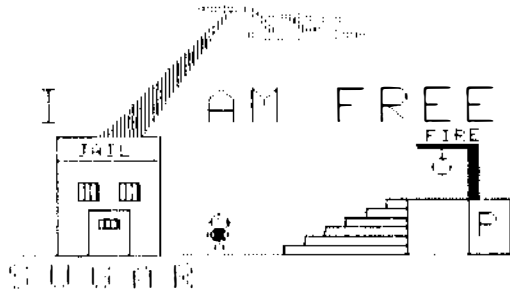
Also you may record a vocal or musical introduction preceding your program. The Auto Run loader will control the audio on/off.

Basic programs can be set to load anywhere in memory above \$600 (the PCLEAR 0 page).

Software authors: The Auto Run prefix may be appended to your software products.

Auto Run is \$14.95 and includes complete documentation and an assembly source listing. Requires 16K Extended Basic.

Galactic Hangman



A great new twist to the popular, educational word guessing game for the Color Computer. Large (700 words) and sophisticated vocabulary. Or enter your own words, your child's spelling list, foreign language vocabulary, etc.

Outstanding high resolution graphics, animation and sound effects.

For \$14.95 you get both the 16K and 32K versions of Galactic Hangman.



Tape Information Management System

A user-oriented, easy to use personal database management system for the TRS-80* Color Computer with these outstanding features:

- * keeps files of programs, names, addresses, birthdays, recipes, class or club rosters, anything
- * variable record and field lengths
- * phrase substitution editor
- * up to 8 user-definable fields
- * ML sort (up to 3 fields), search and delete functions
- * 2 search modes — range and item
- * user-definable printer format, for any printer
- * up to 230 characters per record

For \$24.95 you get the database management system, our full documentation which includes a reference guide and a programmer's guide, and our 1981 Bibliography of articles relating to the Color Computer. Requires 16K Extended Basic. 32K recommended.

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Silly Syntax



A sensational and educational version of a popular party game for the TRS-80* Color Computer . . .

For 1 to 10 players. Load a story into the computer. The players are asked to supply a noun, verb, part of body, celebrity, etc. which the program uses to complete the story. The story, which is displayed when all words are entered, will be hilarious. Silly Syntax requires 16K Extended Basic (32K for disk version). For \$19.95, you get a user guide and a tape containing the Silly Syntax game and 2 stories. You can create your own stories or order story tapes from the selection below.

Silly Syntax stories — Ten stories per tape.

- | | |
|----------------------|---------------------------|
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| SS-002 - Sing Along | SS-006 - Adventure/Sci-Fi |
| SS-003 - X-Rated | SS-007 - Potpourri |

Each story tape is \$9.95. 10% off for 3 or more story tapes. Disk is \$24.95 for Silly Syntax and 2 stories or \$49.95 for Silly Syntax and all 62 stories.



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*TRS-80 is a trademark of Tandy Corp.

```

51          :       K      11    3
52          :       L      12    B
53          :       M      13    0
54          :       N      14    8
55          :       O      15    4
56          :       P      16    C
57          :
58 0000          LOC    $3000
59          B3 ED          INTCNV=$B3ED          ;Convert arg to integer
60          FF 20          BSRSTA=$FF20          ;Cassette I/O address

61 3000          SENPKT:
62 3000 BD B3 ED          JSR    INTCNV          ;Convert arg to integer
63 3003 ED 8D 00 71          STD    FLAG,PCR          ;Save flag and arguments
64 3007 84 3F          ANDA   #$3F          ;Clear bit 0
65 3009 A7 8D 00 6A          STA    RCNTR,PCR          ;Save packet repeat count

66 300D 8D 39          HEADER: BSR    BURST          ;Send out header
67 300F 8D 37          BSR    BURST
68 3011 8D 35          BSR    BURST
69 3013 8D 2E          BSR    PAUSE
70          ;Send out data - house code, unit or command

71 3015 A6 8D 00 60          SEND: LDA    FLAG+1,PCR          ;Get hse code,,unit or cmd
72 3019 8E 00 08          LDX    #B          ;Set size of bit field
73 301C 8D 13          BSR    BITFLD          ;Output the field

```

GRAPHIC MATH ADVENTURE \$21.95



Challenging Adventure! Fully player selectable up to 300 "room." Search for treasure on land, on river, and in the labyrinth of caves. Your search is blocked by many obstacles which can be overcome by correctly answering math problems. Any one or all four functions (+, x, -, /) can be selected to add variety. 24 skill levels make the game challenging for all ages. 32K EXT BASIC Required

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MATH MATER \$14.95 for both

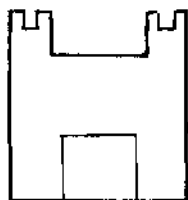
Learn Basic Math Facts (+, x, -, /) and counting routines. Math drill for speed. MATH TUTOR teaches with graphics. MATH DRILL Non-EXT BASIC \$8.95 MATH TUTOR 16K EXT BASIC \$8.95

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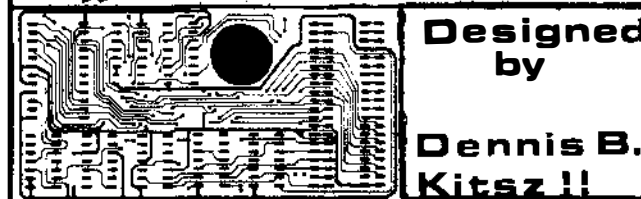
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```

74                               ;Send the unit/command flag (1 bit)

75 301E A6 8D 00 56           SENF: LDA   FLAG,PCR           ;Get the addr/cmd flag
76 3022 49                     ROLA                ;POSITION IN MSB
77 3023 8E 00 01             LDX   #1             ;Set size of bit field
78 3026 8D 09                 BSR   BITFLD         ;Output the flag

79 3028 6A 8D 00 4B           DEC   RCNTR,PCR      ;Repeat RCNTR times
80 302C 26 DF                 BNE   HEADER
81 302E 39                     RTS
82 302F 00                     BSROFF: BYTE 0
83 3030 FC                     BSRON: BYTE  $FC

84                               ;Transmit a byte
85                               ;   C(A) = House code,,unit or command
86                               ;   C(X) = bit field size

87 3031 49                     BITFLD: ROLA         ;Get bit to send in 'C'
88 3032 25 06                 BCS   S1             ;Branch if a '1'
89 3034 8D 0D                 BSR   PAUSE         ;Else, send a '0'
90 3036 8D 10                 BSR   BURST
91 3038 20 04                 BRA   BITDN

92 303A 8D 0C                 S1:   BSR   BURST   ;Send a '1'
93 303C 8D 05                 BSR   PAUSE

94 303E 30 1F                 BITDN: LEAX  -1,X   ;DECREMENT X

```

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```

95 3040 26 EF          BNE  BITFLD      ;If more bits, then repeat
96 3042 39             RTS                    ;Else, BITFLD done

97                     ;Send a "Pause"
98                     ;      Uses B and Y
99 3043 31 8C E9      PAUSE: LEAY  BSR0FF,PCR    ;Pause for 8ms
100 3046 20 03        BRA    BUR1
101                     ;Send a "Burst"
102 3048 31 8C E5      BURST: LEAY  BSRON,PCR   ;Burst for 8ms
103 304B 34 12        BUR1: PSHS  A,X          ;Save A and X
104 304D B6 FF 20      BUR2: LDA    BSRSTA      ;Wait 1/2 tick time (1sBIT is 60Hz clock)
105 3050 85 01        BITA  #1              ;Test for cassette input (=clock)
106 3052 27 F9        BEQ    BUR2
107 3054 86 34        LDA    ##34           ;Kill 7*20us=210us
108 3056 4A           BUR3: DECA
109 3057 26 FD        BNE    BUR3

110 3059 C6 03        LDB    #3
111 305B A6 A4        BUR4: LDA    ,Y          ;BSR0FF contains 0
112 305D B7 FF 20      STA    BSRSTA      ;Clears or sets 120Khz burst
113 3060 86 B2        LDA    ##B2          ;Wait 7*90us= 1ms
114 3062 4A           BUR5: DECA
115 3063 26 FD        BNE    BUR5

116 3065 7F FF 20      CLR    BSRSTA      ;Turn off burst
117 3068 1C 00        ANDCC #0

```



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ACCESSORY PACKAGE \$20.00

A second disk for improved versions of the original single-disk accessory programs. Includes notebook for storage of disks and paperwork.

SORT

New Sort program is faster and more efficient than original version. Runs in 16 or 32K to produce an alphabetic listing of all file types you specify.

RECOVER

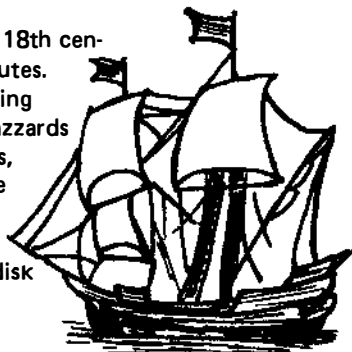
New Recover program not only rewrites directories from master files but can rebuild an entire disk to eliminate "IO" errors.

ZAP

New addition. User friendly directory Zapper to manually correct directory data when all else fails. Menu-driven with help files for novices.

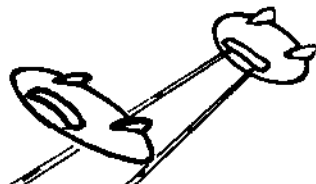
SEA TRADER

A new game in which you play an 18th century sea captain plying the trade routes. The you start start out on a shoestring and try to become a billionaire. Hazards include pirates, storms, bad markets, and bad debts. People have become so fascinated with this game that they actually cheat to keep from winning. 16K color basic, tape or disk \$19.95.



COLOR STAR PILOT

Take a trek through space to defeat the alien enemy in this superior version of a classic space game! Reviewed in Rainbow. Requires extended basic. Comes with 32K 3-level game or 16K novice version. Tape or disk \$19.95.



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JAN '83

DISK DOUBLE ENTRY - If you have spent hours trying to balance your Debits and Credits, this program 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 a user understanding of standard double entry accounting concepts. - \$44.95 in BASIC with Machine Language subroutines.

DISK DATA HANDLER - 64K - Designed to use the full 64K RAM, but may also be configured for 32K. Uses standard ROM's - No special operating system required! Allows you to design disk data files for your specific needs. You define a basic record of up to 14 fields and 246 characters. Provides fast selection and sorting based on any field or combination of fields in this record. Powerful on-screen input and update. User defined output of reports to screen, printer, or disk files which may be read by your BASIC programs for any computational or special formatting requirements. Printer reports allow headings, page breaks, and page numbering, and let you pass control codes to drive your printer's special features. Maximum number of records you may work with at onetime will depend on RAM configuration and record size - 64K (32K) 1850 (500) - 21 char records, 179 (49) - 246 char records. An optional Extended record linked to the basic record may also be defined. The size of this Extended record is not a factor in determining maximum number of records. Will provide the growth capability needed for your increasingly sophisticated applications. \$54.95 in BASIC with Machine Language subroutines.

OCT '82

DISK DATA HANDLER - 32K only version - as above, but without report headings, page breaks, or printer control codes. \$44.95

DATE-O-BASE CALENDAR - 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 and a log of past activity. Study the chronology of the American Revolution or note the day your mortgage will be paid off. 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. **REQUIRES 32K** in BASIC.

JUNE '82

TAPE DATE-O-BASE CALENDAR - \$16.95
(max. 400 memos/tape file)

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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.

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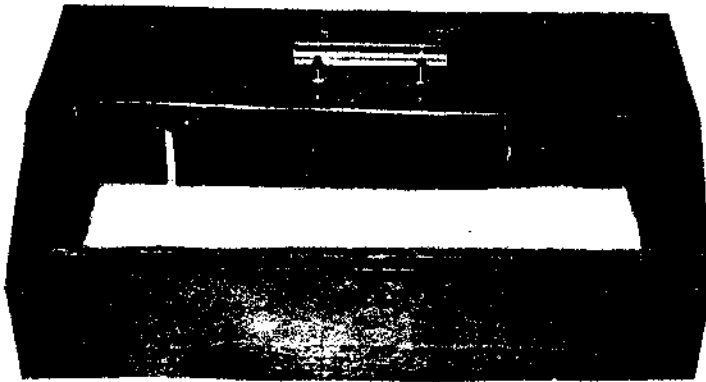
```

118 306A 5A          DECB          ;Decrement B (3 counter)
119 306B 27 08      BEQ      EXIT
                                     ;
120 306D 86 F8      BUR7: LDA    #$F8          ;Wait 9*$DEus = 2ms
121 306F 12          BUR8: NOP
122 3070 4A          DECA
123 3071 26 FC      BNE      BUR8
124 3073 20 E6      BRA      BUR4
                                     ;
125 3075 35 92      EXIT: PULS  X,A,PC        ;Restore x and a
                                     ;
126                  ;Data Area
127 3077            RCNTR: BLOCK 1          ;repeat count
128 3078            FLAG:  BLOCK 2          ;Byte 0 - Bit 0 = 0 adrs
129                  ;                      ;          = 1 data
130                  ;                      ;
131                  ;                      ; Bits 1-7 = repeat count
132                  ;Byte 1 = unit code or command
                                     ;
132                  END

```

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Gemini 10: New Star From Star Micronics

There's a new Star from the Midwest which just might be the one wise men and women are seeking these days. The Gemini 10 printer from Star Micronics has landed on our shores with surprisingly little fanfare, and it looks like it might make a very large dent in the printer market.

After seeing a few ads for it, I called up and ordered one on the spot. Now, I am not ordinarily an "impulse buyer." In fact, I'm well known for carrying comparison shopping to ridiculous extremes. But, I bought the Gemini 10 sight unseen and without even having spoken to anyone who owns one. It has turned out to be a very good move.

Here's a partial list of the Gemini's features:

- *100 characters per second
- *9 x 9 dot matrix
- *true low case descenders (see self-test, below)
- *proportional spacing
- *italics
- *compressed and double width character modes
- *sub- and superscripts
- *underlining
- *2K buffer
- *friction and tractor feed

And, best of all possible worlds—

- *fully dot-addressable (this means graphics!!!)

There are plenty of other goodies, including such characters as Greek sigma and mu; copyright symbol and trademark symbol.

I know. You're saying, "Great, but I bet the price is outta sight." Not so, Bucko. This machine is cheaper than others in its class. In fact, it's only slightly more than the original price of the L.P.VII.

There are a number of mail-order houses currently offering the Gemini. I ordered mine from Texas Computer Systems and was impressed with the speed with which they processed my order. My printer arrived one and a half weeks after I sent the check!

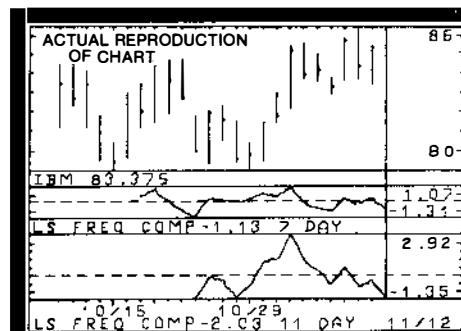
To use the Gemini with a Color Computer (TRS80c or TDP), also buy the serial interface board. This comes with instructions for plugging it into the printer board. It's not difficult to attach the board—even a non-techie like me can do it. What is confusing is setting the eight dip switches on the serial board to conform to the CC's standards. For this, I needed help from the experts, so I went to my good friend, Dennis Lewandowski, of DSL Computer Products. With Dennis' help and a call to some very friendly folks at Star Micronics, we finally figured it out. To save you the same efforts, the serial board switches which should be 'ON' are 3, 7 and 8. (The manual contains a few errors about what switch does what with regard to #3 and #4.) Also, there are eight jumpers on the serial board. Dennis pushed #8 (on far left) up. Don't ask me why—all I know is, it works.

Nothing is perfect, of course, and though I'm hard pressed to find fault with this machine, I do have a "wish list." I wish the dip switches for controlling the baud rate were more easily accessible. They are on the serial board and to get to them you have to unscrew the cover and reach in through a maze of chips and stuff. And you'd better have real long, skinny fingers. I also wish the Gemini were a little quieter. It is lots better than the L.P.VII, but not as quiet as the Epson. Wish #3 is for better documentation. Some program examples, especially for the bit imaging, would be most helpful. The novice will have a tough time figuring out how to address the dot.

I have sung the praises of the L.P.VII many times. I still say you can't beat it as a first printer. But, if you need better print quality and faster throughput—in short, if you're ready for your second generation printer, here's my advice: Follow the Star.

(Star Micronics, 500 Park Blvd., Suite 645, Itasca, IL 60143, \$3.99 suggested retail)

—Kathy Goebel



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USING VARPTR BASIC's *hidden* COMMAND

By Ron Mummaw

There is a command in Extended Color BASIC which I very seldom see used or even mentioned and yet it can be a very useful item. The command is *VARPTR* and I would like to describe how it can be used and how I have found it to be helpful. I have been doing some professional programming recently, and in converting some Apple programs to the Color Computer, I found it necessary to speed up some of the low resolution graphics routines to make them match the Apple's low resolution speed. I realized that machine language subroutines would do the trick and I wanted to use the most efficient way I could of storing them in my programs. That is where *VARPTR* comes in. Even if you are a novice programmer and know nothing about machine language programming, you will find some useful and easily understood information in this article.

If you will look on page 148 of your Extended Color BASIC manual you will find a somewhat confusing and not very useful description of *VARPTR*. It is also mentioned in the reference summary in the back of the book and on the quick reference card. Hopefully, my explanation will make more sense to you, and you will be able to make use of this command.

First of all, a little background on how the computer stores the things it needs to remember. Some of you old pros may want to skip this part. If you have a 16K Color Computer your computer has 16384 little "drawers" that it can store numbers in. The more technical name for these "drawers" is bytes. This is the area known as RAM (random access memory) memory. There are actually up to 65536 "drawers" but many of those have numbers permanently stored in them (the ROM (read only memory) memory areas) and for our purposes we need only be concerned with the ones that

change with each program we load into the computer. If you have a 32K machine then you have 32768 "drawers" of RAM memory.

Each of those "drawers" has a number or an address. The RAM addresses start at 0 and go to 16383 or 32767 depending on the amount of memory you have. The first 1024 locations (numbered 0-1023) are used by the computer to keep track of all kinds of things that go on during the running of a program and some things that are even going

"As you can see, finding where the computer has stored your value for X or A\$ could take you quite some time if you had to go looking through all of those "drawers." Fortunately, your computer is a very efficient file keeper . . ."

on when it appears as though nothing is happening (ie, the timer, sound and play values, etc.). The next 512 are the normal text screen memory locations. After that comes either your BASIC program, high resolution graphics memory, or disk memory storage if you have a R.S. disk system. These areas can change in size depending on how many graphics pages you have *PCLEARed*, how long your BASIC program is and whether or not you have a disk system. Finally the computer uses what is left to store all the variables and their values. Don't forget, all of this stuff is stored in the form of binary numbers from 00000000 to 11111111 which for us the computer changes to 0 to 255.

As you can see, finding where the computer has stored your value for X or A\$ could take you quite some time if you had to go looking through all of those "drawers." Fortunately, your computer is a very efficient file keeper and it has

(Mr. Mummaw has a Bachelor's Degree in Early Childhood Education from Arizona State University. He taught elementary school for six years and is currently doing some freelance programming, mainly for The Learning Company.)

an excellent memory for where it has stored all the things that you tell it. If you ask it just right, it might even tell you where it is keeping some information that you need. That is where *VARPTR* comes in.

Let's say you type in your computer:

A\$="COMPUTER" (ENTER)

The computer has now stored away several pieces of information about what you told it. We can use some of those pieces of information. If you now type in:

PRINT *VARPTR*(A\$) (ENTER)

the computer will give you back a number. For our example only, we'll say that number is 9733. That number is the memory "drawer" where the computer has stored information about A\$. If you were to *PEEK* into that location (by typing *PRINT PEEK*(9733)), the computer would give you the number 8 for our example. Why 8? Because 8 is the number of characters in A\$ or the number of bytes or memory "drawers" that A\$ occupies. The number 9734 or *VARPTR*(A\$)+1 is not used, however, *VARPTR*(A\$)+2 and *VARPTR*(A\$)+3 (9735 and 9736 in our example) are, and they contain very useful information. They contain information that will tell us where the computer has stored A\$.

We need to remember that in any of its memory locations, the largest number that will fit is binary 11111111 or decimal 255 yet the computer has up to 65536 memory locations to keep track of. I could go into a lesson on hexadecimal numbering here, but that would take up another article so I will try to make this as simple as possible without going into a lot of detail, for those who are new to the subject. If you multiply what is stored in *VARPTR*(A\$)+2 times 256 and

add that to what is stored in *VARPTR*(A\$)+3 you will get the beginning address where the computer has stored A\$. That is because *VARPTR*(A\$)+2 contains the "high order byte" and *VARPTR*(A\$)+3 contains the "low order byte." The high order byte must be multiplied by 256 because of the computers use of binary numbers. I know that may not be very clear but it will suffice for our purposes here. Let's say we found that A\$ was stored beginning with memory location 11029. If you type:

PRINT *PEEK*(11029) (ENTER)

you will get a 67 because that is the computer's way of representing a "C." Location 11030 contains a 79 for "O," location 11031 a 77 for "M," etc. Just for fun now type:

POKE 11029,68 (ENTER)

NOTE: 11029 will probably not work for your example. Be sure to use the value for the beginning address of A\$ that you got.

Now type:

PRINT A\$ (ENTER)

Your computer should have printed "DOMPUTER." Why? Because you just poked a "D" in place of where the computer was storing the value for a "C," the first character in A\$.

You're probably sitting there saying to yourself, "So what! This is interesting but what good will it do me?" Now comes the fun part.

This technique comes in very handy if you are using machine language subroutines in your BASIC programs. There are two ways of using a machine language subroutine in a BASIC program; 1) reserve the top X number of bytes of your RAM (depending on the length of your subroutine) and then poke the routine into that area, 2) pack the routine

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into a string and use VARPTR to locate that routine.

Method 1 works okay, but it has some drawbacks. One of those is if the program was written for your 32K machine and you put your subroutine into the top of RAM, then it will not work on your friend's 16K machine even if the BASIC program itself is short enough. Another drawback is the memory space and time it takes to poke it into memory each time you run the program. Finally, when you run another program that might need the memory you reserved, you either have to turn the computer off and on again or, CLEAR200,32767 or CLEAR 200,16383 to get all of your memory space back.

I will now describe how to pack a machine language subroutine into a string and then discuss the advantages of this method.

The following is a source code for a simple machine language routine to draw an orange square in the center of the screen. It is not absolutely necessary at this point that you understand how this program works.

```

10 A$ = "////////////////////
////////////////////"
20 V1 = VARPTR ( A$ )
30 V2 = 256 * PEEK ( V1 + 2 ) +
PEEK ( V1 + 3 )
40 FOR L = V2 TO V2 + 46
50 READ B$
60 A = VAL ( "&H" + B$ )
70 POKE L , A

```

```

80 NEXT L
95 Q$ = HEX$ ( V2 + 27 ) : Q1$ =
LEFT$ ( Q$ , 2 ) : Q2$ = RIGHT$
( Q$ , 2 ) : POKE V2 + 2 , VAL
( "&H" + Q1$ ) : POKE V2 + 3 , V
AL ( "&H" + Q2$ )
90 CLS0
100 DEFUSR0 = V2
110 Z = USR0 ( 0 )
120 GOTO 120
1000 DATA 10,0E,06,1B,0E,04,CE,A
6,A0,01,01,26,05,30,00,1C,20,F5,
01,11,26,01,39,A7,B0,20,EC,FF,FF
,FF,FF,01,FF,00,00,FF,01,FF,00,0
0,FF,01,FF,FF,FF,FF,11

```

The first column of numbers are just line numbers for reference. The addresses where this program could go are the numbers in the second column starting with \$0600 (I will use the \$ to indicate a hexadecimal number). That would be 1536 in decimal or 6*256. This is not, however, where we will put it. The third column are the hexadecimal numbers that tell the computer what to do. Here is a BASIC program that will pack a string with this machine language subroutine.

```

10 A$ = "RUN&RUNDIRSUBSOUND00&00
N!00&9THENFOR!!!08NFORINTSGNFO
RINT!!"
20 V1 = VARPTR ( A$ )
30 V2 = 256 * PEEK ( V1 + 2 ) +
PEEK ( V1 + 3 )
85 Q$ = HEX$ ( V2 + 27 ) : Q1$ =
LEFT$ ( Q$ , 2 ) : Q2$ = RIGHT$
( Q$ , 2 ) : POKE V2 + 2 , VAL
( "&H" + Q1$ ) : POKE V2 + 3 , V
AL ( "&H" + Q2$ )
90 CLS0
100 DEFUSR0 = V2
110 Z = USR0 ( 0 )
120 GOTO 120

```

You will really begin to see the beauty of this technique if you can follow my explanation of this BASIC program. Here goes: Line 10 sets up a "dummy" string. It is that string that will later contain our machine language subroutine. Line 20 finds out where the computer has stored its information about A\$ and makes V1 equal to that address. Line 30 PEEKs into V1+2 and multiplies it times 256. It also PEEKs into V1+3. Then it adds those together to give us the address where A\$ actually begins and it calls that address V2. The loop which starts in line 40 begins with L being equal to the address of the first character in A\$. L will increase 46 times for a total of 47 values, the number of characters in our "dummy" string. Line 50 gets the values in the DATA statement (line 1000) one at a time calls them B\$. Line 60 gets the decimal value of B\$ and sets it equal to A. Line 70 POKES the value of the current A into whatever memory location L happens to be equal to this time through the loop. Line 80 starts the loop over again with the next value of L. After the loop, A\$ no longer contains a series of "/"s. It now contains all the values that the loop POKEd into the memory locations where A\$ is stored. Line 85 is somewhat hard to



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explain, especially if you are not to the point of being able to understand the assembly language listing. To put it simply, the location where the *TABLE* is will change depending on where the computer stores *A\$*. Since the machine language program needs to know where that table is, line 85 figures that out and *POKEs* the new values for the address of *table* into the string at the right location. If that was too confusing, don't worry about it. Line 90 *CLEARs* the screen to black. Line 100 tells the computer where to find the machine language program. Line 110 tells the computer to run the machine language program. Finally line 120 is just to keep the computer from writing *OK* with a green stripe at the top of the screen. To get out of the endless loop in line 120, press the break key.

There's one more line you say? Yes, line 1000 contains the *DATA* for one M.L. program. I got those numbers from the third column of the source listing. You will notice that they are hexadecimal. I did the assembly language program on my assembler first so I wouldn't have to look up all the hex numbers for the commands, but you could just look them up in a good book on 6809 assembly language.

List the program. *WHOA!* What happened to *A\$*? Those aren't the */*'s that were there before. Each command in BASIC has a numerical equivalent. When you poked numbers into the memory locations where *A\$* was stored, the computer looked at them as BASIC commands. However, it will not treat them as such when the program is *EXECuted*. **SAVE THE PROGRAM!**

Run the program. You should, after a short pause, see a black screen with an orange square near the center. The pause was the program poking the M.L. values into memory. If you don't get the orange square and/or your computer "hangs up," you will need to turn it off and then reload the program to find the mistake. If the program runs as it should, then press *BREAK* and *DELeTe* the following lines: 40,50,60,70,80,1000. Now that *A\$* is your machine language program, you no longer need the lines that *POKEd* the hex values into *A\$*. Run the program and you should *immediately* see the black screen with the orange square (no waiting this time). That is the real beauty of this method. Now you can save this final version. You only saved the original in case of errors. This final version will run correctly everytime you load it. Another plus is that it now takes up probably half of the memory space that it did before. Also, the machine language program will run perfectly everytime no matter where the computer stores *A\$*.

There are a few points of caution I should mention. Your M.L. subroutine cannot contain the values 0 or 34 (\$22). A 0 value will confuse the computer into thinking it has reached the end of your string and it will not save *A\$* properly. A value of 34 (\$22) will essentially do the same thing because that is the value for quotation marks. Many times there are ways to get around these problems, but sometimes you will just have to resort to the old method of reserving space at the top of RAM and putting your subroutine there. Another important point to remember is to save your first version of your BASIC program *before* you *RUN* it. This way, if your M.L. program has an error which causes everything to crash, you haven't lost your original.

I hope many of you will find this information useful. Even if you're not at the stage of writing machine language code (as I wasn't when I first learned about *VARPTR*) it would be time well spent for you to experiment with what you have learned here. This method can also be used for "packing" a string with graphics characters for quick animation.

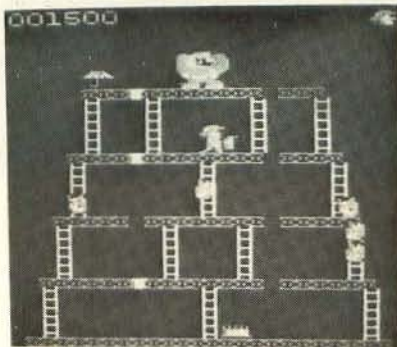
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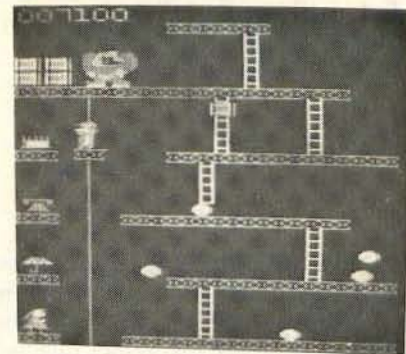
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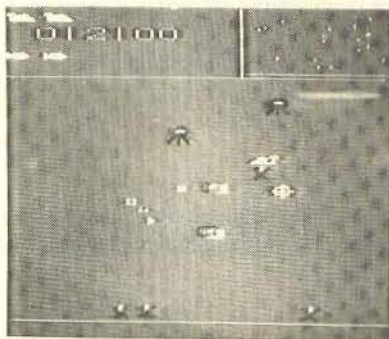
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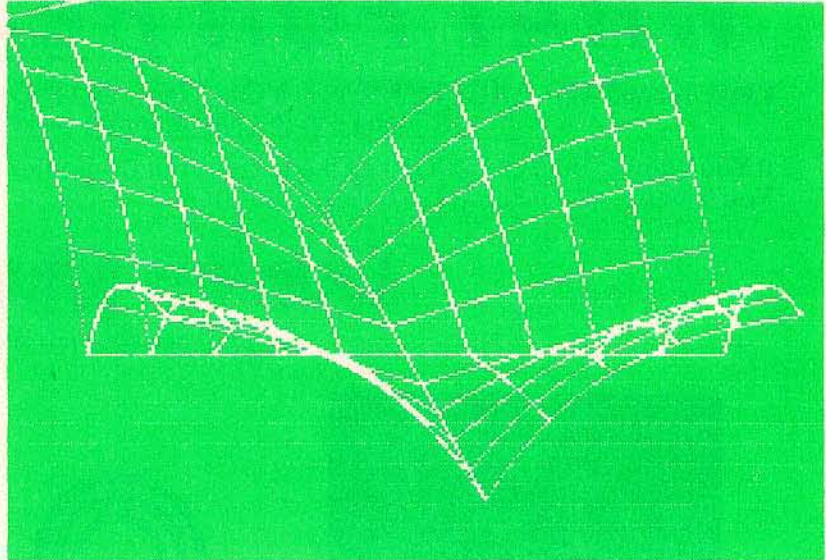
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3-D Graph Plotting of Multiple Variables

By Bob Delbourgo



When a quantity Z depends on a single variable X, it is convenient to plot a two-dimensional graph of Z against X and get a picture of their relationship—your Color Computer and video screen are marvelous aids in this respect. But when Z depends on two variables, say X and Y, the graphical plot ought more properly to be three-dimensional, whereas you are stuck with a flat video screen. In spite of this limitation, it is possible to get a 'perspective' view of the dependence by slanting the Y axis on the screen relative to the X axis and then plotting Z upwards from the so-determined X,Y coordinate. This is how scientific data are often presented in journals and books.

The program below shows you how to accomplish this on your computer. I have arbitrarily chosen X and Y to run from -10 to +10 and have constrained Z to run from 0 to 100; but you can easily adapt the program to other ranges of values.

The spacing between contours has been taken as two (lines 12 and 13) and the resulting pattern forms a "net," again you can vary this spacing yourselves to make finer or coarser meshes. It is also possible to shade in the elevated and distorted grid to form a checkerboard 'quilt'; but this program takes a lot longer to run (if you want a good picture at least) because the contours must be drawn at fine intervals, from the back towards the front. I have chosen PMODE1 as a compromise between resolution and patience but, even so, quilts take a long time to map out. However, the results are very pleasing and, I think, well worth the wait. By using further graphics pages and flipping through them you can modify the program and make the quilts change shape. Also you can overlay quilts with others; but be careful to move from the bottom upwards when superimposing.

The dependence of Z on X and Y appears in Line 30, and it gives a 'folded napkin' picture. As a suggestion, try changing the dependence to the following cases to arrive at other interesting shapes.

```
Z = 100*EXP(-(ABS(X*X-Y*Y)/ 100))
    'diagonally folded napkin
Z = 100*EXP(-(ABS(X)+ABS(Y))/5)
    'spike
Z = 50*(1 + COS(X/3)*COS(Y/3))
    'two-dimensional wave
Z = (X*X + Y*Y - 100)*(X*X + Y*Y - 100)/120
    'hat
Z = 100*EXP(-(X*X + Y*Y)/50)
    'bell
Z = (100 - X*X + Y*Y)/2
    'saddle
Z = 8*SQR(200 - X*X - Y*Y)
    'inverted sphere
Z = 140 - 10*SQR(X*X + Y*Y)
    'cone
Z = (X*X + Y*Y)/2 - 20
    'paraboloid
Z = 5*(20 - ABS(X+Y) - ABS(X-Y))
    'pyramid
```

Naturally you will have your own ideas about possible dependences: test these out quickly on the net before proceeding to the quilt.

13.....0287
END... 043E

The listing:

```
1 DIMA(23):CLS5:DATA100,69,38,7,
8,9,42,75,108,141,174,175,176,14
```

```

5, 114, 83, 52, 21, 22, 23, 56, 89, 122
2 FORI=1TO23:READA(I):POKEA(I)+1
Ø24, 128:POKEA(I)+1248, 128:NEXTI:
PRINT@196, "contour nets and quil
ts";
3 PRINT@427, "r. delbourgo";:PRIN
T@456, "15, willowdene av.":;PRINT
@481, "hobart, tasmania, australia
7ØØ5";
4 SOUND218, 1: SOUND227, 1: SOUND232
, 1: SOUND239, 1: SOUND232, 1: SOUND22
7, 1: SOUND218, 1: FORT=1TO1ØØØ: NEX
T
5 CLSØ: PRINT@229, "NETS(N) OR QUI
LTS(Q) ?":; PRINT@352, "PRESS R TO
RETURN TO MENU AT END";
6 I$=INKEY$: IFI$="" THEN6
7 IFI$="N" THEN1Ø
8 IFI$="Q" THEN2Ø
9 GOTO6
1Ø C=Ø: POKE65495, Ø: PMODE4, 1: PCLS
: SCREEN1, Ø
11 FORJ=ØTO2ØØSTEP2Ø: FORK=ØTO5ØS
TEP5: PSET (J+K+6, 2*K+92, 1): NEXTK,
J
12 FORX=-1ØTO1ØSTEP2: FORY=-1ØTO1
ØSTEP. 1: GOSUB3Ø: GOSUB4Ø: NEXTY, X
13 FORY=-1ØTO1ØSTEP2: FORX=-1ØTO1

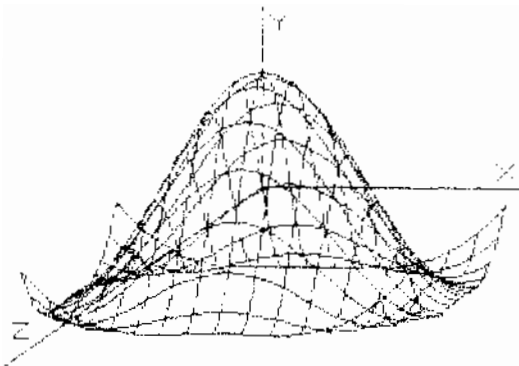
```

```

ØSTEP. 1: GOSUB3Ø: GOSUB4Ø: NEXTX, Y:
POKE65494, Ø
14 IFINKEY$="R" THEN5
15 GOTO14
2Ø POKE65495, Ø: PMODE1, 1: PCLS1: SC
REEN1, 1: COLOR8, 5
21 FORI=6TO2Ø6STEP2Ø: LINE (I, 92)-
(I+5Ø, 192), PSET: NEXTI
22 FORI=92TO192STEP1Ø: LINE (I/2-4
Ø, I)-(I/2+16Ø, I), PSET: NEXTI
23 FORY=-1ØTO1ØSTEP. 1: FORX=-1ØTO
1ØSTEP. 1
24 GOSUB3Ø: GOSUB35: GOSUB4Ø: NEXTX
, Y: POKE65494, Ø
25 SCREEN1, Ø: FORT=1TO5ØØ: NEXTT
26 IFINKEY$="R" THEN5
27 SCREEN1, 1: FORT=1TO5ØØ: NEXTT: G
OTO25
3Ø Z=7Ø*EXP (-ABS (X*Y) /4Ø)
31 RETURN
35 C=INT (X/2) -2*INT (X/4) +5+INT (Y
/2) -2*INT (Y/4): IFC=7 THENC=5
36 RETURN
4Ø A=131+1Ø*X+2. 5*Y: B=142+5*Y
41 IFB<Z THENB=Z
42 IFB>Z+192 THENB=Z+192
43 PSET (A, B-Z, C+1): RETURN

```

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AUTOTERM Won't Make Coffee, But Causes Quite A Stir

By Randolph W. Graham

You see, in a review, you need to say something negative about the product. You have to show that you took a cold, hard look at it. And so, I will put it right up front. *AUTOTERM* will not make coffee! What it will do is everything you have ever wished a terminal program would do—and many things you never dreamed of.

The Big Picture

The wave of the present in personal computing is networking, being connected to a giant computer by telephone lines. We no longer buy programs on media by mail, nor do we type them in laboriously from magazine listings; we download them from CompuServe or the Rainbow Connection. We are not limited to talking to fellow CoConuts at the local club; we exchange messages on bulletin boards all over the country. No more trips to the library for scholarly research; we seek information from the databases of Dialog, BRS, Dow Jones, etc.

To join the *Network Generation*, you need an account number and password (for the commercial services), a telephone to which you attach a modem (a device to translate the computers' bit streams into frequencies which can reliably travel over telephone lines) and a personal computer. CoCo owners plug the modem cable into the serial I/O port. You need one more thing: a program to convert your computer into a "smart" terminal which can communicate with the big computer (called the "host"). Enter *AUTOTERM*.

AUTOTERM, produced and marketed by Phil Zwart, PXE Computing, joins a number of terminal programs now on the market. Compared to the three others with which I am familiar, *AUTOTERM* is the Best of Class. Let me tell you why.

Getting Started

AUTOTERM comes on a cassette with manual. Spend a lot of time studying the manual. The author gives a thorough and painstaking tutorial on the use of the program. This is one time you cannot read the instructions last; you will miss too much. When ready, *CLOADM* and *EXEC*. You will be given a main menu to choose three modes: text editing, terminal and keystroke multipliers. *BREAK* will always get you back to the main menu, as will *RESET*. Surprise, you do not lose text in memory when you hit *RESET*.

Choose #1. In rapid order, type SHIFT-CLEAR to get to commands, U for user options and BEP. The cursor will flash by this option. Type N and ENTER. That stops the beep tone which has been driving you crazy every time you touched a key. I did not give this feature a full test, but my intuition is that my sanity would last about a minute and a half with those beeps. You may want to go through the same routine with the "BOP" option which gives you a "Boo" when you do something wrong. Of course, you can always turn down the volume.

While in the text mode, play around. You will find that entering text is fairly normal. You can backspace to correct, *ENTER* only to start a new paragraph, etc. A neat feature is that the arrow keys repeat. If you hold one down, the cursor will skip along very rapidly. Scrolling up and down is a breeze with this feature. When you are through exploring, delete what you have by going to the command mode SHIFT-CLEAR and type D. Prompts at the top will guide you to delete the whole mess and clear your memory. Back to main menu for the next mode.

Going Online

Assuming that you have a CompuServe password and a modem, select the terminal mode and then call up and log on in the usual way. If you are used to using a terminal program, you will not have trouble with *AUTOTERM*. While online, read something you want to save. *Do not download it—it is not necessary with AUTOTERM. Logoff* in the usual way.

Now the fun begins. Use your arrows to scroll up and down. All the text is still in memory. Switch to edit mode. It is still there. Clean it up. Delete all the conversation and prompts between you and the computer. Save only the text you want to print or save to tape. Have a BASIC program? Save it—and only it—to tape. No extra text to give you a DS ERROR when you try to *CLOAD* it later. Go to the command mode and type S. You will be prompted how to save it. The manual tells you how to insert control codes to save BASIC, binary, ASCII, machine language and picture files.

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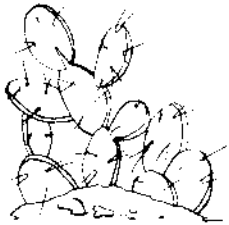
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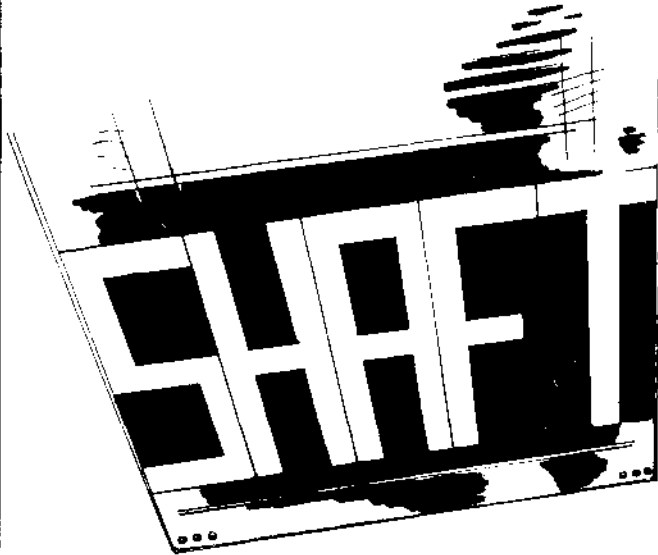
Shaft

It took a long time, but we finally found a 100% machine language arcade game that met our standards. It had to be good, with outstanding graphics and animation. It had to be tough at high levels of play, to challenge an expert, but still have an easier level of play for the beginner or younger child. Maybe hardest of all, we didn't want another copy of some arcade game!!

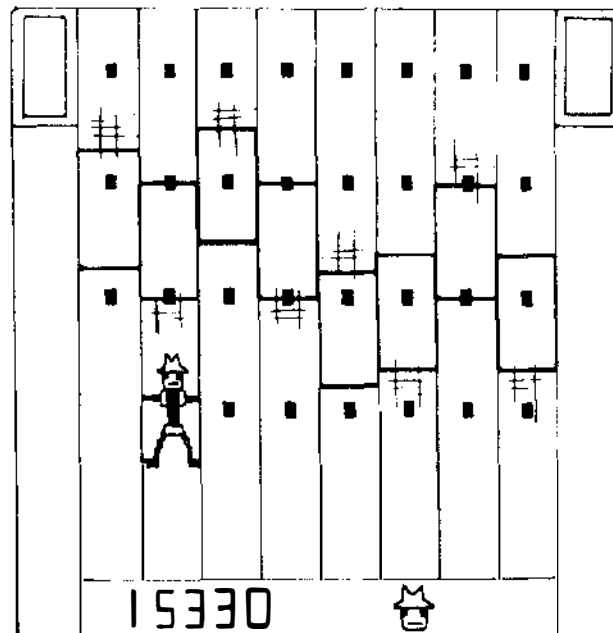
If you are tired of your friends telling you that the Pac-Mac running on their whatever brand video game or computer is better/more like the arcade than your Color Computer version, here's your chance. Show them **SHAFT**. It's new and **ORIGINAL**, and nobody has anything like it on **ANY** other computer (or in the arcades, either).

It starts with one of the most impressive title screens we've ever seen. Yes, there's full animation and sound even on the title screen!!! Then you select your level of play (on a second hi-resolution title screen) and get down to fun.

The animation is smooth and fast (it gets faster as you go along), the sound effects are great, and your man is very detailed. The whole game is done in hi-resolution, multi-color graphics, and while the game looks easy enough, it is very definitely not. In fact, we will send a gift certificate for the purchase price to the first 5 people who send us a picture of the screen showing a score over 50,000, and we will publish their names in a future ad hall of fame section!!! You have to be fast with the joystick and play several moves ahead at the same time if you expect to do well. Are you up to the challenge? **16K — \$24.95 TAPE — \$29.95 DISK**



The drawing to the right is a representation of the screen during play. The eight elevators in the center shafts move up and down in one of several random patterns. Your man starts out at the bottom left. You must maneuver him across the screen to the other side while avoiding the crushing elevators. When you reach the other side the elevator in the top right corner will come down and pick you up. It takes you up one floor, where you must repeat the process going the other way. If you make it all the way across the top floor you get a new, faster screen. The on screen scoring is across the bottom, (15,330 would be a new record for us) and next to it is a row of heads indicating how many men you have left. You start with four men, but they may not last long.



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full range of adjustments to format your page. A common problem with terminal programs is that you cannot have your printer hooked up because your modem is plugged into the I/O port. I do not think it is safe to plug and unplug peripherals while the computer is on. And so, you have to save to tape, turn off, unplug, plug, turn on, reload, print out. I have a DSL switcher to reduce plugging and unplugging and it is a fine accessory here.

A really great feature of *AUTOTERM* is its ability to print a whole line. Ever printed out a text file from CompuServe? Know how it prints 32-character lines because of built-in carriage returns? One of *AUTOTERM*'s options is to ignore these extra CR's so that you print out whole lines with automatic wordwrap (words are not split at the end of a line).

Before leaving the terminal mode, let's explore one other great feature. Want to call up a bulletin board and leave a message? Type it out in advance in the text mode and mark it as a block, as taught in the manual. Now, call up and *logon*. Upload your prepared message by typing a single digit! But, on to greater things.

With Whipped Cream

Time for that third mystery mode. With it, you can predefine a string of characters which is called by typing a single digit. Back to CompuServe for an example: you can predefine a key for your account number, another for your password and a third to type "Go PCS-126" if you want to go straight to the Color SIG. Dial up, type SHIFT-CLEAR 1, (S-C) 2, (S-C) 3 at the proper times and you are in the SIG. You can even add things like *ENTER* at the end of each command. You almost have to see this feature to believe it. Believe it, for greater things are yet to be.

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And A Cherry On Top

The Keystroke Multiplier mode allows what the author calls "Computer Dialogues." This means that if you know your *logon* procedure involves certain queries by the host computer and responses by you, you can preprogram this "dialogue." As each query is received, your terminal recognizes it and automatically makes the proper response and you are online in minimum time. Flexibility is possible through "Wild Card" options.

Information specialists—those of you who play in the big leagues with Dialog, BRS, NYT and so forth—will perk up your ears when I say "search strategy." CompuServe's \$5 per hour is like a trip to the movies. But when you are paying up to \$120 per hour for connect time (figured to the nearest hundredth of a minute), minimizing online time is a survival technique. Well, *AUTOTERM* is what you have been looking for. You can set your *logon* protocols as described and you can preload your search strategy in the text mode. Get on, run the search and get off as soon as possible. Then, go back and clean up your text, format it for printing and print out just what you want to give your customer. It is the fastest database searching I have seen on a home computer.

Nobody's Perfect

Every program has its limitations, and *AUTOTERM* has a few. It is a long program—12K bytes. When I load it into my 32K machine, the memory indicator shows that I have about 18.5K available memory.

It is awkward to insert text. You must insert spaces, then go back and fill them in, and finally wipe out any extras. Pretty tedious for someone like me who has to do a lot of revising. I wish it was as easy to insert as it is to delete.

The documentation is a little thin. The manuals you get for the information service will talk about control characters and parameters that must be used. These are not given in a convenient way in *AUTOTERM*'s manual. You just have to experiment.

A strange feature is that I experienced keyboard bounce for the first time. Shades of old Model I. Perhaps this could be fine-tuned out with a little fiddling with the options.

Summary

I tried every feature of *AUTOTERM* except its ability to work with an automatic-answering modem to achieve what sounds like really automatic computing. The day seems to be drawing near when they won't need us anymore after we push the button.

Everything works. I did not get perfect results on every try, but I think that was due to unfamiliarity with the program's full power. There is a lot of adjusting and tinkering possible to get just the right configuration. Once done, you can save your customized pattern of options to tape for regular reuse. Unfortunately, *Rainbow* only gives you a few days to do a review and fiddling time is limited. But in the few days I used it, I found that I was getting familiar with the actions I most often used.

I would not hesitate to recommend *AUTOTERM* to a friend. If you are thinking about getting into networking, this will be a good investment. The manual will lead you by the hand into effective utilization and you can grow into its exotic features. You will never outgrow it. Experienced networkers will find here the help and the capabilities they have wanted for years.

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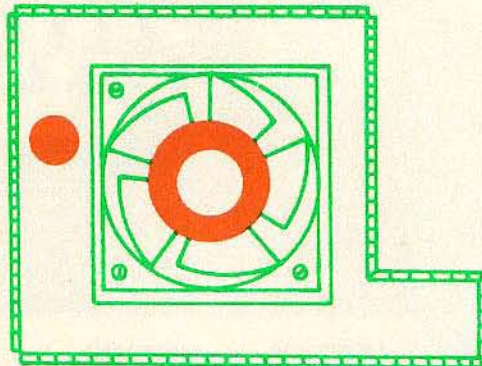
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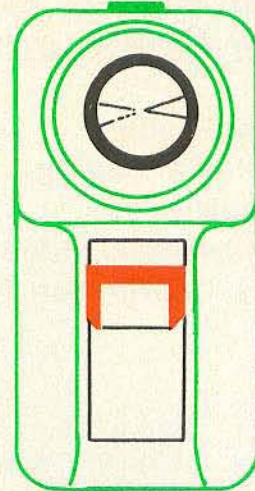
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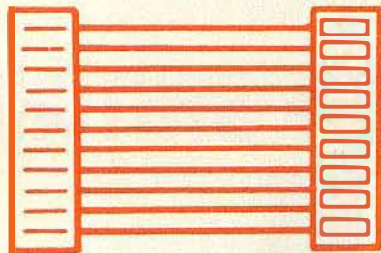
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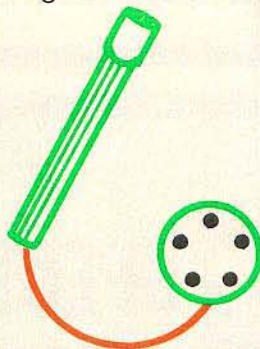
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Using *DATA* Lines To Cache Your Creatures

By Bill Nolan
Rainbow Contributing Editor

Those of you who follow the column will recall that last month we were working on a program to store information about monsters. This kind of information is used in virtually all fantasy role playing games, and there are often several hundred monsters to choose from. This can necessitate a lot of looking things up in books.

Also, while it is fairly easy to look up a certain monster by name, it may be more difficult to find all those that fit a certain range of values as regards armor class, hit dice, or alignment. As a result, the same few monsters tend to get used over and over again.

Before I go on, let me give a few definitions for you novices. Armor class is a measure of how hard it is to hit something in a fight. A monster (or person) may have a good armor class because of actual armor (tough skin, scales, plate mail, etc.) which makes weapons and blows bounce off. A good armor class can also be obtained by a monster that is exceptionally fast and agile, and thus too elusive to easily hit. In most games, the lower the armor class number, the better the armor class, and minus numbers may be common.

Hit dice is a measure of how much damage a monster can withstand before being killed, and a larger number of hit dice is better (for the monster). On the average, it will take about one blow with a sword for every hit die a monster has to kill it. Of course, all these blows would have to connect, and not bounce off the armor, or miss.

Alignment refers to the moral stance of the monster or person. Alignment can be good or evil, lawful or chaotic, or a combination such as lawful good. It can also be neutral,

which could be compared to the person who doesn't vote in an election because they don't care who wins.

Now, let's take a look at the program. It stores the following information about each monster:

- type of monster
- armor class
- movement rate
- hit dice
- number of attacks
- damage per attack
- special attacks
- special defenses
- magic resistance
- intelligence
- alignment
- size

This information is stored in *DATA* lines beginning at line 2000. As you can see, I have put in a few monsters, but you will want to add more. There must be twelve *DATA* items for each monster, as listed above, and you can use as many *DATA* lines as your memory will allow. 16K should allow at least 100 or so, and lots more with 32K. Do a *PMODE0:PCLEAR 1* before loading the program. You can use any unused line number between 2000 and 4999 for additional monsters.

In the program itself, line 20 dimensions the two arrays used. If you have more than 50 monsters, you will have to change the 50 following *MA\$* to a higher number. Line 22 reads the *DATA* in line 1900 into an array *CH\$(X)*.

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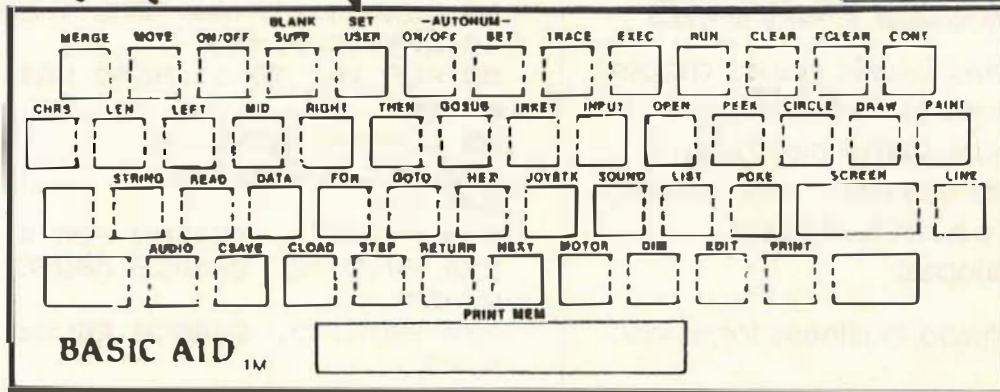
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Lines 30 through 85 read all of the monster *DATA* into the main array *MA\$*. Because it checks for the *DATA* "EOD" (end of data) before reading in each monster, the program doesn't care how many monsters there are.

Lines 200 through 280 print the menu on the screen and get your choice before branching to the correct search routine. Lines 400 to 410 do a search by name of monster. The name you input must be the same—letter for letter and space for space—as the first *DATA* item about that monster or the monster will not be found. Computers have no sense of humor about spelling.

Lines 600 to 620 search for a monster having more than a certain number of hit dice, and the computer will prompt you for a number to use as a basis for the search. Since the hit dice are stored as a string in the array *MA\$*, line 610 converts the first two characters of the string into a number. This allows the program to handle things like "9 to 11" and "4 + 3." In the first case, the first two characters are 9 and a space, which is converted into the number 9, and the 4 and space in the second case are converted into a 4. However, if the space was left out between the 4 and the "+," then the "+" would be the second character and would result in a value of zero being returned. For this reason, make sure you leave a space after the first number in the hit dice *DATA* element.

Lines 800 to 820 are almost identical to the 600s, except that the program is searching for monsters with hit dice less than the target value rather than greater. The big difference is the symbol between the "Z" and the "T" in 610 and 810.

Lines 1000 and 1010 search for a certain alignment, and the same caution regarding spelling applies here as well as to the name. Lines 1200 to 1220 search for monsters having an armor class equal to or better than the target value you


input. Here again, the left two characters are used, so be sure to put a space after all the numbers if there is more than a simple number in your *DATA* statement. (These cautions about a space after hit die and armor class numbers in the *DATA* lines don't apply if the number has two digits.)

The sections at 600, 800, 1000, and 1200 will bring up all of the monsters fitting the selection criteria. They will be displayed one at a time, and you press any key to go to the next one. After the last one, or if none are found which meet the criteria, you will be returned to the menu.

Line 1400 ends the program if you select that choice from the menu, and lines 1450 to 1470 are the subroutine that prints out the information about each monster.

By the way, the programs in this column are for use by people who play fantasy role playing games. They are not games themselves. Every month I get letters from people who typed in the program and then can't get the computer to play the game. So, if you aren't a fantasy gamer, these programs may not be of use to you. However, the gaming industry estimates that between 15 and 20 million people in the U.S. play fantasy games, and a recent survey indicated that 95 percent of those had a personal computer. That explains why computer magazines run articles on using your computer for a fantasy game!

Till next month, remember—this is "Be Kind to Dragons" month. But then, who would be mean to a Dragon?



275... 01FC
1200... 041E
END... 0748

The listing:

```

10 CLS
15 PRINT"READING DATA"
20 DIM MA$(50,11),CH$(11)
22 FOR X=0 TO 11:READ CH$(X):NEX
TX
25 CC=0
30 READ A$:IF A$="EOD"THEN 200
40 MA$(CC,0)=A$
50 FOR X=1 TO 11:READ MA$(CC,X)
80 NEXT X
85 CC=CC+1:GOTO 30
200 REM MAIN MENU
205 CLS
210 PRINT"1. SEARCH FOR A NAME"
220 PRINT"2. SEARCH ABOVE CERTAI
N HD"
230 PRINT"3. SEARCH BELOW CERTAI
N HD"
240 PRINT"4. SEARCH BY ALIGNMENT
"
250 PRINT"5. SEARCH FOR BETTER T
HAN A          CERTAIN AC"
255 PRINT"6. END THE PROGRAM"
260 PRINT:PRINT"KEY THE NUMBER O
F YOUR CHOICE":K$=INKEY$
270 K$=INKEY$:K=VAL(K$):IF K<1 O
R K>6 THEN GOTO 270
275 SOUND 150,1
280 ON K GOTO 400,600,800,1000,1
200,1400
400 CLS:INPUT"WHAT MONSTER";T$:S
OUND 150,1:FOR X=0 TO CC-1:IF MA

```

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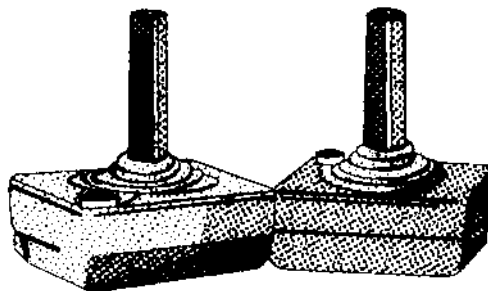
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```

*(X,0)=T* THEN GOSUB 1450:GOTO 2
00
403 NEXT X
405 CLS:PRINT"MONSTER NOT IN FIL
E":PRINT"CHECK SPELLING":FOR X=1
TO 1000:NEXT X
410 GOTO 200
600 CLS:INPUT"ABOVE HOW MANY HIT
DICE";T:SOUND 150,1:FOR X=0 TO
CC-1
610 Z=VAL(LEFT$(MA$(X,3),2)):IF
Z>T THEN GOSUB 1450
620 NEXT X:GOTO 200
800 CLS:INPUT"BELOW HOW MANY HIT
DICE";T:SOUND 150,1:FOR X=0 TO
CC-1
810 Z=VAL(LEFT$(MA$(X,3),2)):IF
Z<T THEN GOSUB 1450
820 NEXT X:GOTO 200
1000 CLS:INPUT"WHAT ALIGNMENT";T
*:SOUND 150,1:FOR X=0 TO CC-1:IF
MA$(X,10)=T* THEN GOSUB 1450
1010 NEXT X:GOTO 200
1200 CLS:INPUT"WHAT ARMOR CLASS"
;T:SOUND 150,1
1210 FOR X=0 TO CC-1:Z=VAL(LEFT$(
MA$(X,1),2)):IF Z=<T THEN GOSUB
1450
1220 NEXT X:GOTO 200
1400 CLS:END
1450 CLS:FOR Y=0 TO 11:PRINTCH$(
Y);:PRINTMA$(X,Y):NEXT Y
1460 PRINT:PRINT"PRESS ANY KEY T
O GO ON";:K*=INKEY*
1470 IF INKEY*="" THEN 1470 ELSE
SOUND 150,1:RETURN
1900 DATA "NAME----- ", "AC-----
--- ", "MOVE----- ", "HIT DICE--
", "# OF AT.-- ", "DAM/ATTACK ", "S
P. ATTACK ", "SP. DEF.-- ", "MAGIC
RES. ", "INTEL.---- ", "ALIGNMENT
- ", "SIZE----- "
2000 DATA GOBLIN,6,6,1 (1-7 HP),
1,1-6 OR BY WEAPON,NIL,NIL,NORMA
L,AVERAGE,LAWFUL EVIL,SMALL (4'
TALL)
2010 DATA MINOTAUR,6,12,6 +3,2,
2-8 OR 1-4/BY WEAPON TYPE,NIL,SU
RPRISED ONLY ON A 1,NORMAL,LOW,C
HAOTIC EVIL,LARGE
2020 DATA RED DRAGON,-1,9/24,9 T
O 11,3,1-8/1-8/3-30,BREATH WEAPO
N + POSSIBLE MAGIC USE,NIL,NORMA
L,EXCEPTIONAL,CHAOTIC EVIL,LARGE
(48' LONG)
2030 DATA ROC,4,3/30,18,2 OR 1,3
-18/3-18 OR 4-24,NIL,NIL,NORMAL,
ANIMAL,NEUTRAL,LARGE (60' WINGS)
5000 DATA EOD

```



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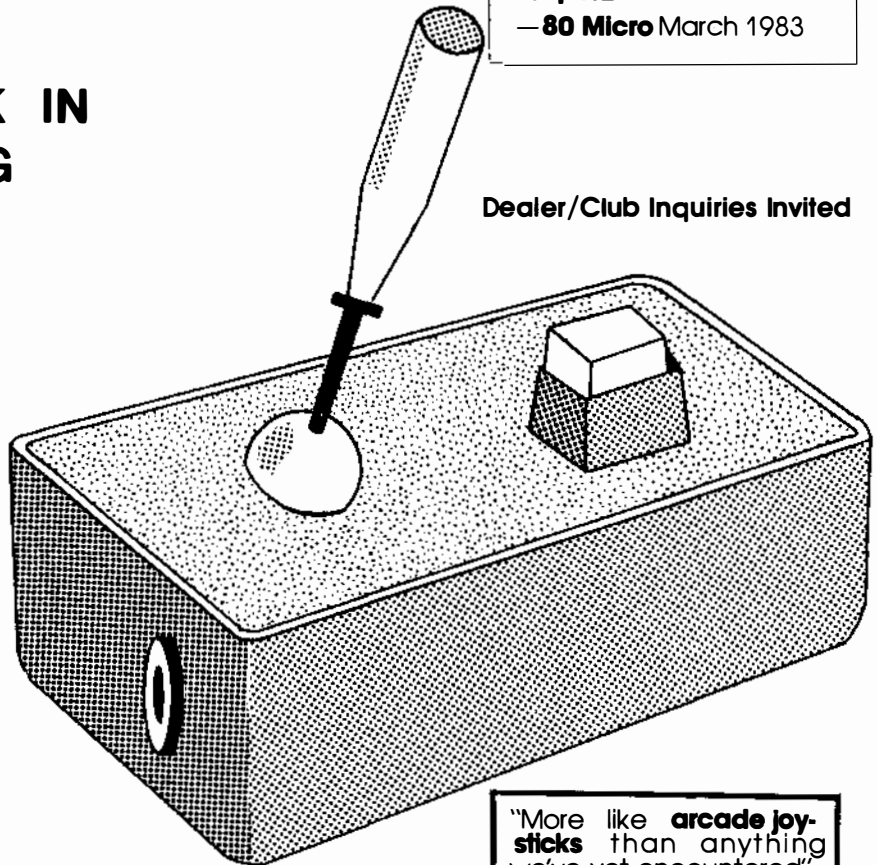
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PIPELINE

RUMORS AND REPORTS

abound as to what might be the future for our favorite computer. We've heard just about everything that could possibly come down the pike, but one of the things that is clear—the Color Computer, in some form, will be with us for quite some time. And, too, remember, that Radio Shack has *never* obsoleted any computer. In other words, they always make certain that all the software generally available to one computer will run on anything that may come down the pike in the future.

We are *not* trying to tell you that the Color Computer will soon die. It just doesn't seem to be in the cards (see another piece of information in this month's column for some reinforcement of this), but there will be some changes in CoCo, for sure.

Yet, look at Radio Shack's record. It has been several years since they produced the Model I, yet they continue to produce software and other items which are useful on the Model I. And, as far as the aftermarket is concerned, there is still a hefty business in Model I software and hardware.

The point simply is that *were* Radio Shack to end production of the present Color Computer tomorrow, it would be years and years before they would stop producing software and hardware to support it. And, outsiders would continue to produce material, too.

Taking all that into perspective, we hear two general stories: First, that there will be a "No Frills" Color Computer to come along and that, Second, there will be a "Super" CoCo, too. In any event, software for all systems would be usable on one another—given memory and certain other requirements.

We do not have confirmation of any of this, but we hear that "No Frills" would be in the low price range that would compete with such as Commodore and TI. It probably would *not* have Extended Basic—and may have no socket for adding it. It certainly would have an RS-232 for printer and com-

munications output. And, of course, a ROM Port and joysticks.

"Super" CoCo, on the other hand, would probably have an even more powerful video display—there is the possibility of as many as 2,000 colors—and a 64 character screen display. Will the screen be built in? We don't know. Will it have built-in disk drives? Maybe.

At this stage, all these are rumors and reports, with nothing whatsoever confirmed. However, they seem to indicate that Tandy—unlike some reports you may have read elsewhere—is committed to the Color Computer concept. And no wonder, it has been a major seller for them for a couple of years now.

SOFTWARE CITY IS A name you may be hearing a lot more about in the future. The firm has 18 franchises operating nationally, with a whole lot more scheduled to open in the future. The concept is somewhat unique, in that Software City is just that—a software city. The stores operate on a software-only concept, which means that they do not market computers themselves. While they do sell peripherals as well as software, they have an interesting concept which does not tie them to a single computer system.

EDUCATION IS MAKING some major strides in the CoCo market, and in the next several months we believe you will see a lot of the firms which, frankly, made the Apple so well known come into play for the Color Computer.

Radio Shack has announced a whole range of agreements with a host of the largest names in educational software to produce learning materials for the CoCo. And, if you follow the advertisements in our pages, you will see that several educational software publishers are now advertising some of their products directly. More will follow and, we believe, you will see an increased emphasis on educational programming that can be translated into increased use of CoCo in schools.

A NEW DATA BASE program is now available from The Computer House (Box 1051, Dubois, PA 15801). It includes machine language sorting capabilities and a top capacity of 24,000 characters in a 32K CoCo. It is available on tape or disk.

WORLD ELECTRONICS reports that it has several kits available for CoCo projects. The projects are offered both in bare board and fully assembled form. Further information can be obtained from World Electronics (177 27th Street, Brooklyn, NY 11232).

SINCE INCOME TAX TIME has just passed, you might want to consider a small contribution to help your tax status next year, suggests reader Tom Clines, a CPA. Clines says that if you wish to make contributions of a *Rainbow* subscription to the local library or to any school, that contribution would be tax deductible. It would also help turn on others to the CoCo's capabilities.

80-U.S. JOURNAL HAS changed its name and will be known as *Basic Computing* in the future. *80-U.S.* was one of the early Radio Shack magazines and covers all the models. It went to a "slick" magazine format the first of the year and gives some fine information about CoCo, as well as other TRS-80 computers. Further information can be obtained from the magazine (3838 South Warner St., Tacoma WA 98409).

MARK DATA PRODUCTS has a new high-res machine language game out, called *Glaxxons*. This attack-the-alien game is said to provide a challenge for both novice and expert players and has seven selectable skill levels. It is available on disk or tape (at 24001 Alicia Parkway, Suite 207, Mission Viejo, CA 92691).

YOU HAVE READ a great deal on these pages about a compiler for the CoCo, and now we hear one is just about ready to come to market. It may be a couple of months yet, but we understand the program is just about complete and that it has reached the "writing the documentation" stage. Our understanding is that this compiler is pretty full-blown in that it will support both graphics and non-graphics commands. For those who don't know, a compiler is a program that will take a BASIC listing and change it into a machine language program. This is probably *the* most difficult program of all to write.

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CoCo *Crypto* A Three-Star Puzzler

By Chris Reid

The Color Computer, with only 512 characters on screen and no lowercase letters, is far from ideal for word puzzles. But the real problem is shared by all home computers: the memories are much too small and the microprocessors are too slow. In a few "generations" of home computers, when they can store lists of 20,000 words internally and search them very fast, we'll be able to play games like Scrabble on (and against) computers; but today most word games are better handled with pencil and paper, or on game boards.

Cryptograms—simple substitution ciphers—are an exception. They don't need word lists, they're short enough to fit on any screen, and they're easily available—the computer doesn't have to supply them. Cryptograms can be handled right now on the Color Computer—in fact, the only improvement I'm waiting for is a \$25 optical scanner to take puzzles out of the puzzle magazines so I don't have to type them.

Working cryptograms with a pencil can get rather tedious. It takes too long to write an "E" over each of ten "Q"s—which have to be searched for, and you're apt to miss a couple. Then if you decide to change the "E"s to "A"s, you have some erasing to do. After a few false starts you'll be tempted to abandon the mess.

The computer fills in all 12 "E"s in no time. It replaces them just as easily. And you can make as many false starts as you need—in fact, you can put in letters just to see if they work. You wouldn't want to do that with a pencil.

Even the first crude versions of *Crypto* revived my interest in cryptograms to the point of addiction. My speed and skill improved rapidly. I used to be able to solve two of the six increasingly difficult cryptograms in *Four-Star Puzzler*—now I average five.

The features I added later—eliminating wraparound, automatic copying of punctuation, ability to erase trial solu-

tions and to correct mistyped letters in the puzzle, and the second, "frequency" cryptogram—were added because as a solver I needed them. None of them are just for show. This is one of the obvious—but constantly violated—principles of recreational programming. Some more:

- ∴ It's not enough for the creation of a program to present interesting problems to the programmer. If the program won't interest the *user*, it should be put aside for later—or forever.

- ∴ There's no way to know in advance whether a program will get that lucky "click." For example, everyone has tried writing a kaleidoscope program. It never gives the same thrill as a real kaleidoscope. (Much sharper diagonal lines and faster movement of large color patterns are needed—and should arrive by 1990.)

A respectable program that doesn't have that sparkle should be put aside for another try later.

- ∴ A recreational program should be tested for many hours by the programmer as user. The idea is not only to get bugs *out*, but to get interest *in*.

Why does *Crypto*—which I believe will be useful (with a few modifications) for many computer generations—have such limited commercial value? One reason is that the market for software is split among an increasing number of computer brands, each accepting only software written in its own dialect. Slow-but-sure sales are too small to be worth waiting for when a program can only be sold to users of one brand—which will be obsolete in a few years. It makes more sense to take a chance on a shoot-'em-up which may make a quick killing before everybody gets sick of it.

What's needed is a translation company which will take superior programs of lasting appeal and produce versions for Pet, Sinclair, Atari, IBM PC, the Color Computer, and even the no-color computers. Instead of grabbing a copy of, say, *Getting Started with Color BASIC* and rushing out a

translation that will barely run, the company should use a knowledgeable translator for each brand name—a person who has done a lot of programming on that brand and knows its ins and outs on at least this level: If cryptograms are INPUTted instead of LINEINPUTted, there will be problems with commas, colons, and quotation marks.

Today's home computers are already powerful and resourceful—it's surprising how few useful, enjoyable recreational programs there are. Someone has defined the home computer as "a solution waiting for a problem." *Crypto* tries to be an example of what computers were really made for: enjoyable expansion of the powers of the user.

For a Quick Start

If you're typing the program, you can start with a no-frills version that only takes a few minutes. Type lines 50, 700-720, 740, 760, 4000-4010, 5000-5060, 5080-5100, 5120, and add the following lines:

```
80 CLEAR500:CLS:"PRINT"TYPE CRYPT
OGRAM AND ENTER";:PRINTSTRINGS(3
9,32);:LININPUTCS
750'
4500'
```

Later you can change these three lines and type in the rest of the program.

Here are a few cryptograms to get you going—then you can find lots more in puzzle magazines (which are on most newsstands) and go on, if you wish to specialized magazines and books.

```
10 CLEAR1000
20 C$(1)="SC ZKKV P ABPVGHMW LHB
KMS          MCFFPDL JBCF WMBCEEHDA
, PLL        "+CHR$(34)+"JCBP=1SC2W
SKV0:DKTS"+CHR$(34)+". ("+CHR$(3
4)+"P"+CHR$(34)+"          DKQKB AKSW
SC 2.) SC KDL, GHS  SGK "+CHR$(
34)+"NBKPZ"+CHR$(34)+" NRSSCD.
30 C$(2)=CHR$(34)+"XTLBY @"+CHR$(
34)+" PJRVX J OGCEGJP OJKXV, IK
Y QCK FJS'Y KXV YTV RVQICJGZ. YG
Q "+CHR$(34)+"IGVJR"+CHR$(34)+"-
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ZLGVFY FCPPJSZ YC  XV TCA PKFT
CB YTV OGCEGJP LX  ZCSV, JSZ TCA
AVDD.
40 CA$(2)=" YTVS YQOV  "+CHR$(3
4)+"FCSY"+CHR$(34)+" JSZ YTV OGC
EGJP ALDD          FCSYLSKV ATVGV LY
DVBY CBB.
50 C$(3)="22222222.2*10=22222222
2, KG UIT YGJKS'W 22222222.2*10-
22222222 JEDCH VJAG? (WAT XW.)
WIJ CSKUJA XK WIJ XSBXKXNHJ WJSW
I YXZXW-- XW YGJKS'W ZJW OAXSWJY
, NDW XW CQQJLWK QDAWIJA LCHLDH
CWXGSK.
60 C$(4)="QSW TGN TQDS'M MSK MKS
MG WPOPM AKVF, QD PM DGFYRW LK?
```

```
LKIQYDK (KEIKXM ZFV PSMKOKVD)
SYHLKVD IQS OKM ZYAAN TGKS MGK
IFHXMKV IGQSOKD MGKH MF LPSQVN
SYHLKVD, IQRIYRQMKD, QSW MGKS I
GQSOKD MGKH LQIB.
70 PRINT#-2,C$(1):PRINT
80 PRINT#-2,C$(2);
90 PRINT#-2,CA$(2):PRINT
100 PRINT#-2,C$(3):PRINT
110 PRINT#-2,C$(4)
```


Program Notes

First, I would like to thank *INSTR*. This very fast command (in Microsoft's Extended BASIC) is essential to this and many other word programs. Without it—even with *POKE65495,0* and C.J. Roslund's Break Disable utility—this would be a slow program (lines 3240 and 5030; 50; 10-40).

Second, in a slow part of the program the even faster *POKE65497,0* disables the screen and tries to offer a rather off color "snow"—but a switch to *PMODE2* fixes the color (lines 3040 and 3290).

Last, in the 3000 block, the frequencies FR(Z) have been added up for each letter in the cryptogram: "B" appears once, let's say, "W" 12 times, and "T" 3 times. Each number is put into the left side of a string, with the letter on the right side. This is FR\$(Z), which is "1B", "12E", and "3T". These strings have *VAL*ues (1, 12, and 3—*VAL* ignores the letters),

"CARRY"



1	1	
0	9	7
+		
5	2	8

9	2	5

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and can be shell-sorted in decreasing order: "12E", "3T", and "1B".

Now the RIGHTS\$, 1 of the "Siamese strings" can be read off in order and used as "A", "B", and "C" in a new, "frequency" cryptogram where "A" represents the most frequent letter in the cryptogram, "B" the next most frequent, and so on. (The frequency cryptogram is a powerful tool which, as you get the feel of how to use it, will greatly increase your ability to solve tough cryptograms.)

So a string that contains a number (which can have several digits, but must be on the left) and a letter (or several, but always the same number of letters) can be treated sometimes like a numeric variable and sometimes like a string. This can save a lot of memory and execution time.

```

100... 020D
220... 06AA
320... 09E1
570... 0C2B
1050... 0E3E
1320... 102D
END... 1AC4

```

The listing:

```

"CRYPTO". COPYRIGHT 1983 BY CHRIS REID, 319 E. 5TH ST., NEW YORK, NY 10003
10 IFPEEK(16057)<>50THENCLEAR200,16048:FORI=33465T033566:POKEI-17408,PEEK(I):NEXTELSE40
20 FORI=0T02:POKEI+16061,18:NEXT
30 I=16158:POKEI,38:POKEI+1,3:POKEI+2,126:POKEI+3,131:POKEI+4,34

```

```

:POKEI+5,126:POKEI+6,164:POKEI+7,76
40 POKE411,62:RUN50
50 POKE65495,0 'IF THIS SPEEDUP WORKS ON YOUR COMPUTER
60 GOT05130
70 CLEAR1500:DIMFR(26),FR$(26):CLS:Q$=CHR$(34)
80 PRINT"IF YOU NEED INSTRUCTION S, TYPE "Q$"?Q$" AND ENTER":PRINT:PRINT"IF NOT, TYPE CRYPTOGRAM AND ENTER";:PRINTSTRING$(59,32);:LINEINPUTC$
90 IFC$=""THENCLS:GOTO80
100 IFC$="#"THENCLS:END
110 IFLEFT$(C$,1)<>"?"THEN500
120 CLS:PRINT"AFTER YOU ENTER THE CRYPTOGRAM, IT WILL REAPPEAR ON SCREEN WITH NO WRAPAROUND. (TO KEEP WRAP- AROUND, TYPE "Q$@"Q$" AND ENTER; THENENTER CRYPTOGRAM)
130 PRINT:PRINT"IF, FOR EXAMPLE, YOU SEE THE 1- LETTER WORD "Q$Q"Q$" AND THINK IT MAYBE THE WORD "Q$"A"Q$", TYPE "Q$"A"Q$" AND THEN "Q$"Q"Q$"
140 PRINT:PRINT"AN "Q$"A"Q$" WILL APPEAR OVER EVERY "Q$"Q"Q$" IN THE CRYPTOGRAM
150 PRINT@480,"PRESS ANY KEY TO CONTINUE...";
160 IFINKEY$=""THEN160
170 CLS:PRINT"IF YOU DECIDE THAT "Q$"Q"Q$" IS REALLY"Q$"I"Q$", TYPE "Q$"I"Q$" AND THEN "Q$"Q"Q$". AN "Q$"I"Q$" WILL REPLACE EACH "Q$"A"Q$" OVER THE "Q$"Q"Q$"S. (TO ERASE THE "Q$"I"Q$"S, HIT THE SPACEBAR AND TYPE "Q$"Q"Q$")
180 PRINT:PRINT"IF YOU FIND A MISTYPED LETTER IN THE CRYPTOGRAM, YOU CAN TYPE "Q$"&"Q$" AND GET INSTRUCTIONS ON HOW TO CORRECT IT
190 PRINT@480,"PRESS ANY KEY TO CONTINUE...";
200 IFINKEY$=""THEN200
210 CLS:PRINT"IF YOUR SOLUTION ISN'T WORKING OUT, TYPE "Q$"^"Q$" AND IT WILL VANISH. THE CRYPTOGRAM IS STILL THERE AND YOU CAN GET A FRESH START
220 PRINT:PRINT"IF YOU'RE REALLY STUMPED, TYPE "Q$"<"Q$". A NEW VERSION WILL REPLACE THE CRYPTOGRAM, WITH "Q$"A"Q$" AS THE MOST FREQUENT LETTER, "Q$"B"Q$" THE NEXT MOST FREQUENT, AND SO ON
230 PRINT@480,"PRESS ANY KEY TO

```


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```

CONTINUE...";
240 IFINKEY$=""THEN240
250 CLS:PRINT"SOME OF THE MOST C
OMMON LETTERS (E, T, A, O, I, N)
WILL NOW BE REPRESENTED IN THE
CRYPTOGRAM BYEARLY LETTERS SUCH
AS A, B, C, D, E, F. THIS MAKE
S IT EASIER TOSOLVE
260 PRINT:PRINT"A BLACK BOX AT L
OWER RIGHT SHOWSYOU ARE USING TH
E FREQUENCY CRYPTOGRAM. IF Y
OU TRY A SOLU- TION LETTER THAT
IS THE SAME AS THE PUZZLE LETTE
R IN THE ORIGI- NAL CRYPTOGRAM,
A WARNING CHREEPIS PLAYED
270 PRINT@480,"PRESS ANY KEY TO
CONTINUE...";
280 IFINKEY$=""THEN280
290 CLS:PRINT"TO GET BACK FROM T
HE FREQUENCY CRYPTOGRAM TO THE
ORIGINAL, TYPE"Q$">"Q$
300 PRINT:PRINT"WHEN YOU'VE SOLV
ED THE CRYPTO- GRAM (OR GIVEN U
P ON IT), TYPE "Q$"+"Q$" AND TR
Y ANOTHER--
310 PRINT:PRINT"OR TYPE "Q$"#"Q$
" TO END THE PROGRAM. (YOU CAN E
ND THE PROGRAM DURING OR BETWEEN
CRYPTOGRAMS)

```

```

320 PRINT@480,"PRESS ANY KEY TO
CONTINUE...";
330 I$=INKEY$
340 IFI$=""THEN330
350 IFI$="#"THENCLS:END
360 CLS:PRINT" & CORRECT MISTY
PED LETTER":PRINT:PRINT" ^ ERA
SE SOLUTION":PRINT:PRINT" < GE
T FREQUENCY CRYPTOGRAM;":PRINT"
> GET BACK THE ORIGINAL":PRINT
:PRINT" + START ANOTHER CRYPTO
GRAM;":PRINT" # END THE PROGRA
M
370 PRINT@480,"PRESS ANY KEY TO
RETURN";
380 I$=INKEY$
390 IFI$=""THEN380
400 IFI$="#"THENCLS:END
410 CLS:GOTO80
500 IFC$="@ THENNJ=1:CLS:GOTO80
510 IFNJ=1THEN700
520 FORV=0TO7
530 IFLEN(C$)<32*V+33THEN700
540 IFMID$(C$,32*V+32,1)=" "ORMI
D$(C$,32*V+33,1)=" "THEN610
550 IFMID$(C$,32*V+32,1)="-"ANDA
SC(MID$(C$,32*V+33,1))>64ANDASC(
MID$(C$,32*V+33,1))<91THEN610
560 FORH=31TO2STEP-1

```

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```

570 IFMID$(C$,32*V+H,1)<>" "ANDM
ID$(C$,32*V+H,1)<>"- "THEN600
580 IFLEN(C$)+32-H>255THEN700
590 C$=LEFT$(C$,32*V+H)+STRING$(
32-H,32)+RIGHT$(C$,LEN(C$)-32*V-
H):GOTO610
600 NEXTH
610 NEXTV
700 CLS:IF158<LEN(C$)THENSQ=1
710 FORL=1TOLEN(C$)
720 PRINT@L+63-32*SQ+(64-32*SQ)*
INT((L-1)/32),MID$(C$,L,1);
730 IFASC(MID$(C$,L,1))<>32AND(A
SC(MID$(C$,L,1))<65ORASC(MID$(C$
,L,1))>90)THENPRINT@L+31-32*SQ+(
64-32*SQ)*INT((L-1)/32),MID$(C$,
L,1);
740 NEXT
750 IFHH$<>" "THENHI$=HH$:HH$="":
GOTO1000
760 HI$=INKEY$:IFHI$=" "THEN760
1000 IFHI$<>"&"THEN2000
1010 IFLEN(C$)<225THEN1060
1020 ER$="":FORZ=1495TO1502:ER$=
ER$+CHR$(PEEK(Z)):NEXT
1030 PRINT@471,"too long";:FORZ=
1TO3000:NEXT
1040 FORZ=1TO8:POKEZ+1494,ASC(MI
D$(ER$,Z,1)):NEXT

```

```

1050 GOTO760
1060 IFF=1THENPRINT@466,"press
> first";:FORZ=1TO3000:NEXT:PRIN
T@466,STRING$(12,32);:POKE1502,1
41:GOTO760
1100 PRINT@480,"LINE NO. OF CRYP
TO. (1-7)?";
1110 I$=INKEY$
1120 IFI$=" "THEN1110
1130 IFASC(I$)<49ORASC(I$)>55ORL
EN(C$)<32*VAL(I$)-31THENPRINT@50
7,"REDO";:FORZ=1TO1500:NEXT:PRIN
T@507," " "":GOTO1110
1140 PRINT@507,I$;
1150 LI=32*VAL(I$)*(3-SQ)-32
1160 ER$="":FORZ=LI+992TOLI+1023
:ER$=ER$+CHR$(PEEK(Z)):NEXT
1170 FORZ=LI TOLI+31
1180 IFPEEK(Z+1024)=96THENPOKEZ+
992,38:GOTO1200
1190 NEXT
1200 FORZZ=1TO50:NEXT
1210 PRINT@480,STRING$(28,32);
1220 FORZZ=1TO50:NEXT
1300 PRINT@480,"WHICH LETTER (A-
Z)?";
1310 I$=INKEY$
1320 IFI$=" "THEN1310
1330 IFASC(I$)<65ORASC(I$)>90THE
NPRINT@500,"REDO";:FORZZ=1TO1500
:NEXT:PRINT@500," " "":GOTO1310
1340 POKE992+Z,96
1350 PRINT@500,I$;
1360 CN=0
1370 FORZ=LI TOLI+31
1380 IFPEEK(1024+Z)=ASC(I$)THENP
OKE992+Z,38:CN=CN+1
1390 NEXT
1400 IFCN=0THENPRINT@500," " "":FO
RZ=1TO1000:NEXT:PRINT@500,"REDO"
";:FORZ=1TO1500:NEXT:PRINT@500,"
" "":GOTO1310
1410 FORZZ=1TO50:NEXT
1420 PRINT@480,STRING$(21,32);
1430 FORZZ=1TO50:NEXT
1500 PRINT@480,"OCCURRENCE ON LI
NE (1-9)?";
1510 J$=INKEY$
1520 IFJ$=" "THEN1510
1530 IFASC(J$)<49ORASC(J$)>57ORV
AL(J$)>CN THENPRINT@506,"REDO";:
FORZ=1TO1500:NEXT:PRINT@506,"
" "":GOTO1510
1540 PRINT@506,J$;
1550 OC=0
1560 FORZ=LI TOLI+31
1570 IFPEEK(1024+Z)=ASC(I$)THENO
C=OC+1ELSE1590
1580 IFOC<>VAL(J$)THENPOKE992+Z,
96ELSEPS=Z

```

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16KEXT Cassette \$19.95


```

1590 NEXT
1600 FORZZ=1T050:NEXT
1610 PRINT@480,STRING$(27,32);
1620 FORZZ=1T050:NEXT
1700 PRINT@480,"REPLACEMENT (A-Z
)?";
1710 I$=INKEY$
1720 IFI$=""THEN1710
1730 IFASC(I$)<65ORASC(I$)>90THE
NPRINT@499,"REDO";:FORZ=1T01500:
NEXT:PRINT@499," ";:GOTO1710
1740 PRINT@499,I$;
1750 POKE1024+PS,ASC(I$)
1760 FORZ=1T032:POKEZ+LI+991,ASC
(MID$(ER$,Z,1)):NEXT:POKE992+PS,
96
1770 L=PS-63+32*SQ-(INT(PS/32)-2
+SQ)*(64-32*SQ)/(3-SQ)
1780 MID$(C$,L,1)=I$
1790 IFLEN(F$)=0THEN1820
1800 FORZ=1T026:IFRIGHT$(FR$(Z),
1)=I$THENMID$(F$,L,1)=CHR$(Z+64)
:GOTO1820
1810 NEXT
1820 FORZ=1T050:NEXT:PRINT@480,S
TRING$(20,32);:FORZ=1T050:NEXT:P
RINT@480,"GO AHEAD";:FORZ=1T0100
0:NEXT:PRINT@480,STRING$(8,32);
1830 GOTO760
2000 IFHI$<>"^"THEN3000
2010 S1=31-32*SQ:S2=33+S1
2020 FORL=1TOLEN(C$)
2030 AS=ASC(MID$(C$,L,1))
2040 IFAS<65THEN2070
2050 IFAS>90THEN2070
2060 PRINT@L+S1+S2*INT((L-1)/32)
," ";
2070 NEXT:GOTO760
3000 IFHI$<>"<"THEN3500
3010 IFFF=1THEN760
3020 FF=1
3030 IFF$<>" "THEN3300
3040 PMODE2:PCLS:SCREEN1,1:POKE6
5497,0:FORZ=1T026:FR(Z)=0:NEXT
3050 FORL=1TOLEN(C$)
3060 AS=ASC(MID$(C$,L,1))
3070 IFAS>64ANDAS<91THENFR(AS-64
)=FR(AS-64)+1
3080 NEXT
3090 FORZ=1T026:FR$(Z)=STR$(FR(Z
))+CHR$(Z+64):NEXT
3100 QB=1
3110 QB=2*QB:IFQB<=26THEN3110
3120 QB=INT(QB/2):IFQB=0THEN3170
3130 FORZ=1T026-QB:QC=Z
3140 QD=QC+QB:IFVAL(FR$(QC))>VA
L(FR$(QD))THEN3160
3150 QE$=FR$(QC):FR$(QC)=FR$(QD)
:FR$(QD)=QE$:QC=QC-QB:IFQC>0THEN
3140

```

```

3160 NEXT:GOTO3120
3170 F$=STRING$(LEN(C$),32)
3180 FORL=1TOLEN(C$)
3190 IFASC(MID$(C$,L,1))<65ORASC
(MID$(C$,L,1))>90THENMID$(F$,L,1
)=MID$(C$,L,1)
3200 NEXT
3210 FORZ=1T026
3220 NT$=RIGHT$(FR$(Z),1)
3230 NP=1
3240 NF=INSTR(NP,C$,NT$)
3250 IFNF=0THEN3290
3260 MID$(F$,NF,1)=CHR$(Z+64)
3270 NP=NF+1
3280 IFNP<=LEN(C$)THEN3240
3290 NEXT:POKE65496,0
3300 FORL=1TOLEN(C$)
3310 PRINT@L+63-32*SQ+(64-32*SQ)
*INT((L-1)/32),MID$(F$,L,1);
3320 NEXT
3330 POKE1502,141
3340 GOTO760
3500 IFHI$<>">"THEN4000
3510 FF=0
3520 FORL=1TOLEN(C$)
3530 PRINT@L+63-32*SQ+(64-32*SQ)
*INT((L-1)/32),MID$(C$,L,1);
3540 NEXT
3550 POKE1502,143
3560 GOTO760
4000 IFHI$<>"+"THEN4500
4010 HI$="":F$="":FF=0:SQ=0:NJ=0
:CLS:GOTO80
4500 IFHI$="# "THENCLS:PRINT"THE
PROGRAM HAS ENDED, BUT THE VARI
ABLES ARE STILL IN MEMORY. IF Y
OU WANT TO GET THE CRYPTO-GRAM
BACK, TYPE "Q$GOTO700"Q$" AND
ENTER":PRINT:END
5000 LO$=INKEY$:IFLO$=""ORLO$=""
THEN5000
5010 PO=1
5020 IFFF=0THENIN=INSTR(PO,C$,LO
$):GOTO5040
5030 IN=INSTR(PO,F$,LO$)
5040 IFIN=0THEN5090
5050 PRINT@IN+31-32*SQ+(64-32*SQ)
*INT((IN-1)/32),HI$;
5060 PO=IN+1
5070 IFHH$=""THENHH$=INKEY$
5080 IFPO<=LEN(C$)THEN5020
5090 IFFF=0THEN750
5100 IFASC(LO$)<65ORASC(LO$)>90T
HEN750
5110 IFRIGHT$(FR$(ASC(LO$)-64),1
)=HI$THENPLAY"L25505V31CGDAEBF#C
#A-E-B-FCGDA
5120 GOTO750
5130 PCLEAR2:GOTO700

```



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Want A Workhorse Editor? Here's *Mr. Ed!*

By Hubert E. Samm, Jr.

How often have you ever been in the middle of keying in a program, and needed to do a *GOSUB*, or a *GOTO*, only you weren't certain what line number it was you needed to go to? Have you ever wished you could do a search and find a string in your program? Instead you print it out, and laboriously scan each line looking for the all-illusive string. ●ops! Typed another word wrong. No worry—that is, if you are using '*MR. ED.*'

What is '*MR. ED.*' you ask? Read on.

For my living (besides programming on my CoCo, and reading *the Rainbow*) I program on the large IBM computers. In doing this, I use the editors that have been written for the larger computers and, in the back of my mind, keep thinking how nice one of these editors would be on my CoCo.

After three months of programming with the built-in editor of the CoCo, one evening I decided to write my own. ●originally I designed *MR. ED* for my assembly language programs, but now have become so attached to it that I use it for all my programs.

MR. ED is an editor for an ASCII file. It operates on the principles of a full screen editor with many features of the editors found on large scale computers. Some of these are:

- Being able to browse through a program.
- Replacing one string for another.
- Locating a string in a program.
- Paging through a program.
- Getting multiple files, and creating one file with them.
- Replacing one line for another.
- Copying one line multiple times.
- Moving a line from one section to another.

The program is written in BASIC, and keeps the program you are working on in an array. An array was a must since speed would be important. I had a disk version, but abandoned it due to slow response time. There is also another unique feature of this program in the design of the arrays. It uses forward and backward links, or pointers. This was absolutely necessary. A sequential search through an array would have been just about as bad as my earlier disk version.

The links work in this manner. The program is loaded into the array, and the last entry is noted. Any new lines are added here. Forward and backward links are changed to point to the new lines, and backward links of the new lines, pointing back into the array. (See figure 1 for examples.)

Figure 1.

The following shows how a program would look in the arrays.

Entry	Text of Line	Forward	Backward
00	line number 1	01	00
01	line number 2	02	00
02	line number 3	03	01
03	line number 4	04	02
04	last line of program	00	03

When reading this program, entry 00 is always the starting point of a program. From there, the forward link points to the next line of the program. In the example below, a line was added after entry 01.

Entry	Text of line	Forward	Backward
00	line number 1	01	01
01	line number 2	05	00
02	line number 3	03	05
03	line number 4	04	02
04	last line of program	00	03
05	inserted line	02	01

Note how the forward and backward links operate. It is due to this that the great speed and dynamic insertions are done in *MR. ED*.

The backward link is used in browsing backwards in a program. The forward link, in addition to keeping lines in sequence, is used in forward browsing operations.

The program you are editing will start at the beginning, and display the first 10 lines. You can then issue any of the commands, and you're on your way to adding lines, replacing lines, etc. . . .

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The screen has the following format:

- Line 1 — is always the CURRENT LINE. Any of the commands always use this as the reference point.
- Lines 2-12 — are the next lines of the program. The maximum characters for a line is limited to the 256 established by the CoCo; however, *MR. ED* will display only the first 64 characters of each line. (I find 64 characters more than adequate for all programming.)
- Line 13 — is a separator line. The work 'TXT' appears at the end of this line. This is a prompt for you to enter your text line. In some cases, the text line is used in conjunction with a command. (We'll discuss this later on.)
- Lines 14-15 — is the text line. Program statements as well as some commands are typed here.

NOTE: once a text or command has been placed in the text line, the *ENTER* key must be hit. Once the *ENTER* key has been hit, the last four positions of the text line (line \$ 15) will be overwritten with the prompt 'CMND.' Do not worry if this overwrites part of your text line, it has not been destroyed.

- Line 16 — is the command line. The single character command will display here. The current entry number and total number of statements appear here also.

The following rules must be observed with *MR. Ed*.

- 01) Program line 1 must be reserved for the program name. It will be set up for you with the 'N' function of *MR. ED*.

The format of this line is ** in columns 1 and 2, followed by a space, followed by an apostrophy, and then an eight (or less) character program name.

ie. . .
** 'PAYROLLI
** 'GAME10

Since *MR. ED* was originally set up for assembly language programs, this format is treated as a comment, and ignored. This is not true with BASIC programs. To do BASIC programs, use the 'N' function, and then use the 'C' function to change the ** to 00. This way BASIC will treat the statement as a REMark.

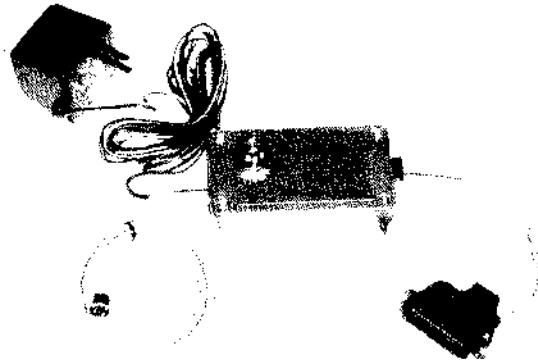
- 02) Many of the commands do not require text. The first mode of *MR. ED* is text mode. If the command requires no text, simply hit enter, thus causing *MR. ED* to enter in command mode.
- 03) Although lines may be longer than 64 characters, *MR. ED* will only display the first 64 characters. A good practice is to only use 64 character lines.
- 04) The /* you see as the last line of your program must never be removed. It is never written to your disk file; it is used for an internal end of file. (This should look familiar to all you IBMers out there.)

The following briefly explains the lines of the program:

LINE \$	DESCRIPTION
30	sets up string of dark boxes for screen format.
40	arrays used for the program, forward link, and backward link.
50-215	main program root. Decides which command was

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selected, and performs the proper subroutine to execute the command.

220-end subroutines to execute the commands

230-360 format screen, get text, get command

370-400 name set up

410-440 insert text

450-460 position to top of program

470-530 write program to disk

540-610 read program from disk, set it up for editing

620-630 delete the current line

640-640 replace current line with text line

650-710 locate string in text line

720-770 page forward one page (9 lines)

780-860 get another file, and insert it after the current line

870-1039 search current line for string number one, and change that string to string two

1040-1130 screen refresher

1140-1150 browse backward one line

1160-1190 print starting at current line to end of file, or 'S' key is hit

1200-1200 copy a line for later use

1300-1300 insert a copied line after current line

COMMAND HOW TO USE IT

N Key in name of program you wish to create. (up to 8 characters)

NAME Hit *ENTER*

Key 'N'

You should now see your program name at the top of the screen, followed by a '/' on line 2.

I Type in the line you wish to be inserted.

INSERT Hit *ENTER*

Key 'I' or hit *ENTER*

The text line will insert after the current line (first line of screen) and become the current line.

T Hit *ENTER*

TOP Key 'T'

The start of the program now becomes the current line.

D Hit *ENTER*

DOWN ONE LINE Key 'D'

The next line after the current line becomes current line (forward browse)

F Hit *ENTER*

FILE PROGRAM Key 'F'

The program will be written to disk. Its name will be the name in the name line, the extension will be TXT.

E Key in name of program for file you wish to edit.

EDIT PROGRAM Hit *ENTER*

Key 'E'

The program will be read in from disk. The display will start at beginning of the program.

D Hit *ENTER*

DELETE A LINE Key 'X'

The current line will be deleted.

R Key in replacement line.

REPLACE LINE Hit *ENTER*

Key 'R'

The current line will be replaced with the new line of text.

L Key in string you wish to locate.

LOCATE STRING Hit *ENTER*

Key 'L'

The search will start with the current line. If the string is not found, the current line will be reset to the start of the program. If the string is found, then the line in which it is found will become the current line.

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P Hit *ENTER*

PAGE FORWARD Key 'P'
The next nine lines are skipped, and the 10th line becomes the current line.

Q Hit *ENTER*

QUIT Key 'Q'
Causes the program to end "quit."
NOTE: the file is not saved, changes will not be reflected.

G Type in name of file you wish to get.

GET FILE Hit *ENTER*
Key 'G'
The file is ready, and inserted following the current line.

C Type in string one, string two. Separate string one and string two by a slash.

CHANGE STRING Hit *ENTER*
Key 'C'
The current line will be scanned for string one. If it is found, it will be replaced by string two. If it is not found, no action will occur.

U Hit *ENTER*

UP A LINE Key 'U'
The previous line will become the current line (backward browse).

2 Hit *ENTER*

PRINT Key '2'
Printing of the program will start at the current line. It will continue till end of file, or the 'S' (stop) key is held down.

K Hit *ENTER*

COPY (KOPY) Key 'K'
The current line is copied to a hold area.

UP ARROW Hit *ENTER*

COPY PART 2 Key 'up arrow'
The line that was copied will be inserted after the current line.

M Hit *ENTER*

MOVE Key 'M'
The current line will be copied to a hold area, and then deleted.

UP ARROW Hit *ENTER*

MOVE PART 2 Key 'up arrow'
The moved line currently in the hold area will be inserted after the current line.

MR. ED is set up for a 500 statement program. This is not a hard rule; to allow editing of a larger program, change the *DIMS* to a larger number. The default extension name is *TXT*. If you wish to use some other name, change the disk open and close statements.

I hope you find *MR. ED* as useful as I do.

One other note.

Any BASIC program may be saved as an ASCII file by specifying 'A' on the save command.

SAVE "NAME/TXT",A

If this type of file is edited with *MR. ED*, you will see that line 1 is blank. No worry, replace it with a name line.

Remember the format:

00 'program name

```
380.... 02B4
770.... 0592
END... 088D
```

The listing:

```
10 'MRED
20 PCLEAR1: CLEAR17000:CLS
30 U#=STRING*(127,120)
40 DIM TX*(500), T(500), BL(500)
50 GOSUB 230
60 GOSUB 250
70 IFC#="N"GOSUB370
80 IFC#="I"GOSUB410
90 IFC#="T"GOSUB450
```

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```

100 IFC$="D"GOSUB460
110 IFC$="F"GOSUB470
120 IFC$="E"GOSUB540
130 IFC$="X"GOSUB620
140 IFC$="R"GOSUB640
150 IFC$="L"GOSUB650
160 IFC$="P"GOSUB720
170 IFC$="Q"THENEND
180 IFC$="G"GOSUB780
190 IFC$="C"GOSUB870
200 IFC$="U"GOSUB1140
210 IFC$="2"GOSUB1160
211 IFC$="K"GOSUB1200
212 IFC$="^"GOSUB1300
215 IFC$="M"THENK$=TX$(CL):GOSUB
620
220 GOSUB1040:GOTO60
230 PRINT@384,U$;
240 POKE &H5FF,126:RETURN
250 POKE &H5FF,126
260 PRINT@384,U$;
270 PRINT@490,NL;
280 PRINT@500,CL;
290 PRINT@413,"TXT";
300 LINEINPUTX$
310 LX$=TX$
320 PRINT@476,"CMND";
330 C$=INKEY$:IFC$=""GOTO330
340 C=ASC(C$)

```

```

350 IFC=&H0D THENC$="I"
360 PRINT@480,C$;:RETURN
370 TX$(0)="**"+X$
380 T(0)=1:BL(0)=0
390 TX$(1)="/*":T(1)=0:BL(1)=0
400 NL=2:CL=0:RETURN
410 OL=CL:SL=T(CL):T(CL)=NL
420 TX$(NL)=X$:T(NL)=SL:CL=NL
430 BL(CL)=OL:BL(T(CL))=CL
440 NL=NL+1:RETURN
450 CL=0:RETURN
460 Y=T(CL):CL=Y:RETURN
470 VERIFY ON
480 N$=MID$(TX$(0),5,8)
490 OPEN "O",#1,N$+"/TXT":Y=0
500 IF TX$(Y)="/*"GOTO530
510 PRINT#1,TX$(Y):Z=T(Y):Y=Z
520 GOTO500
530 CLOSE:VERIFY OFF:END
540 OPEN"I",#1,X$+"/TXT":Y=0
550 LL=-1
560 IFEOF(1)=-1GOTO600
570 LINEINPUT#1,TX$(Y)
580 BL(Y)=LL:LL=LL+1
590 T(Y)=Y+1:Y=Y+1:GOTO560
600 TX$(Y)="/*":T(Y)=0:CL=0
610 NL=Y+1:CLOSE:BL(0)=0:RETURN
620 CF=T(CL):CB=BL(CL):CL=CF
630 T(CB)=CF:BL(CF)=CB:RETURN

```

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```

640 TX$(CL)=X$:RETURN
650 Y=T(CL)
660 F=INSTR(TX$(Y),X$)
670 IF F>0 GOTO 710
680 Z=T(Y):Y=Z
690 IF Y=0 THEN CL=0:RETURN
700 GOTO 660
710 CL=Y:RETURN
720 Y=CL
730 FOR W=1 TO 9
740 Z=T(Y):Y=Z
750 IF Y=0 THEN CL=0:RETURN
760 NEXT W
770 CL=Y:RETURN
780 OPEN "I",#1,X$+"/TXT"
790 IF EOF(1)=-1GOTO860
800 LINEINPUT#1,X$
810 OL=CL:SL=T(CL):T(CL)=NL
820 TX$(NL)=X$:T(NL)=SL:CL=NL
830 BL(CL)=OL:BL(T(CL))=CL
840 NL=NL+1
850 GOTO 790
860 CLOSE:RETURN
870 A=0:B=0:C=0:T$="":CH$=""
880 FOR X=1 TO 24
890 H$=MID$(X$,X,1)
900 IF H$="/"GOTO930
910 T$=T$+H$:B=B+1
920 NEXT X
930 FOR Y=X+1 TO 32
940 H$=MID$(X$,Y,1)
950 IFH$="/"GOTO 980
960 CH$=CH$+H$
970 NEXTY
980 F=INSTR(TX$(CL),T$)
990 IFF=0THENRETURN
1000 A=F-1:C=LEN(TX$(CL))-A-B
1010 A$=MID$(TX$(CL),1,A)
1020 C$=MID$(TX$(CL),A+B+1,C)
1030 TX$(CL)=A$+CH$+C$:RETURN
1040 CLS:Y=CL
1050 FOR X=0 TO 10
1060 IFLEN(TX$(Y))<33GOTO1090
1070 PRINT@(X*32),TX$(Y):X=X+1
1080 GOTO1100
1090 PRINT@(X*32),TX$(Y)
1100 Z=T(Y):Y=Z
1110 IF Y=0THENRETURN
1120 NEXTX
1130 RETURN
1140 Z=BL(CL):CL=Z
1150 RETURN
1160 Y=CL
1170 IFT(Y)=0THENRETURN
1180 IFINKEY$="S"THENRETURN
1190 PRINT#-2,TX$(Y):Z=T(Y):Y=Z:
GOTO1170
1200 K$=TX$(CL):RETURN
1300 X$=K$:GOTO410

```

RECEIVED & CERTIFIED

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

This month the *Seal of Certification* has been issued to:

Stagecoach, a game played with 16K ECB. Objective: you are responsible for the safe journey of the judge's daughter, Annabelle, while you try to carry gold across the desert in a stagecoach. The James Gang and Indians are in hot pursuit. Available from Petrocci Freelance Associates, 651 N. Houghton Road, Tucson, AZ 85710, \$19.95.

Weather Watch, a series of three programs which will provide you with National Weather Service approved statistics in a monthly report format. Also, retrieves a single day from data-file for review. 16K, \$24.95. **Forecaster & Weather Watch**, used to forecast general weather conditions with 80 percent accuracy. Includes the above Weather Watch program, all on one disk. 32K E disk, \$49.95. Available from Petrocci Freelance Associates, 651 N. Houghton Road, Tucson, AZ 85710.

Color DFT (Direct File Transfer), a utility program that allows two TRS-80s equipped with a modem and the DFT package to transmit any file from one to the other over telephone lines and the file may be transmitted without any conversation. Available from Computer Shack, 1691 Eason, Pontiac, MI 48054, tape \$24.95, disk \$29.95.

The Color Picture Plotter (CPP), a program that produces color pictures on the CGP-115 plotter. 16K ECB required. Available from Ultralight Industries, 1144 Kingston Lane, Ventura, CA 93001, \$14.95.

Graphics Program Generator I, a graphics editor and program generator using 16K or 32K ECB. Using GPG-1 you can build a complex picture on the PMODE 3 screen in either of four color sets and then it will write a graphics program to tape to reproduce your picture exactly. \$11.95. **Graphics Program Generator II**, has all the features of the above GPG-1, plus characters with a self-loading language module. \$16.95. Available from CoCo Data Enterprises, 1215 Emerald Drive, Orlando, FL 32808.

Soooper Pac, a pac-maze style game requiring 16K non-extended. Includes 3 mazes, 30 skill levels, 6 programmable speeds, 3 background colors, and 17 bonus point objects. Choose between joystick or keyboard action. Available from Bear Bones Software, Inc. G-3117 Corunna Road, Suite 108, Flint, MI 48504, \$21.95.

Intergalactic Force (ROM Pack), a space bat-

tle game requiring 16K ECB. Objective: you are piloting an X-wing fighter and must penetrate the defenses of the Death-Star and fend off the attacks of imperial fighters that have been dispatched to destroy you. When you approach the shaft opening, you must attempt to fire a bomb into the shaft. Available from Anteco Software, P.O. Box 14728, Fort Worth, TX 76117, \$24.95.

Add-A-Voice, a machine language utility program which allows the user to add voice output to any BASIC program for the TRS-80 with 16K (non-extended). Available from H.I.B., 3505 Hutch Place, Chevy Chase, MD 20815, \$14.95.

Kwikgraf, a bargraph drawing program for ECB used in conjunction with EPSON MX-80 printer. Available from West Bay Company, Route 1, Box 159-B1, White Stone, VA 22578, \$12.50.

Robottack, a 16K game with colorful high resolutions graphics for 1 or 2 players. Objective: you are the super human who must fight off attacking robots and save the remaining humans from destruction. Available from Intracolor Communications, P.O. Box 1035, East Lansing, MI 48823, \$24.95.

Canyon Climber, a game of skill and reflex for 16K or more memory. Objective: gather as many points as possible while avoiding mountain goats, arrow-shooting Indians, and rock-dropping eagles to reach your goal—the rim of the canyon. Available from Radio Shack Stores, Cat. No. 26-3089, \$34.95.

Graphic Screen Print Program, a utility screen print program for the Star Micronics Gemini 10/15 printers. This tape has the 1.0 version on one side and the 1.1 version on the other. Available from Custom Software Engineering, Inc., 807 Minuteman Causeway, Cocoa Beach, FL 32931, \$9.95.

Mathwar, an education program that provides an entertaining way for a child to practice beginning math: adding and subtracting. Available from Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110, \$11.95.

TRS-80 Extended Color BASIC, a (8½" x 11", 170-page, soft-cover) textbook for learning to program BASIC using the TRS-80. Suitable for high school, junior college, and university levels, or can be used for self study. A Spectrum book, written by Richard

Haskell. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632, \$12.95. Also available in cloth—\$19.95.

Datamail, a cassette-based mailing list program for home or business use. 32K holds approximately 300 files. Available from Dataman, Box 431, Station B, Hamilton, Ontario, Canada, L8L 7W2, 16K, \$14.95.

First Sampler, a tape with six programs, including a mental math skill game, a word game, a computer convoy game, a computer memory game, an arcade-type game, and a haunted house adventure game. Also available from Dataman. 16K, \$9.95

Yaazee, a 16K dice game for two players. Objective: player pushes firebutton and tries to get the best poker hand using five dice. Available from Tom Mix Software, 3424 College, N.E., Grand Rapids, MI 49505, \$19.95.

The Frog, an arcade-type 32K game. Objective: you are a frog trying to get safely across a busy road while dodging traffic and jumping on the backs of turtles, alligators, and logs to cross a river. Also available from Tom Mix Software. \$27.95 tape, \$30.95 disk.

Trapfall, an arcade-type 16K game. Objective: fight your way through the jungle collecting treasures as you jump the pits and swing across the alligators. But be cautious of the creature hidden in the basement. Also available from Tom Mix Software. \$27.95 tape, \$30.95 disk.

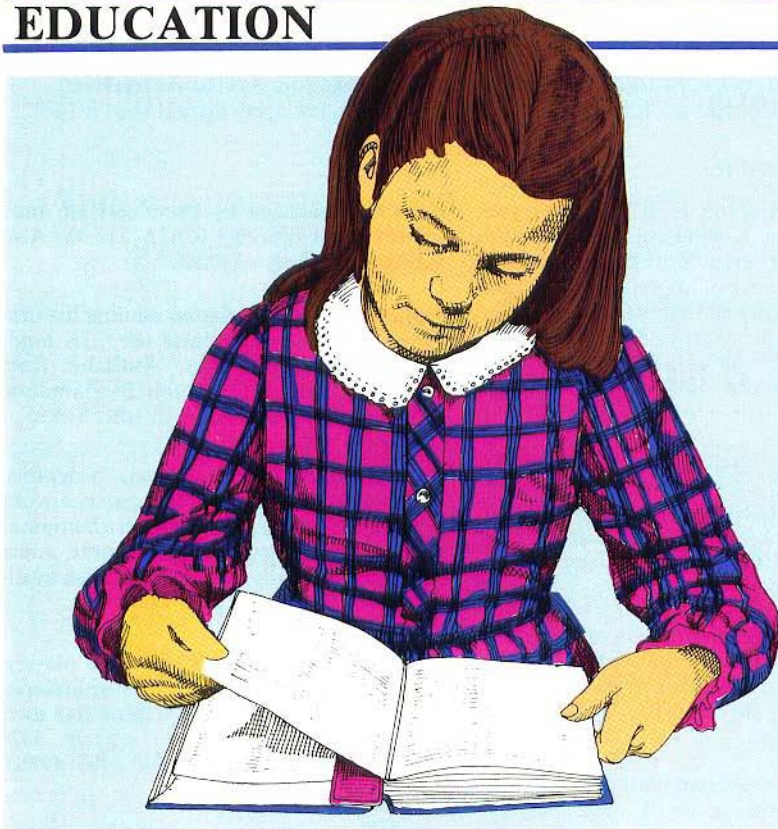
Space Shuttle, a game requiring 32K. Objective: learn to fly the space shuttle from launch to landing. Also available from Tom Mix Software. \$28.95 tape only.

MSI Data Base, a program used for maintaining a customer list or any list of names and addresses that you may wish to create with full edit and update functions. Available from Delker Electronics, Radio Shack Dealer #D223, P.O. Box 897, Smyrna, TN 37167, disk \$39.95.

Upload, a program that provides the computer with the capability of transferring programs to another computer in either BASIC or machine language. Available from ML-US'R Software, 115 Rising Sun, Fort Mitchell, KY 41017, \$16.95.

The *Seal of Certification* program is open to all manufacturers of products for the TRS-80 Color Computer, the TDP-100, or the Dragon-32, regardless of whether they advertise in *the Rainbow*. By awarding a *Seal*, the magazine certifies the program *does exist*, 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.

—Jutta Kapfhammer



Estimate Reading Difficulty Sentence- By-Sentence

By J. C. Kretschmer, Ph.D.

Interested in the reading level of the books you are considering purchasing for your children—or those that are being used by your local schools? Perhaps you are planning to write a children's book. Will the finished product be “over their heads” in terms of vocabulary and sentence length? Now your CoCo can give you this information in a way that no other readability program can, thanks to a new readability estimation procedure from Sweden that has been modified for use with English texts (see J. Anderson's article in the March 1983 *Journal of Reading*).

Simply called *Rix* (a modification of “*Lis*,” which is a shortened version of *Labarhet.sindex*, the original Swedish formula), this new procedure differs from other short readability methods in that it can provide a readability estimate with as little as one sentence of text as a sample. Of course, it is far more accurate if a sizable number (30 or so) sentences are analyzed, preferably equal proportions from the beginning, middle and end of a book or article.

There are several readability programs for microcomputers, but they all share a common limitation: you have to enter about 30 sentences or more of text, then wait for the computer to calculate the readability and display it. *RIXRATE* will monitor the readability of the text as you enter it, on a sentence-by-sentence basis. This BASIC program features a “status window” similar to the status lines of word processing programs that continually updates the readability estimate. *RIXRATE*'s status window displays the text title (a one-word descriptor input by the user), the total number of words, number of sentences, number of long words (7+ letters), average sentence length and, finally, the estimated reading grade level of the text being entered. All

this information is updated as soon as the user signals the end of each sentence by pressing *ENTER*.

For writers of children's books and educational materials, *RIXRATE* can provide a check on whether or not their writing is unconsciously beginning to “drift upward” out of range of the intended readership. Teachers who produce very clearly-written assignment sheets sometimes inadvertently introduce them with directions that would make an IRS-form writer proud. Keying such text into this program might spare their students from “Directions Shock.”

Those people who write the “simple” directions for assembling children's new Christmas toys might also do well to run them through *RIXRATE*.

The program listing includes complete directions that make the program user-friendly. About half of the listing (lines 290-690) consist of instructions, and these should be read carefully when the program is run. You can type in the text normally, thanks to the *INKEY\$* loop that is the heart of the program (lines 700-800), but you must omit all punctuation except apostrophes (for contractions) and hyphens (for hyphenated words). Be especially careful to remember to hit the space bar before pressing *ENTER* at the end of each sentence. (If you don't, the last word will not be registered. An occasional slip won't affect the readability to any significant extent, but consistently doing this will result in loss of accuracy.)

Pressing *ENTER-CHR\$(13)*—clears the screen and updates the readability statistics through two subroutines (see line 770). *GOSUB 1000* computes the *Rix* score ($Rix = \text{number of long words} / \text{number of sentences}$) and converts it to a grade level. Grade level scores beyond grade 12 are reported as “college” (see lines 2020 and 3030). *GOSUB 3000* clears the screen and prints the status window with updated readability figures. For very long sentences (William Falkner's *The Bear* has sentences of several hundred

(Dr. Kretschmer is with the Department of Teacher Education, School of Education and Applied Professions, Miami University, Oxford, Ohio.)

words) line 790 provides a mechanism that clears the screen but does not change the readability stats if the input overflows the bottom of the screen. The counter (r) is set in line 740. You can correct spelling mistakes by backspacing and not inflate the word length count because line 750 subtracts each backspace. Finally, line 780 resets the word length count (l) to -30 after determining whether a word has seven letters. This prevents additional letters from being counted as long words. To fool the system, a word would have to be 36 letters long! (Since "paradichlorobenzene" has only 19 letters, I'm assuming this will take care of any jawbreakers you choose to enter.)

The program does not require Extended Color BASIC. *RIXRATE* has no formal ending command, so simply press *BREAK* when you've had enough.

Now—is *Lady Chatterly's Lover* really difficult enough to be safely indecipherable to your 10-year-old?

```

330.... 02F7
480....0536
620....0751
770....0965
END... 0BA9

```

The listing:

```

100 'RIXRATE READABILITY PROGRAM
110 CLS:FOR X=32 TO 63
120 PRINT@X,CHR$(143+32);:NEXT X
130 PRINT@64+11,"rixrate
140 PRINT@128+6,"A RAPID READABI
LITY
150 PRINT@160+6,"PROGRAM BASED O
N THE
160 PRINT@192+6,"RIX PROCEDURE B
Y J.
170 PRINT@224+6,"ANDERSON (JOURN
AL OF
180 PRINT@256+6,"READING, MARCH
1983)
190 PRINT@320+6,"<BASIC PROGRAM
BY>
200 PRINT@352+6,"< JOE KRETSCHME
R >
210 PRINT@384+6,"<MIAMI UNIVERSI
TY>
220 PRINT@416+6,"<OXFORD OHIO 19
83>
230 FOR X=480 TO 511:PRINT@X,CHR
$(143+32);:NEXT X
240 FOR P=1 TO 3000:NEXT P
250 CLS:PRINT@196,"DO YOU NEED I
NSTRUCTIONS?
260 PRINT@258,"(TYPE <Y> FOR YES
--<N> FOR NO)
270 R$=INKEY$:IF R$=""THEN 270
280 IF R$="N"THEN 710
290 PRINT@32,"instructions:
300 PRINT@64,"1.YOU WILL BE ASKE
D TO TYPE IN
310 PRINT@98,"A SHORT TITLE FOR
THE TEXT TO
320 PRINT@130,"BE ANALYZED BY ri

```

xrate.

```

330 PRINT@160,"2.AFTER THE TITLE
IS ENTERED, A
340 PRINT@194,"STATUS WINDOW WIL
L APPEAR AT
350 PRINT@226,"THE TOP OF THE SC
REEN. rixrate
360 PRINT@258,"MONITORS READABIL
ITY SENTENCE
370 PRINT@290,"BY SENTENCE. ALL
FIGURES WILL
380 PRINT@322,"BE AT ZERO UNTIL
A COMPLETE
390 PRINT@354,"SENTENCE IS ENTER
ED.
400 PRINT@384,"3.TYPE IN THE TEX
T, SPACING
410 PRINT@418,"AFTER EACH WORD A
S USUAL, BUT
420 PRINT@451,"<PRESS ANY KEY TO
CONTINUE>
430 R$=INKEY$:IF R$=""THEN 430
440 CLS:PRINT@66,"OMIT ALL PUNCT
UATION EXCEPT
450 PRINT@98,"APOSTROPHES AND HY
PHENS.
460 PRINT@128,"4.SIGNAL THE END
OF A SENTENCE
470 PRINT@162,"BY PRESSING <ENTE

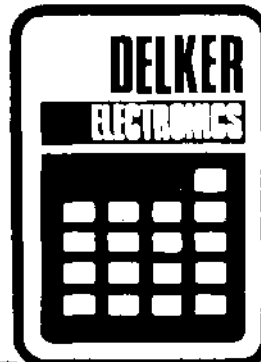
```

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615-459-2636 (Tennessee)

```

R>. BE SURE
480 PRINT@194,"TO SPACE AFTER TH
E LAST WORD.
490 PRINT@224,"5.DIALOGUE EXPRES
SIONS SUCH AS
500 PRINT@258,"<WHAT? ASKED ANN>
SHOULD BE
510 PRINT@290,"CONSIDERED ONE SE
NTENCE.
520 PRINT@320,"6.USE THE _ KEY T
O CORRECT
530 PRINT@354,"MISTAKES, BUT BE
CAREFUL TO
540 PRINT@386,"SPACE ONLY ONCE F
OR EACH WORD.
550 PRINT@419,"<PRESS ANY KEY TO
CONTINUE>
560 R$=INKEY$:IF R$=""THEN 560
570 CLS:PRINT@64,"7.BE SURE TO I
NCLUDE ENOUGH
580 PRINT@98,"SENTENCES TO CONST
ITUTE AN
590 PRINT@130,"ADEQUATE SAMPLING
OF THE TEXT.
600 PRINT@162,"TAKE BLOCKS OF SE
VERAL SENTEN-
610 PRINT@194,"TENCES FROM THE B
EGINNING,

```

```

620 PRINT@226,"MIDDLE AND END OF
THE TEXT.
630 PRINT@256,"8.FINALLY, REMEMB
ER THAT READ-
640 PRINT@290,"ABILITY ESTIMATES
ARE ONLY ONE
650 PRINT@322,"FACTOR IN DETERMI
NING THE
660 PRINT@354,"THE DIFFICULTY OF
WRITTEN
670 PRINT@386,"MATERIAL. CONTENT
AND OTHER
680 PRINT@418,"FACTORS ARE EQUAL
LY IMPORTANT.
690 PRINT@452,"<PRESS ANY KEY TO
START>
700 R$=INKEY$:IF R$=""THEN 700
710 CLS:S=0:SL=0:W=0:LW=0:R=0
720 INPUT"TEXT TITLE (9 LETTERS
OR LESS): ";T$:GOSUB 3000
730 L$=INKEY$:IF L$=""THEN 730
740 PRINTL$;:R=R+1
750 IF L$=CHR$(0)THEN L=L-1:R=R-
1:GOTO 730
760 IF L$=CHR$(32)THEN W=W+1:L=0
:GOTO 730
770 IF L$=CHR$(13)THEN S=S+1:SL=
W/S:GOSUB 1000:GOSUB 3000
780 L=L+1:IF L>6 THEN LW=LW+1:L=
-30
790 IF R>355 THEN R=0:GOSUB 3000
800 GOTO 730
1000 RX=LW/S:IF RX<.2 THEN G=1:R
ETURN
1010 IF RX<.5 THEN G=2:RETURN
1020 IF RX<.8 THEN G=3:RETURN
1030 IF RX<1.3 THEN G=4:RETURN
1040 IF RX<1.8 THEN G=5:RETURN
1050 IF RX<2.4 THEN G=6:RETURN
1060 IF RX<3.0 THEN G=7:RETURN
1070 IF RX<3.7 THEN G=8:RETURN
1080 IF RX<4.5 THEN G=9:RETURN
1090 IF RX<5.3 THEN G=10:RETURN
2000 IF RX<6.2 THEN G=11:RETURN
2010 IF RX<7.2 THEN G=12:RETURN
2020 IF RX>7.2 THEN G=13:RETURN
3000 CLS:PRINT@0,"TEXT: ";T$:PRI
NT@16,"TOTAL WDS=";W
3010 PRINT@32,"NO.SENT'S=";S:PRI
NT@48,"NO.LONG WDS=";LW
3020 PRINT@64,"AV.SEN.LNTH=";INT
(SL)
3030 IF G=13 THEN PRINT@80,"grad
e 1v:COLLEGE": GOTO 3050
3040 PRINT@80,"grade 1v:";G
3050 FOR N=96 TO 127:PRINT@N,CHR
$(140);:NEXT N
3060 RETURN

```

TRS-80 COLOR BASIC

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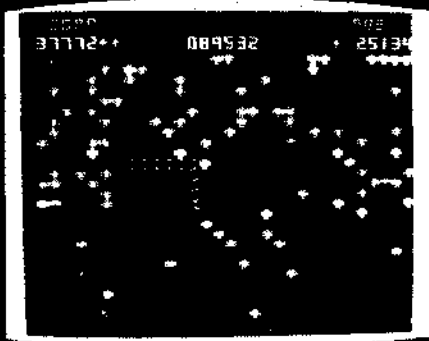
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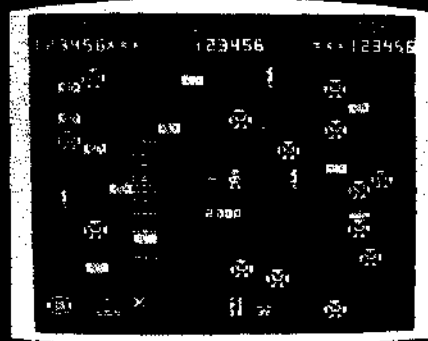


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Like Card Games?

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We've all had that feeling of having purchased something at such a low price that we almost felt like a thief, expecting at any minute to receive a phone call informing us that a mistake had been made and would we please return the merchandise or cough up the correct amount.

That's about how I felt upon receiving a copy of Radio Shack's *Card Game*, a collection of six superb games on three cassette tapes, which sells for only \$19.95. This collection of programs is enough to quench the card-playing thirst for people of all ages—with Poker, Black Jack and Solitaire for the older set, and Go Fish, Last Pirate and War for the youngsters. Included is a nicely designed and well-written 24-page instruction book that makes it easy to play them.

Another thing that should have bothered me, I guess, was that I enjoyed some of the games directed toward the children—such as Go Fish and Last Pirate—just as much as

those aimed at more mature audiences. I found them fascinating, in fact, and very challenging. Gee, you're thinking, this guy is either off his rocker or those are awfully good games. You're probably right on both counts. Trust me!

Black Jack—Everybody knows how to play this old favorite, don't they? Oh, well, just in case: up to four players may compete with the dealer in this version. The object, of course, is to beat the house in drawing cards that add up to 21. If you wind up closer to 21 than does the dealer, you win. If not, or your cards total more than 21, you lose.

Everyone receives \$500 to start the game and the minimum bet per hand is a buck. The maximum wager is \$500, even if your winnings exceed that amount. The cards are dealt after the last player's bet has been entered. The dealer's hand is at the top of the screen with one of the cards concealed. The amount of money a player has remaining is displayed at the left of his cards, along with his/her name (which blinks when a card is dealt, and the current amount bet on the hand. Winnings are one-and-a-half times the amount bet. If you want a hit, simply press the "H" key, "D" to double the bet, and "S" to stay.

If your experience is similar to mine, you'll play until every last dollar is gone. But you always get another \$500 when you start a new game.

Solo Poker—Playing one hand of poker can be a challenge, but did you every try playing 10 hands at one time? That's what is expected of you in this mind-boggler.

You have five horizontal and vertical rows, in which you try to obtain the best hands possible. Five cards have already been dealt face down in a left-to-right diagonal pattern. They will become a part of the 10 hands you build.

The deck is to the right of the playing area. When a card is to be dealt, a flashing block appears which can be moved to any position within the five rows via the cursor. Once a card is placed in a square it can't be moved again.

In order to turn one of the diagonal cards mentioned earlier, you need to have at least a pair in the same row or column. It then becomes a part of two hands—the one going up and the one going down. It is wise to turn these cards up as soon as possible.

The game is very confusing at first, as are many good computer games, but with practice, the enjoyment increases.

Go Fish—A game that my seven-year-old son, Stephen, used to play a lot with cards before we even dreamed of owning a CoCo. And there's no doubt in my mind that playing the game with CoCo is a much more enjoyable experience. Seven cards are dealt to each player—you and the computer. The computer's cards are at the top of the screen face down. Yours are at the bottom of the screen face up, but the computer doesn't know what's in your hand.

The object is to make more books than your opponent. You ask the opponent for a card that matches what you have in your hand. If you don't get the card, you are told to "Go Fish," drawing one from the deck. If you get one that matches one you already have, you get to go again.

There's really a lot of good interaction between you and the computer. And for a seven-year-old, it's quite a learning experience.

War—Half the deck is lined up on the left of the screen, the other half on the right. The object is to get all the cards away from the opponent. To win a hand, your card simply has to be higher. Doesn't require much thinking, but it's interesting to watch the rat-a-tat-tat of the cards as they fly to the winner's side.

```

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DANGER RANGER



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Your joystick controls **Danger Ranger** on his mission to make the universe safe for Mom, Brotherhood and The American Way. First, our hero finds himself in the surrealistic 'Chamber of Pasha,' which consists of five consecutive platforms. **Danger Ranger** has to blast his

way through radioactive bats and roving eyes to pick up the ten keys that may spell the difference between survival and death for the human race!

If **Danger Ranger** can muster enough skill and courage to survive those challenges, he'll enter the 'Acid Chamber.' Here, not only do demons guard the treasure boxes he wants to collect, but fatal drops of acid fall from the ceiling and rise from the floor. Not a nice way to make a living - but it makes one heck of a video game.

Danger Ranger, from **ScreenPlay**.

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Two Zaxxon Games Provide The Arcade Experience

Last Pirate—A pirate's card is substituted for a queen in this game and the object is not to be left holding that card or you'll walk the plank! Your cards are dealt face up, the computer's face down. During each turn you draw a card from the opponent's hand, until eventually all pairs have been removed. A blinking cursor moves so rapidly that it's a little tricky trying to stick the computer with the pirate, but it's fun trying.

Solitaire—Sometimes this game is called "patience" because it's very hard to win. It's even more difficult with CoCo because CoCo doesn't stand for any wishful thinking or planned coincidences. If you try to play a card in the wrong place, CoCo automatically returns it to the pile it came from.

The deck is situated in the upper left corner of the screen, above the seven rows of cards face down, except for the final card in each column. In the lower right is the "picked up" corner, where a card stays until you've figured out what to do with it.

Beforewarned: You will rarely win, and Solitaire requires a lot of time to play. But I think that the game was invented as someone's way to kill time.

All in all, *Card Games* is an impressive effort on the part of Radio Shack. And if this is any indication of how the company plans to beef up its software support for CoCo, then we all can look forward to even more delightful experiences.

(Available at Radio Shack Stores, Cat. No. 26-3320, three-tape package \$19.95)

—Charles Springer

During a recent visit to the local arcade, I noticed something very interesting. Almost all of the "in" games are currently available for our CoCo. As each new breed of games shows up in the arcades, the most popular soon becomes available to us.

The latest entries into the family of arcade games for our CoCo are two versions of the very popular *Zaxxon*. Both of them are written in machine language and require 32K. In this game, you have to try and zap the deadly *Zaxxon* robot. Before you get the chance to do this, however, you must fight your way through a space fortress and then make your way through outer space and fend off the enemy fighters. Once you make it past these obstacles, which is no easy task, you are ready to take on the *Zaxxon* robot.

Flying through outer space is similar to some of the 'space-war' type games, in that you must kill or be killed. The most interesting part of the game is when you have to make your way through the space fortress. There are walls and force fields which you must navigate around. There are also radar towers and fuel tanks, which you must either destroy or navigate around. There is a certain amount of strategy involved also. For example, if you destroy a fuel tank, you are given additional fuel for your spacecraft. Naturally, there are other things to contend with. There are gun emplacements, missiles, and enemy planes, whose mission in life is to zap your spacecraft and prevent you from getting a chance to kill the *Zaxxon* robot.

Zaxxon is the 'official' version of this game, which explains why the name is the same. It has a nice demo mode, and will accommodate two players. This one can be considered a clone copy of its big brother.

Zaksund, I guess, is the 'un-official' version of the game. This one has two skill levels to choose from, and features amazing sound effects during the beginning and ending of each game. Although not quite a clone copy, probably for legal reasons, it is very similar to its big brother.

Both of these games feature excellent fast moving graphics as well as great sound effects. To me, they represent what we should expect from a 32K machine language game these days. There is no way to adequately describe the visual effects, except to say that you really get the feeling that you are flying a spacecraft. Responsiveness to the joystick is also very good, and this is important in these games, because maneuverability is the key to success.

Zaxxon more closely resembles the arcade version, and has a slight edge in the graphics department. *Zaksund*, on the other hand, has the edge in offering two levels of play for the novice and expert alike. In deciding which of these two fine offerings to buy, I recommend that you either flip a coin, or better yet treat yourself to both of them.

(*Zaxxon*, Datasoft Inc., 9421 Winnetka Ave., Chatsworth, CA 91311, \$39.95 tape or disk. *Zaksund*, Elite Software, P.O. Box 11224, Pittsburgh, PA 15238, \$24.95 tape, \$27.95 disk)

—Gerry Schechter

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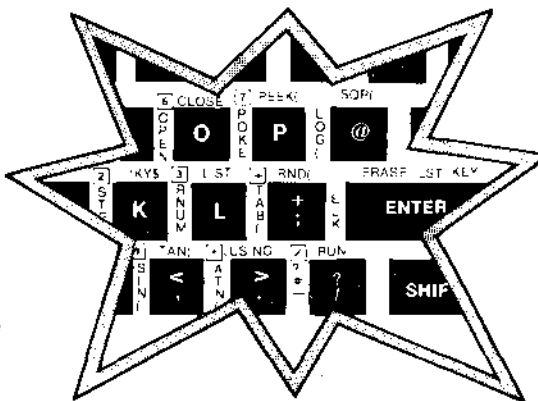
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Line Printer Conversion Chart

Function	Radio Shack LP VII	Radio Shack LP VIII	Radio Shack DMP 100	Radio Shack DMP 200	TDP Line Printer I	Smith Corona Daisywheel	Microline 82A	Epson MX Series	Gemini 10/15
Line Feed	10 or 13	10 or 138	10 or 13	10 or 138	10 or 13	10	10	10	10
Back Space	—	8nn	—	8nn	—	8	—	8	8
Carriage Return	26	13 or 141	26	13 or 141	26	13	13	13	13
Start Underline	Graphics	15	15	15	15	25	—	ESC "-" 1	ESC "-" 1
Cancel Underline	Graphics	14	14	14	14	—	—	ESC "K"	ESC "K"
Enter Graphics Mode	18	18	18	18	18	—	14	ESC "@"	ESC "@"
Data Processing Mode	30	30	30	30	30	—	14	ESC "@"	ESC "@"
Word Processing Mode	—	—	—	20	—	—	—	—	—
Normal Characters	30	30	30	30	30	—	15	ESC "@"	ESC "@"
Expanded Characters	31	ESC 14	31	ESC 14	31	31	—	14	14
Cancel Expanded	30	ESC 15	30	ESC 15	—	—	—	20	20
Condensed Characters	—	ESC 20	ESC 20	—	—	—	29	14	14
Italic Characters	—	—	—	—	—	—	—	ESC "4"	ESC "4"
Cancel Italics	—	—	—	—	—	—	—	ESC "5"	ESC "5"
Double-Strike	—	—	—	ESC 31	—	—	29 31	ESC "G"	ESC "G"
Cancel Double-Strike	—	—	—	ESC 32	—	—	-	ESC "H"	ESC "H"
Emphasized	—	—	—	—	—	—	—	ESC "E"	ESC "E"
Cancel Emphasized	—	—	—	—	—	—	—	ESC "F"	ESC "F"
Set Line Length	—	—	—	—	—	—	—	ESC "Q" nn	ESC "Q" nn
Set Form Length	—	—	—	—	—	—	ESC "F" nn	ESC "C" nn	ESC "C" nn
Top Of Form	—	—	—	—	—	12	12	12	12
Skip Over Perforation	—	—	—	—	—	—	—	ESC "N" nn	ESC "N" nn
Superscript	—	ESC 30	—	ESC 30	—	—	—	ESC "S" 0	ESC "S" 0
Subscript	—	ESC 28	—	ESC 28	—	—	—	ESC "S" 1	ESC "S" 1

NOTES:

All commands (except nn, see below) are written as PRINT #-2, CHR\$(NUMBER) where NUMBER is shown in the chart above. Thus, to send a line feed on an Epson printer, the proper format is PRINT #-2, CHR\$(10).

ESC is achieved by typing CHR\$(27)
nn means a number

Where the format is shown as ESC "G" the command is typed PRINT #-2, CHR\$(27)"G"

For your convenience, we at *the Rainbow* have prepared this chart to enable you to make the appropriate changes when confronted with a program written for a printer other than yours.

Although most printers are produced to receive input via the American Standard Code for Information Interchange, there are subtle differences in programs written for various models. For example, you would type in CHR\$(27) CHR\$(31) to program expanded characters on Radio Shack's Line Printer VII. But on the DMP 200 and others, an ESC(14) is required.

We have selected 26 of the more common printer commands,

which should satisfy the needs of most hobbyists and personal computer users, and maybe even some small businesses. The capabilities of printers vary, obviously, so if there's a dash under a category listing, the option is not available under normal circumstances.

If you have a notebook, or another method of keeping helpful hints readily available, this chart belongs there. The value of this information will increase as you become more familiar with your computer and printer, and as the computer becomes a growing part of your lifestyle. Keep it handy!

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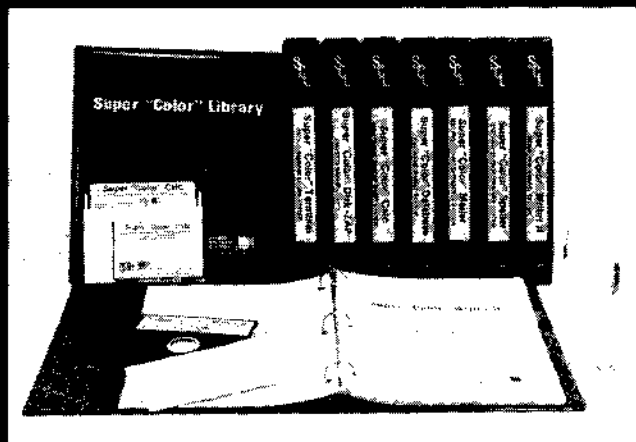


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ELECTRONIC SPREADSHEET By Kevin Herrboldt

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If It's Not The 'F' Board How About The '285'?

By Mike Reilly

I was one of the early Color Computer owners. Well over a year and a half ago I had my 4K—1.0 Color Basic in my rev. D board and was perfectly happy. After all, I didn't have to worry about those old A, B, and C revisions. But bliss ended quickly. My first friend to get a machine told me, "When my screen comes up it says COLOR BASIC 1.1." Right there and then I should have known what Tandy had in store for me. Soon, most hardware types could tell you all about the "E" board, with the 32K RAM piggyback, or those strange "half-good 64K RAM chips." Then the full 64K modification appeared along with the five little jumpers, and with a few wires you could handle FLEX and much more. At that point we were ready for the long rumored "F" board. Around the end of last year the new board appeared in the TDP 100 and in November the TRS-80C got it. But . . . it's not the "F rev.," folks. The board layout is totally different. So what do we call this board? The old board number was 8709137-E and the new number is 8709285. How about the "285" board?

I'll explain what's different and what has changed.

There are no major design changes except for one very nice one: the ability to use the full 64K RAM mode. This needed some wiring and I.C. pin bending with the "E" board, but had been designed into the stock board. The 64K chips and just four jumpers are all that you need to access all the memory. You pull out the eight 16K chips, move the three jumpers in the memory area over to the 64K position, add a jumper to the lone 64K patch posts to the left of U17 and cut capacitors C58, C60, C62, C66, C68, C70, C72, and you're finished. That's what most figured might happen on the "F" rev. if we were lucky. My guess is that very soon we'll see the Extended BASIC 1.1 ROM that will allow us to use 64K for Radio Shack's BASIC. This way the Color Computer can easily compete with the Commodore 64. Now that makes sense, doesn't it?

Some of the changes to the layout are:

The power transformer has moved toward the keyboard, so the power supply section moved to the back.

The troublesome cassette motor relay has been changed from a read type to a solenoid/hard contact type. You can hear quite a difference between the two. The reed gave a small ping; the new relay sounds very prominent. Just by turning the machine on you can hear if you have a new board. This will help you people with tape recorders other than Radio Shack, where the motor would not turn off because of a locked up relay due to that motor's current.

The door on the ROMpack port door might be supported by a very sturdy metal strap, not the upper half of the case. But from what I see, even that will be changed soon as an all plastic ROMpack door assembly is now appearing in new units.

The keyboard connector which used to be a short flat ribbon cable with two connectors was changed to a camera-type, clear, flat cable which is part of the keyboard. You can still disconnect the keyboard, but it's much more difficult to do. The keyboard itself is also totally different. It looks exactly the same as before, but now, inside there is a flat conductive rubber contact sheet which solves the sticky key problem many had. Lots of folks will rejoice over that.

The large RF shield has shrunk way down in size. It now only covers the memory chips and the 6883 SAM chip. It's tougher to remove, too. It's held in place by seven metal fingers that go through the board and are bent underneath. To remove it, you can reach under to straighten out most of the fingers, then slowly pull it off.

One of the two 6821 PIAs has been changed to a pin for pin compatible 6822 IIA which stands for Industrial Interface Adaptor. There's not much difference between the two, but the new chip is capable of higher drive levels and sensing with higher noise immunity, which is needed for the keyboard matrix decoder contact system for the new keyboard.

Another possible problem change is the whole schematic. Almost none of the designs have changed, but all the parts were physically moved, and worst of all, every part has a new location part number. This makes it extremely hard to find anything without the new renumbered schematic. Not to worry, because Tandy has them on the way. We'll be needing an update to the Color Computer Technical Manual before new owners get stuck with old schematics.

And last, I've noticed in the few new machines I looked into that there are some small "fixes" (floating parts soldered across other components, such as in the video output area) in various places in some Color Computers, and not in others, so get ready for the "285 rev. A." Here we go again!

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Kid Tested: Radio Shack Tutors Are A-OK

Tandy Corporation has introduced two vocabulary tutors for children ages 8-10 or grades three to five. *Words That Act* and *Words About Things* are written for CoCo using 4K (Hooray! Hooray!). These programs employ text, pictures and recorded speech to increase vocabulary skills. Questions and feedback response techniques are used to enhance user interest and provide a fun way to teach children without the use of "shoot-em-up" arcade type rewards for correct answers.

The programs are written in machine language, so *CLOADM* and *EXEC* are the appropriate commands for loading and running them. Also the recorder must be left ON, so that the voice-cued lesson can proceed. This is not a usual procedure for 4K programs and care should be taken in explaining this to the "I-can-do-it-myself" age group these tutors are geared for. The documentation suggests that the volume control of the CTR-80A recorder be set between "5" and "7," in order to load the program. We consistently received an I/O error at these settings. *Words That Act* finally loaded at "1" and *Words About Things* loaded at "3." The volume setting on the recorder then had to be readjusted so that the voice could be heard. In all fairness, the documentation does say that some minor adjustments may have to be made by turning the volume "a little higher or a little lower." Still, I was disappointed in the hit and miss way the proper setting had to be found for a program produced by Radio Shack, using our original Radio Shack equipment, which had been recently serviced.

Well, enough of the "adult" observations about these latest entries. The proof is in the pudding. My daughter,

Jenny, is eight years old and in the third grade. Having the opportunity to help in reviewing these programs, was a wonderful chance for her to invite her friends to "play" with our CoCo. She invited a cross section of children, aged 8 to 10, in third through fifth grade.

Judging from the way the children handled the programs, the age specifications were accurate. Of course, individual differences and abilities must always be considered. Most had no previous experience with a computer, except game playing using joysticks.

In each program the student works at his own pace, therefore having plenty of time to think out the answer. In both programs, a word is presented with a brief definition and an accompanying "picture." Then a question about its meaning is asked. The next question then reinforces the definition. At the end of the program, there are a few review questions. *Words That Act* contains 45 questions and *Words About Things* has 39. Both lessons took between 15 and 20 minutes to complete.

I was glad to see adequate reinforcement for correct answers, as the voice indicates modest praise. Wrong answers are indicated by a short beep tone, followed by a new screen giving a verbal "hint." In fact, in most cases, the hint is the answer. The screen then returns to the original and the question is asked again. Most questions are multiple choice, with some requiring a fill-in answer. The older children and those who were more computer literate enjoyed the challenge of the latter. Both tutors involve reading and listening skills and a score at the end was welcomed by the children. It was evident that each child felt pride in doing well. The boys were less impressed with the activity than the girls. However, all said they really enjoyed doing them and would do both repeatedly if they had the opportunity. All the students expressed a desire to have programs like these in their schools.

Words That Act and *Words About Things* are a good step in the right direction for educational software.

As an educator, I would like to have had more thought put into the choice of words used. It seems that the words chosen were done so without a theme or common denominator within the programs. Also, many of the children expressed their confusion concerning the low resolution graphics. They said that sometimes they concentrated more on trying to figure out what the picture was and missed the verbal explanation of the word. Most frustrating for the children was that, in multiple choice questions, if a key other than the ones needed to answer the question was pressed, it was considered a wrong answer. For example, if the procedure was to choose answer 1, 2 or 3 and the child inadvertently keyed 4 or spacebar, etc., the answer was incorrect. Once they adjusted to this, they were more cautious. These things concerned me as an adult. However, all of these proved to be minor inconveniences to the children. The result was that the children, for whom these programs were written, were very impressed and they really liked doing them, while learning in the process. This teacher gives Radio Shack an "A-" on this report card; there's always room for improvement, but these two are near the top of the class.

(Radio Shack, Nationwide, *Words About Things* (Vocabulary Tutor 1) is Cat. No. 26-2568. *Words That Act* (Vocabulary Tutor 2) is Cat. No. 26-2569. Each is \$8.95 on cassette)

—Stephanie Snyder

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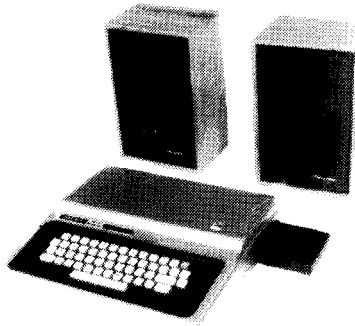
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Got a Program? Get a Market!

By Tom Nelson

Springtime! The creative spirit, welcome or not, has invaded our bodies. It's time to get the lead out and make that great idea into a best-selling program. To those of you with that affliction, I offer a discussion of considerations for making that program a block-buster. My approach this month will not be so much legal as it will be a mixture of common sense and experience.

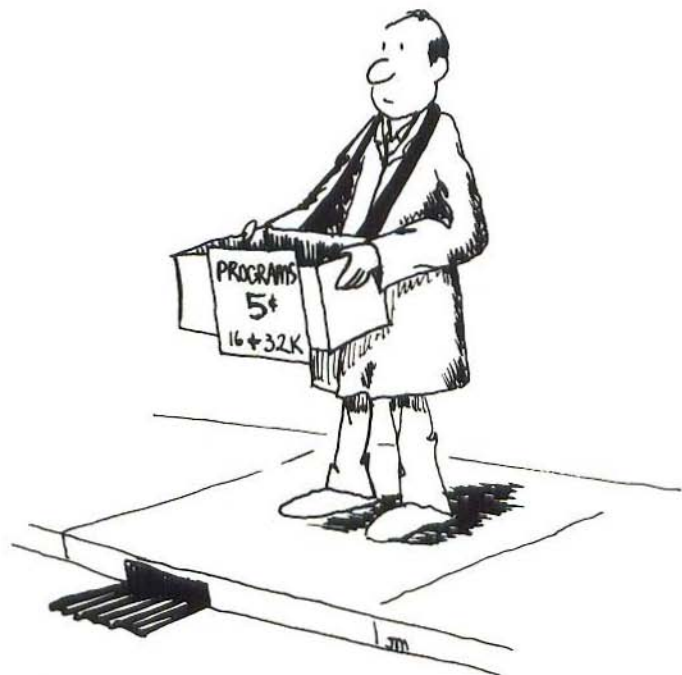
Programs, programs, programs. There are many kinds of programs you can write and, maybe, sell. Before writing, however, you must first carefully research to determine what you should write. After all, there are some things that just won't sell.

So where do you start researching? You start with the computer for which you intend to write. You have to find out a number of things about the computer: How many are there on the market; how many will there be; and, how long will this computer be "viable," i.e., how many years will it be around? You must also assess the technological status of the computer. Is it old technology, or is it at the razor's edge? Do its features, including display, memory capacity and hardware expandability, meet the developing consumer needs and tastes, compared to those offered by other equivalent computers? None of these questions is easy to answer, but you at least have to make an educated guess and then compare your findings with the features of other competing computers.

You next have to consider the market structure of the software industry associated with the computer. This includes the number and nature of the hardware and software houses, the software and hardware distribution network, and the packaging and pricing structure of the market. These considerations are very important since they control the number of units you can expect to sell and the price that you can command.

(The information given in this article is not legal advice. If you have legal questions you should see competent legal counsel.)

Let's look at the Color Computer in light of these essentially marketing questions. I don't know the number of units sold or to be sold, or the projected life span of the Color Computer. The TDP-100 is just now beginning to be distributed, as is the Dragon-32 and the Sampo, a Japanese version. Also, it should be noted that Apple (tm) computers of 1978 vintage are still alive and well. As to the relative quality of the Color Computer, we all know that the Color Computer is an excellent computer, or we wouldn't own one, right? Still, the prospective software author must objectively compare its features to those of other similar computers in light of both what they can really do and in light of



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what the machines are perceived by the public as being able to do. How much memory will be a minimum requirement in the future, especially as people demand more and more "user friendly" programs which take more and more memory? What will be the future of bit-mapped graphics which also requires memory and a fast microprocessor to process the screen so that it is updated to a tolerable speed? What degree of resolution and sound will be expected by the consumer? These and many other questions must be a part of your objective analysis.

The distribution network is also well worth considering. The Color Computer presently is sold primarily through Radio Shack stores, although the TDP-100 and the Dragon-32 are being sold in other outlets. Until very recently, Radio Shack stores were not allowed to sell or recommend software from outside authors, nor were outside vendors allowed to sell Radio Shack computers. Tandy has recently opened somewhat its software marketing policies, soliciting submissions from independent developers to judge whether it will allow the software to be recommended to Radio Shack customers. These programs will not be marketed by Radio Shack; Radio Shack merely allows them to be recommended to customers. Of course Tandy, like all software houses, will always give submissions consideration for potential license or purchase. Thus, if you feel that your program is what they're looking for, don't hesitate to submit the program for purchase, license or recommendation.

If Radio Shack will not distribute your program, how do you get it sold? Outside of the Radio Shack outlets, a distri-

bution network is growing somewhat because of the TDP-100 and the Dragon-32. Software houses are increasing in number and distributors are slowly beginning to become interested in the Color Computer. Still, this distribution network is very immature compared to that of other computers. Do not go into the effort required to create a program without considering how it will be marketed and how many people can be reached through the distribution network.

Closely related to the question of the technological status of the computer is the question of the programming language the computer uses. Before going on with this discussion, I must say the obvious. To be salable, most kinds of programs will have to be written in machine language. This is primarily mandated by two things: memory and speed. Machine language is much, much faster than the alternative for the Color Computer, BASIC. Also, machine language programs take up a fraction of the memory used by BASIC. The Color Computer currently comes in two models, a 16K and a 32K. (64K is also available with some modifications to the other computers, and Tandy must surely be working on a 64K model by now.) Since many people own 16K machines, to sell well, programs must be workable in 16K machines. These memory constraints absolutely require that machine language be used for programs of any great size or complexity. There are also the considerations of program protection, flexibility and total control of the system. Thus, only very limited applications allow the use of BASIC. In reality, the customer also expects the speed and quality associated with machine language programs.

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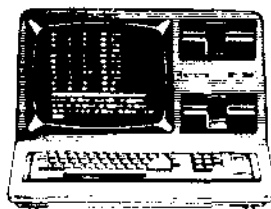
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JOE McMANUS



The Color Computer uses 6809 machine language (assembly language). You must consider the value of learning 6809 assembly language, and the routines particular to the input and output specifications of the Color Computer, versus the assembly languages and routines of competing computers. What languages are similar? You also must consider the feasibility of transferring your programs to other computers to broaden your customer base. How many "popular" 6809 computers are there, and what are the similarities of their configurations, versus, say, machines based

over the 6502 because of its greater flexibility. Although this is a good reason to choose to program a 6809 over a 6502 for your personal use and pleasure, it should not be a limitation on your choice of computer. For example, perhaps the Z8000 chip is the easiest and "funnest" chip to program ever—I really don't know if it is or isn't—but how many machines are there with the Z8000 chip? Your new word processor written in Z8000 may not sell more than a handful. You must be flexible if you are going to make the right choice.

"To be salable, most kinds of programs will have to be written in machine language. This is primarily mandated by two things: memory and speed."

Once you have decided on your computer, you have to decide on the type of program to create and how exactly to create it. Of course, the type of computer you have chosen will dictate to some extent the kind of program you will develop. Some computers are primarily "game" machines.

The language to use has already been discussed. Of course, you also must choose the right type of program to create. This is done by carefully assessing the market before taking the plunge. You must look at what is already available, generally and specifically, and, most importantly, what do your potential customers really want.

This last question is very important. All programmers get caught up to some extent, after a while, programming what they themselves like or feel is important, as limited by the constraints of the machines. This is a very logical way to develop programs for yourself, but the public is not, and cannot be, so limited in its expectations. Your buyer will not, nor should he or she, understand the limitations or special capabilities of the computer; he or she usually will

on the 6502 or 8086? Since you now own a Color Computer, you probably are aware of the number of machines based on the 6809 chip. You should assess the transferability of your program and the breadth of your potential customer base.

Many programmers become tied to a particular kind of microprocessor, and there are good reasons for this. Most assembly language programmers prefer to program the 6809

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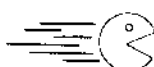
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not be deeply schooled in the subtleties of the area covered by the program. What the purchaser has are legitimate expectations of what a product should be, expectations often created by playing dedicated arcade games or working with other larger computers. These expectations, however, based on more powerful computers or dedicated game machines, cannot be ignored. The programmer who creates the greatest program of its kind in the world, making use of every capability of the Color Computer to the fullest, but without finding out and implementing the features that the consumer feels are important is likely to lose to the less meticulous programmer who has determined the customer's wants and actual needs and adequately responded to them. This point cannot be overemphasized.

As to particular kinds of programs to develop, you must first assess what kinds of programs you like to write, and have sufficient experience to write. If you have trouble filling out your own tax returns, and hate every minute of it, a tax preparation program is not for you. Within this framework, you must assess the marketability of particular types of programs. Should you create another *Donkey*

“All programmers get caught up to some extent, after a while, programming what they themselves like or feel is important, as limited by the constraints of the machines. This is a very logical way to develop programs for yourself, but the public is not, and cannot be, so limited in its expectation.”

Kong? Aside from the copyright violation problems, what of the market. How many kong-alikes are there, and what chance have you got of convincing a dealer to sell yours rather than that which his or her customers are asking for? Of course, if you avoid “knocking off” a game or other program, you have to assess the likelihood that you can sell it to a possibly saturated public. You still have to compete with the kong-alikes and the pac-alikes for the purchaser's dollar for games, for instance. Still, we're all waiting for more and better utilities and games. Software is always getting better, and the new blood and ideas are what will make it so.

If you have decided to develop a game, great! Games are always an area for rewards. There's also the chance that you will hit it big. There are several things you must consider in developing a game. First, games are low ticket items with very high marketing costs. They cannot be sold for a lot of money, but it costs quite a bit to sell them. Therefore, if your program proves to be a small seller, the profits will be very small. Moreover, games, although good sellers all year round, sell best just before and after Christmas. Thus, you may want to time the introduction of your program just before the Christmas season rather than in April. Another aspect is that games are more and more a fad item. A few nationally advertised games are of interest and the others

have a hard time competing. The temptation to “knock off” a copy of a nationally popular game is great, and frequently succumbed to, with obvious potential legal consequences. Even if you choose to create a new game, the games played in arcades have set the standard for quality and consumer expectations. You must, therefore, do a real quality job on your game so that your customer's expectations are satisfied. Even with all this, games can be very profitable and can be very fun to write, so good luck.

Utilities, such as word processors, on the other hand, do not sell like games since purchasers usually must have peripherals such as a printer and maybe a disk drive to use them. Many, maybe most, Color Computer owners do not fall into this category. Moreover, utilities sell best if part of a package of compatible software. You might therefore consider looking for a niche in the utility market not satisfied by other software authors. Still, good quality utilities of all kinds are always needed and welcomed by the consumer.

Once you have decided on what kind of program you wish to create, you have to decide how you are going to market it. This will strongly influence how you will write the program. Up until now, the assumption has been that you will be sending the program off to some software house so they can assume the marketing costs and you can reap the royalties. Don't forget that you can also market the program yourself and join the ranks of software houses. Welcome to the crowd. Self-marketing brings its own problems which, although not discussed here, must be dealt with.

In whatever manner you intend to market your program, be prepared for work, hard work. Contrary to popular belief, programming is extremely hard and complicated, especially the final 10 percent of the program. The concept and initial programming can be relatively easy. It is the finishing touches which are time consuming and frustrating. Many of us have several “almost done” programs laying around which we will “get to real soon.” The truth is that the work to finish, really finish, these programs, is what takes stamina. Once you think you are done, you must let novices try out your program and criticize it. Your “done” program soon develops bugs only the new user could find. Moreover, some of the criticisms are more substantial, such as that game that you have been slaving over for the last six months is *boring to play!* Now what do you do? You should always plan in this kind of revision. And those bugs must be fixed. Sure, you can get used to this glitch or that bug, but the purchaser shouldn't have to. Bugs, like cockroaches, will never be eliminated from the face of this earth, but if your program has too many, your customer will get the itch to go elsewhere, and a software house will look askance. As best, the sale of your program will be delayed because you failed to do the whole job. Therefore, you have to be a very harsh critic of your own work, a perfectionist. It's either you kicking yourself or your customers doing it for you, over and over and over.

These are some of the basics you must consider when developing your software. I hope that this discussion has provided some food for thought. Your work is cut out for you, but properly planned, you will reap the rewards of hard work and success.

In my next column, I will discuss the submission of software to a software house from a practical and legal standpoint. Until then, good luck with your programming.





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INSIMB: Helpful ML Programming Tool

Computer hobbyists tend to be almost fanatical about their machines. Color Computer owners are no exception. Most of us have seen or participated in rather heated discussions that revolve around the 6809 microprocessor being superior to a Z-80 or 6502. Without a doubt, the best way to win an argument of this nature is to develop a real appreciation of how the CoCo works and how its 6809 brain thinks. To do this requires an understanding of the microprocessors' native language—machine code.

In learning machine language, there are several programming tools which are helpful and sometimes absolutely necessary. These tools are not built into the Color Computer but must be added in the form of software.

INSIMB is one of these tools which can be used to learn the operation of the 6809. *INSIMB* is described as a "machine code instruction simulator." It is used to write and debug hexadecimal machine code programs.



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"Simple and straightforward to use" (Color Computer Magazine, April'83) but includes right justification, global commands, file chaining, multiple copies, etc. Works with any printer. 16-32K Cas, 32K Disk.

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Mailing list data base for CoCo and any printer. 4 Star Rating (80 Micro, Jan'83). From 90 to over 1000 records depending on your system. The C.C.Merger option merges Name and Address with C.C.Writer letters. Up to 4 line Address. Disk or Cassette. With C.C.Merger-\$25

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INSIMB allows the following primary functions:

M — Memory examine and change. This allows you to examine and change the hex code stored in memory. The machine language program being examined is either read into the computer before executing *INSIMB* or is entered one instruction at a time in hex code using this command.

D — Disassemble code. This is a mini-disassembler which decodes the hex numbers stored in memory into the microprocessor command code mnemonics.

R/C - Display the contents of the simulated 6809 registers. Allows you to change the registers.

P — Allows protection of a portion of memory so that it cannot be accidentally written to or executed by the simulator.

S/G/J — Single step(S) or continuously (G) simulate execution of a specified amount of code. With the "J" option the value in each of the 6809 registers are displayed after each program step. This is the heart of the program. Combined with the allowed "breakpoints" you can examine in detail the execution of machine code. This is useful in learning how the code works as well as trying to debug a program.

An additional feature allows the output of the disassembler or simulation to go to either the screen or the printer.

Although this program is referred to as an "instruction simulator," it provides most of the functions commonly found in a monitor. The disassembler and the ability to single step through the execution of a program are not always found in a typical monitor. There are a few shortcomings as well, the most obvious is the inability to load and save code from within the program. This requires you to hit the reset button to go to BASIC in order to save or load a routine. Also, the simulation of a program is very slow. To give you a feel for it's speed (or lack of), a short routine to clear the screen by loading &H8E into the text screen addresses is instantaneous (i.e., less than one second) if executed as a normal ML routine. The same routine simulated using the "G" option takes about four minutes.

INSIMB is a relocatable machine language utility which requires a Color Computer with at least 16K. It works with disk or tape. *INSIMB* normally loads at &H0600, you need to offset load it by &H1000 when using disk. It uses about 8K memory—this is a lot considering that a 'typical' monitor often uses less than 2K. The documentation which comes with this program is quite marginal. It describes each of the functions provided, but could spend more time with a general overview. In fact, given a better description I may have gotten a warmer feeling for the advantages of an instruction simulator over a monitor/debugger.

The bottom line here is that the very detailed examination of machine language program execution and the level of debugging achieved by *INSIMB* trade off against its slow speed and large memory requirements. If you already own a monitor/debugger, this program may not contribute much additional utility. If you're thinking about learning machine language, this may be the place to start, but be aware that with this program you write hex code directly, and not the wordlike mnemonics used with an assembler.

(B.C. Engineering, P.O. Box 768, Manchester MI 63011, \$39.95)

—Thomas Szlucha

A WORD FROM THE SPONSOR

Number five in these chats, and it is still too early to judge the results in our *Name the Column* contest. But I have received some excellent entries, and will have the winner next month. Stay tuned.

At this point, I'd like to thank a few more magazines for giving our products great reviews in the past few months — in March, *Color Computer News* reviewed NEWTALK and *Rainbow* reviewed REMOTERM, while in April 80 *Micro* reviewed STAR-DOS. They all loved them . . . naturally.

This month I thought you might be interested in some of my cassette procedures.

While a number of outfits make leaderless computer cassettes, I distrust them. From my audio days, I know that the beginning and end of a reel-to-reel or cassette tape tend to get crinkled and develop dropouts. This can destroy a program copy, and so I wouldn't use the beginning of a leaderless tape anyway. In that case, why pay extra for leaderless tape when you don't use it?

Instead, I buy 10-minute C-10 cassettes. These cassettes are available from a variety of sources, and cost about 50 to 80 cents each. I prefer to use one cassette per program, rather than put many programs on one tape and then have to search for them.

All of these tapes have a leader, and so when you use them you must be careful not to record your program on the leader instead of the tape. Using fast forward to get past the leader may leave a bit of an old program on the tape just before the new one, and CoCo will have trouble separating them. Instead, my method is to do the following: First, make sure the tape is fully rewound. Then place the recorder in RECORD, and type the command MOTOR ON on the computer. This starts the recorder motor, so that you are recording although the computer is not yet writing anything to tape. This erases the beginning of the tape. In the meantime, type your CSAVE or CSAVEM command, but do not hit ENTER until you see that the tape is well past the leader. I usually give it about ten seconds before typing ENTER. This procedure not only makes sure that I get past the leader, but also guarantees that there is blank space before the program to make reading it easier. Works every time.

For the disk users among you, I would like to announce two new products: STAR-DOS 64 and STAR FLEX. Both are disk operating systems for 64K computers. STAR FLEX is the famous FLEX system by Technical Systems Consultants, adapted for the CoCo, while STAR-DOS 64 is our own STAR-DOS, but modified for 64K computers. Both come with high resolution screens and have many features for the more advanced disk user. STAR FLEX is, of course, compatible with the large amount of software developed over the years for FLEX systems. STAR-DOS 64 will also run much of that software, but its big advantage (besides the fact that it is cheaper) is that its disk format is the same as Radio Shack's.

If you do not have a 64K system, then by all means consider the original STAR-DOS. The upgrade from STAR-DOS to STAR-DOS 64 is just the price difference between the two, so you can upgrade at any time. (But before getting any DOS for your CoCo, read our February advertisement!)

That's it for this month. Until June, just remember: *On a Clear Disk, You Can Seek Forever.*

Peter Stark

STAR-KITS

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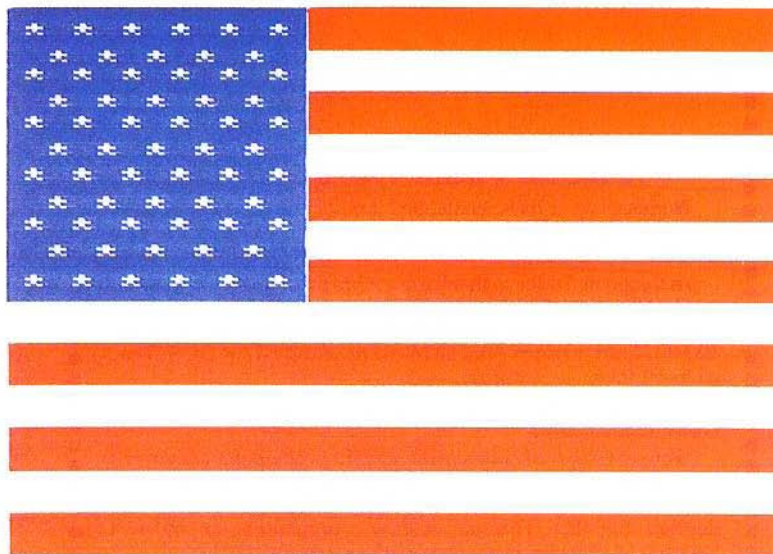
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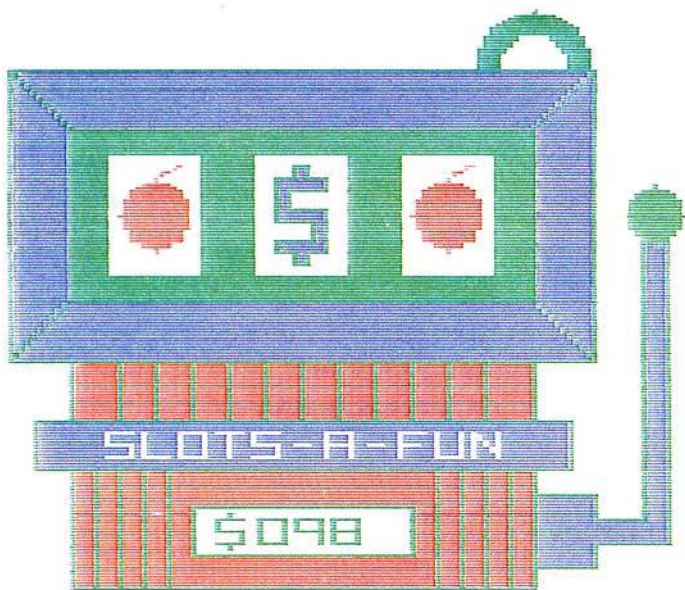
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CPP Does It With Style (And In Color, Too)



Being the adventurous type, I decided to buy the Radio Shack Color Graphics Printer as soon as I could get my hands on one. It seemed to me, at the time, to be a logical extension of the capabilities of my CoCo. After all, if my computer could produce nice colorful displays, why shouldn't my printer be able to do the same thing? Maybe I haven't been trying hard enough, but I have yet to get my CGP-115 to produce anything other than cute drawings and colorful listings. Every time I thought that I would sell it, I always figured that I would eventually teach myself how



exactly to program it. The other day, a review assignment arrived from *the Rainbow*. Now I'm glad I kept it.

Color Picture Plotter, *CPP* for short, is a utility program designed to produce color pictures on the CGP-115 plotter. Aside from the obvious, it also has several additional features that provide flexibility in deciding how the pictures should be produced.

CPP is written in BASIC with machine language sub-routines. It uses the Auto Run loader (by Sugar Software), and is therefore started with a *CLOADM*. It will produce a three-color picture from a Pmode 3 screen, and it is recommended to use color set 1 for best results. In order to accommodate the full screen, the picture is drawn lengthwise by rotating the screen image 90 degrees to the left. Drawing is done one color at a time, and it is sort of like watching a Polaroid picture develop. The time it takes to print a picture varies considerably. A simple picture, with only two colors, can be printed in 10-15 minutes. A more complex one, with three colors (not counting the background color), can take an hour or more.

The first thing that *CPP* asks is whether you have a tape or a disk system. It then asks if you would like to print alternate lines. This allows you to choose a high density picture, with each horizontal line plotted twice, or a low density picture, with every other line plotted once. Although the high density mode produced the best results, I found the low density mode to be very good, and used it most of the time because of the additional time required in the high density mode.

Another nice feature of *CPP* is the ability to make up to nine copies of your picture if it is already in memory. The way you do this is to first run your program, Break it, and then run *CPP*. You can also load a picture in from tape. If you select this option, you are asked how many files are to be printed. Using this feature, you can save several pictures to tape, and then print them one right after the other. Due to the printing speed of the CGP-115, you can enjoy a nice night out on the town while printing your collection of ten or so pictures.

CPP is a great utility that is not only unique, but very easy to use. The documentation explains everything you need to know in order to run it, except for how to save your pictures to tape. It also comes with a sample picture of the American flag, so you can check it out as soon as you load it. If you own a CGP-115 plotter, and would like to add some color to your life, make out your check now and run straight to the Post Office. Also, while you are out, don't forget to pick up some new pens for your plotter. You will need them.

(All-American Ultralight Industries, 1144 Kingston Lane, Ventura, CA 93001, \$14.95 on tape)

—Gerry Schechter

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Developing A Program

By Richard A. White
Rainbow Contributing Editor

In previous articles we looked at data input from keyboard and files and data output to files. A next obvious step is to discuss data output to the screen and printer. I was considering what examples would make a good article when another idea presented itself. I was working a local bulletin board and had a message typed in and nearly ready to save when the phone connection was lost, along with the message. There are advantages to composing messages off-line when the terminal package being used supports sending preloaded files a line at a time. An ASCII file can be loaded into COLORCOM/E and sent in this way. To do this, one would not need a full word processor, and it might be fun to try writing one for preparing messages for bulletin boards. Besides, the project would provide some good examples for

ing must be worlds better than retyping the line, so I made a list of needs and wants.

- 1) Be configurable to different bulletin boards in terms of number of lines and line lengths.
- 2) Display lines used and lines left. As finally implemented, this became lines used and lines allowed.
- 3) Allow user to scroll up or down through the message using the arrow keys.
- 4) Edit or delete the bottom line displayed.
- 5) Be able to insert new or copied line between others.
- 6) The editor will be a phrase substitution type where the user types the material to be removed and then the new text.
- 7) Provide word wrap so lines longer than the limit can be typed and the excess from the last space before the limit will be moved into an additional line or added to the next line as appropriate. This was expected to be tricky and I listed some additional thoughts for later reference.
 - a. If we use *LINE INPUT*, very long lines can be entered and the program has to deal with these.
 - b. The same goes for the insert mode. Will this be different from adding lines at the end of the message? Things like this need to be recognized early and dealt with before they force time wasting rewrites.
 - c. What happens when a user edits an existing line to longer than the limit. Obviously, the program has to detect this and add the excess to the next line which then may become too long.
- 8) In addition to arrow key control, how about other control keys like "T" for top of message, "B" for bottom of message and "G" to *GOTO* a particular line. "G" was not implemented due to screen space limits.
- 9) We have mentioned copying a line. Combined with ability to delete messages we have a move function as well.
- 10) We need a print routine so hard copy proofs and final drafts for file can be made.
- 11) There should be a main menu to serve as the crossroads from printer to entry to cassette/disk load and save.
- 12) And lastly, there are the save and load routines which need to offer a cassette or disk option.

I had written code for some of these functions for other

"Message entry and editing on most bulletin boards are grim at best. Line lengths are limited, generally to 64 characters, and the number of lines in a single message are limited."

"Bits and Bytes." Let's call it Communications Word Processor or COMMWP for filing.

The next idea was to write the first draft of the columns while the program was being written. The objective was to provide a more complete discussion of both the code and the thinking that went into it. Thinking has to start with what a program is to do. What are the needs and what restrictions must be observed?

Message entry and editing on most bulletin boards are grim at best. Line lengths are limited, generally to 64 characters, and the number of lines in a single message are limited. Message entry is line at a time, and don't make the line too long or it will be chopped in mid-word or rejected entirely. Editing is generally by retyping the entire line. Line length and number of lines restrictions are clear enough, and edit-

programs and would need only to copy and modify. In other cases, new code would be written. And as the program develops, some limits will be encountered and opportunities recognized. Expect details of the plan to change.

The next step is to convert our outline to program modules or sections and allocate blocks of line numbers to them. I like to deal in blocks of 50 or 100 lines to make it easier to remember what is where. It's easier to remember that input starts at 100 and edit starts at 200 than to remember lines like 120 and 175. Single use or infrequently used code goes to the end of the program so the Interpreter does not have to look through it all the time. Speed sensitive

```
TORON:FORX=1T0600:NEXT:NEXT:MOTO
ROFF'END
```

```
11000 PCLEAR1:GOTO2000
```

In 2000, string space is cleared and A\$(I) is dimensioned to 50. This means space is provided for 50 lines of text. Since bulletin boards typically allow 16 or 24 lines there will be ample space, unless you are preparing data for something like an IBM TSO system. Anyway, you know where the limits are defined and can easily change the program to meet your needs. Default values for characters per line, CL, and

COMMWP MODULES AND NUMBER BLOCK ASSIGNMENTS

Lines	Module	Comments
5-99	Subroutines	Frequently called subroutines used by more than one routine
100-199	Enter Message	Enter lines at bottom of message
200-249	Edit	Phrase substitution editor
250-299	Insert	Put new text between existing lines
300-399	Wordwrap	Cut over limit text and add to next line
400-500	Delete	Delete line and renumber those above
500-600	Copy	Copy line into temporary variable and insert at new location
600-700	Printer	Hard copy for proof or file
900-1000	Save/Load	Disk or cassette option
1000-1050	Main Menu	Select primary functional choices
1050-1100	Configuration	Configure limits to specific bulletin board requirements
2000-2100	Initialization	Read strings and enter key variables into table
10000	Auto-save	Run past leader and save two copies to tape
11000	PCLEAR1	Avoid SN Error

Table 1

sections and frequently used sections go to the beginning. I like commonly used subroutines to be between 5 and 99 with the main routines starting at 100. You can see these rules play out in Table 1.

This table turned out to be very handy during program development and you should have numerous occasions to refer to it if you follow the text closely. I will try to avoid repeating what is in the table except to elaborate or reinforce the information.

The first thing I put in was the initialization, auto-save and PCLEAR 1 code. For you newer owners, there is a bug in Extended BASIC that produces an SN ERROR if you PCLEAR to a smaller number than currently set at the beginning of a program. Putting PCLEAR 1 in the last line of the program avoids this.

```
0 GOTO11000
```

```
2000 CLEAR5000:DIMA$(50)
```

```
2010 CL=64:LM=16:A=0:B=0:K=0
```

```
2100 GOTO1000
```

```
10000 AUDIOON:INPUT"RUN PAST LEA
DER Y/N";I$:IFI$="Y"THENMOTORON:
FORX=1T06000:NEXT
```

```
10010 FORC=1T02:CSAVE"COMMWP":MO
```

lines per message, LM, are defined in 2010 along with A, B, and K which were entered when the delete section was written. The program now moves on to the main menu.

Screen formatting was one of the hardest things for me to get a handle on. The objective is to provide a neat text arrangement that is readily understood and to which the user can easily respond. Ours will use *PRINT@ X*, and the ";" which holds the cursor at the end of the last character printed. There are 512 locations for "X" where printing can start on CoCo's screen. Zero is the upper left hand corner. Then count across to the upper right hand corner which is 31. That's 32 characters or printing positions on the line. Computers like to start with zero even if people don't. The second line starts with 32 and continues to count up. There are charts showing the screen positions on page 277 of "Getting Started With Color Basic" and on the Nanos System Reference Card. The last location on the screen is 511 at the bottom, right-hand corner. Now let's look at the menu code.

```
1000 CLS3:PRINT@41,"COMMUNICATIO
NS";:PRINT@73,"WORD PROCESSOR";:
PRINT@105,"VERSION 1.0";:PRIN
T@197,"NEW MESSAGE";:P
RINT@229,"CURRENT MESSAGE"
;
```

```
1005 PRINT@261,"BULLETIN BOARD L
```

```

IMITS";:PRINT@293,"PRINT MESSAGE
";:PRINT@325,"SAVE/LOAD
MESSAGE ";:FORJ=0TO0:Z$=INKEY
$:J=(Z$=""):NEXT:Z=INSTR("NCBPS"
,Z$):IFZ=0THEN1000

```

```

1010 ONZ GOTO1020,100,1050,600,9
00

```

Screen graphics can be like a suit and tie. They add class and make the user more comfortable about the program. We will add a little special touch to our menus with different colored backgrounds and control printing, but not spend much extra time on code. The main menu should show program name, version, give the choices and hint how to select them, and perhaps report a few key pieces of information about work in progress. The last item might be lines used and lines available, but we will leave that for possible inclusion later.

The above code centers the program name on the second and third lines, the version on the fourth line and then skips two lines to start choices. These are centered, justified left and have added space to square off the right side of the green text block on the blue background. Each choice starts with a different letter and is chosen by keying that letter. This is signaled by putting the selection letters in reverse video.

Since single keystrokes make the choice, an *INKEY\$* routine is the natural input statement. Credit Richard Metzler writing in the January 1983 *80 US Journal*, page 42, with the code in line 1005 to do this. In Microsoft BASIC, an

assignment statement like (*Z\$=""*) that has equal values on both sides of the equal sign returns a *-1* for true. If values are not equal, a zero is returned. As long as no key is pressed, *Z\$=""* and *J* is set to *-1*. When the *NEXT* is encountered, *J* is incremented to zero which does not exceed the limit, zero, set after *TO* and the program loops back to have another look at *INKEY\$*. When a key is pressed, *Z\$* equals something, *J* is set to zero and then to *+1* by *NEXT*, the limit is exceeded and the program goes on to the *INSTR* statement. An alternative is to use a subroutine and replace the code in 1005 with a subroutine call.

```

5 Z$=INKEY$:IF Z$="" THEN 5 ELSE
RETURN

```

When a program uses numerous *INKEY\$* inputs, the *GOSUB 5* approach saves code at the expense of some clarity. For this program we will go for clarity, but you may choose to use the subroutine if you wish. The subroutine is a tad faster. You can prove this with the following test lines. *RUN 100* then *RUN 200* and note the slight difference. *TIMER* reports 1/60 seconds.

```

100 TIMER=0:FOR X=1 TO 10:GOSUB
B5:NEXT:PRINT TIMER:END
200 TIMER=0:FOR X=1 TO 10:FOR
J=0 TO 0:Z$=INKEY$:J=(Z$=""):
NEXT:NEXT:PRINT TIMER:END

```

Going back to line 1005, the *Z\$* is tested in the statement *Z=INSTR("NCBPS",Z\$):IFZ=0 THEN 1000*. If *Z\$* equals one of the letters in the string "NCBPS," the count up the string to that letter is assigned to *Z*. Otherwise, *Z=0* and we go back for another try. A valid choice yields a number between 1 and 5 which *ON Z GOTO* in 1010 can react to.

```

1020 FORI=1TO50:A$(I)="":NEXT:I=
0:IH=0

```

```

1050 CLS3:PRINT@70,"BULLETIN BOA
RD LIMITS";:PRINT@166,"cCHARACTER
S/LINE "CL;:PRINT@198,"1 LINES/ME
SSAGE "LM;:PRINT@230,"OK AS I
S ";:FORJ=0TO0:Z$=IN
KEY$:J=(Z$=""):NEXT:Z=INSTR("CLO
",Z$):ONZ GOTO1060,1070,1000

```

```

1055 GOTO1050

```

When New Message is chosen, line 1020 nulls the text strings, sets current line, *I*, to zero and does the same for lines in the message, *IH*. The user is given the option to reset the then-current characters per line and lines per message limits. Here a bit different method is used to handle the incorrect entry. *ON Z GOTO* does not respond to a zero so control goes to 1055 which loops back to 1050 for another try.

```

1060 C$="":PRINT@184," ";:FORK=
0TO1:FORJ=0TO0:Z$=INKEY$:J=(Z$="
"):NEXT:PRINT@184+K,Z$;:C$=C$+Z$
:NEXT:CL=VAL(C$):GOTO1050

```

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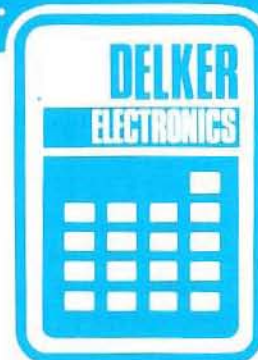
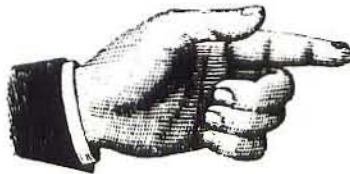
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```

1070 C$="":PRINT@216," ";:FORJ=
@TO1:FORJ=@TO@:Z$=INKEY$:J=(Z$="
"):NEXT:PRINT@216+K,Z$;:C$=C$+Z$
:NEXT:LM=VAL(C$):GOTO1050

```

If the user wants to change the number of characters per line, 1060 is called. Its purpose is to erase the current characters per line value from the screen and get two digits printing them as they are entered. The digits are added to form C\$ and its value obtained by CL=VAL(C\$). The program then loops back to 1050 to give the user another choice. Line 1070 does the same thing for number of lines.

```

1000 IFIH=0THEN100ELSEIFIH>LM TH
ENCL3:PRINT@160,"CURRENT MESSAG
E";:PRINT@299," HAS MORE LINES "
;:PRINT@232,"THAN LIMIT SET.";:P
RINT@296," PRESS ANY KEY ";:PRIN
T@320," TO CONTINUE ";:FORJ=@TO
@:J=(INKEY$=""):NEXT

```

```

1090 I=1:GOSUB300:GOTO100

```

When limits have been properly set, the user presses "O" for okay as is and the program goes to 1080. If this is a new message, IH will be zero and control goes to line 100 for message entry. If we are reconfiguring a current message to new limits for a different board, there may be too many lines or the lines may be too long. In the first case, the best we can

do is to send a message that there are too many lines and let the user decide what to edit out. Here the user has the option to use the message as is and send it as two messages from the terminal package program. Finally, the Word wrap subroutine is called to check for overlength lines and correct them. This is the GOSUB 300 call.

```

300 FORJ=I TOIH:F1=0:IFLEN(A$(J)
)<CL THENNEXT:RETURN

```

```

305 F=INSTR(F1+1,A$(J)," "):IFF<
CL ANDF<>0THENF1=F:GOTO305ELSEC$
=RIGHT$(A$(J),LEN(A$(J))-F1):A$(
J)=LEFT$(A$(J),F1)

```

Since Word wrap has been used, let's finish this month with a discussion of how it works. First, we need to check each line from I which does not have to be one, but is when we have reset board limits to the last line in the message, IH. That is what the FOR TO statement in 300 does. The variable F1 must be reset for each new line tested. Then, if the length of the line is less than limits, the NEXT goes back for another. The RETURN is there for when the last line of the message is found. If the line length is equal to or greater than

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CL, the limit, we go to 305. There, the program loops through the INSTR statement looking for either a space after the line length limit or a zero. In either case, the variable F carries the information while F1 holds the location of the last space found before the limit. If there are no spaces in the line, this code is in a world of hurt. We need to refine this for Version 1.1. F1 indicates where the excess to put into C\$, a temporary variable, starts while the left hand portion is put back into A\$(I).

```

310 IFJ<IH ANDA$(J+1)<>" "ANDLEFT
$(A$(J+1),1)<>" "THENA$(J+1)=C$+
" "+A$(J+1):NEXT:RETURN

```

```

315 IFJ=IH THENA$(J+1)=C$:RETURN

```

In line 310, we check if conditions are right to add C\$ to the next line. First there must be a next line, then that line must not be a blank and lastly it must not start with a blank. These last two conditions may exist for message formatting purposes that should not be disrupted. If all is in order, C\$ and a space are added to the beginning of the next line. The NEXT sends us back to line 300. If we are working with the last line of the message, a new line is created in line 315 and

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C\$ put there. If C\$ is larger than CL, the problem will need to be handled from the message entry mode. Here is another place for refinement in Version 1.1.

```
320 FORJ1=IH TO1 STEP-1:A=VARPTR
(A*(J1)):B=VARPTR(A*(J1+1)):FORK
=0TO4:POKEB+K,PEEK(A+K):NEXT:NEX
T:IH=IH+1:A*(J1+1)=C*:NEXT
```

Line 320 is the code to insert a new line between two existing ones. We start with the last line of the message, move its variable table listing up one and repeat the process moving up the message one line at a time until space above A\$(1) is opened for the new line. The key thing to know when using variable pointer techniques is that any variable used must first have been defined and be in the variable table. A\$(0) to A\$(50) are there because of DIM A\$(50) in 2000. We put K=0, A=0 and B=0 in 2010 for this purpose. If we had not done this and obtained A=VARPTR(A\$(J1)) then B=VARPTR(A\$(J+1)), B would be entered into the variable table, the listing for A\$(J1) would move up to make room and A would become meaningless. Next, we can PEEK the five byte length and address for A\$(J) and POKE it to A\$(J+1) location. Finally the number of lines in the message is increased by one and C\$ is put in A\$(J+1), which is the same as A\$(I+1) when the FORTONEXT loop for J1 is satisfied. NEXT sends us back to line 300 to look again for excess length lines.

Anyone had enough for this month? I have, and TELEWRITER is full. We have covered a lot of meaty material. The best way to digest it is to type in each piece and study how each works. The type in and test is the best debugging method anyway. Next month we will finish the program.

Hebrew Utility Good, But Requires Programming Ability

If you have ever had the desire or need to create Hebrew greeting cards or Hebrew calendars, flash cards, etc., this may be a program you might want to consider. *Hebrew Bulletin Board* by Computer Island, is written for 16K Extended BASIC and is intended to be used as a utility when Hebrew or both Hebrew and English is desired in a program.

After loading it easily into my CoCo and RUNNING it, I was able to see three examples of the way the program can be utilized. After reading the well written documentation, I found that in order to continue I needed to change a line in the program. The change enables the user to bypass the three demos and create his or her own material, allowing 200 lines of original programming. It quickly became evident that, in order to use this program, the user must have considerable knowledge of programming. Each letter or series of letters must be placed on the screen with a DRAW statement, which must include X and Y coordinates, where the letters are to begin and at least, in the first line of programming, the color, rotation and size of the letters must be set. Finally, the STRINGS representing the letters are added to the line. Although it might seem complicated to the novice, it's not. With some practice, it's not too difficult, but very time consuming. Since Hebrew is written from right to left and English from left to right, care must be taken not to let the letters crash.

In running my completed program, I found the Hebrew letters (in PMODE 4) to be accurate representations of the accepted alphabet. I did however have difficulty lining up the vowels under the appropriate letter. It seems that after three consecutive vowels, they begin to move left, eventually winding up under the wrong letter. This might not be a problem for some people, since vowels are often omitted by those fluent in the language.

The applications of this program are limited only by the imagination of the user. I see it to be a good teaching tool. Flashcards and work sheets come to mind immediately. The letter size can be easily adjusted to meet the needs of the age group. Of course, you'll need a graphics screen print program and a printer with graphics capabilities to get hard copies. You might get ambitious and translate a contemporary short story or novel to stimulate students' interest.

All in all, *Hebrew Bulletin Board* does what the publisher claims it will do. If you have a need to use the Hebrew alphabet, this will adequately fill the bill.

(Computer Island, 227 Hampton Green, Staten Island, NY 10312, \$15.95 tape)

—Stephanie Snyder

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```
10 PRINT "EXAMPLE": FOR X=ATO M:FORY=STO
P:Z=X+Y:PRINTZ:NEXTY:NEXTX
```

```
Into this: - 10 PRINT "EXAMPLE":
FOR X = A TO M:
FOR Y = S TO P:
Z = X + Y:
PRINT Z:
NEXT Y:
NEXT X
```

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A *FORMATR* For The Gemini

By Bill Bohne

The purpose of the program which follows is to allow formatting of the Star Micronics *Gemini 10/15* printers. It is compatible with Epson printers with the exception of "Vertical Tab" and "Proportional Characters," which Epson does not use, and n/144 inches which Epson substitutes with n/216 inches in the Line Feed Length mode.

With some modification, the program can be used with other printers using similar control codes. The Baud rate is set to run at 600. Line 100 contains the Baud rate value and may be changed to accommodate the appropriate value for the printer used.

On typing *CLOAD* "FORMATR" and *RUN*, the user will be prompted to put the printer "On line." He will then be prompted to enter the size of printer width. This will set the maximum column size for format variables.

NOTE: From this point on, the user may ENTER "X" as a response to any question the program asks. This will return the user to the menu.

The program makes use of 25 printer format parameters

contained in a menu format. The user selects the appropriate value from the menu for the format he wishes to set. The menu contains basically three types of modifiers. Each modifier appropriately prompts the user for any required additional information.

There are eight Format modifiers. Format modifiers allow alteration of printer parameters controlling page format. These include Skip Over Perf, Header Size, Left and Right Margins, Form Length (set by lines or inches), Line Feed Length, and Horizontal and Vertical Tab Sets.

There are 12 Character modifiers. Character modifiers either modify characters directly or select alternate character sets. Characters include *Slashed Zero*, *Underline Mode*, *Double Strike*, *Italic Characters*, *Proportional Characters*, *Superscript and Subscript Modes* and 10, 12, 17 and *Expanded Character Modes* and *Emphasized Characters*.

There are five Utility modifiers. Utility modifiers select certain printer functions. They include *Unidirectional Printing Mode*, *Print If Paper Out*, *Form Feed*, *Software Reset* and *Exit Program*.

The program is useful in setting up printer conditions for programs that require horizontal or vertical tabbing, page formatting or alteration of text font or emphasis. With some creative thinking, it can be used with Radio Shack's *Disk Spectaculator* to generate data forms in a condensed test format that display in excess of the normal 80-column width. This requires formatting the printer to use the left side of the page first, back scrolling to the top of the page, then reformatting to use the right side of the page. This yields rather impressive results, quite similar to that achieved with substantially more expensive spread sheets.

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For those who have printers other than Epson and Gemini, this program can be easily modified with the aid of our printer control code conversion chart, which appears on page 156.



360.... 0393
680.... 0783
890... 0AC0
1070 ... 0D28
1300 ... 10A0
1480 ... 1350
1700 ... 1650
1930 ... 1994
2170 .. 1C0B
END ... 1F3E

The listing:

10 *GEMINI 10/15 PRINTER FORMAT
TER
20 * COPYRIGHT 1983
30 * WILLIAM BOHNE
40 * ELGIN, ILLINOIS
50 * THIS IS A MENU ORIENTED PROG
RAM
60 * DESIGNED TO FORMAT GEMINI 10
/15

```

70 'PRINTERS.
80 '
90 '****SET BAUD RATE TO 600****
100 POKE 150,87
110 CLEAR 500
120 Z=27:Z#=CHR*(Z):L=0
130 GOTO2040
140 CLS:PRINT@71,B#:RETURN
150 '
160 '****IF INPUT=X BREAK TO FOR
MAT****
170 I=VAL(I#):IF I=0 AND I#="0"
THEN RETURN ELSE IF I=0 THEN SOU
ND50,5: GOTO 2180 ELSE RETURN
180 '
190 '****ERRORS****
200 PRINT" LEFT MARGIN >= RIG
HT":L=0:RETURN
210 PRINT" RIGHT MARGIN <= L
EFT":RETURN
220 PRINT" CAN'T USE 0 OR 128 0
R >=";B+1:RETURN
230 PRINT:PRINT" CAN'T USE TH
AT VALUE":RETURN
240 '
250 '****SEND BELL****


```

```

260 SOUND230,5
270 PRINT#-2,CHR*(7):RETURN
280 '
290 '****2 SEC TIMER****
300 FORT=0T0960:NEXTT:RETURN
310 '
320 '****SET MAXIMUM COLUMNS****
330 PRINT:PRINT:PRINT" IS PRINT
ER 80 OR 132 COLUMN?"
340 PRINT:INPUT" 80 OR 1
32";B#:B=VAL(B#):I#=B#:GOSUB160
350 IF B=80 THEN B=127:R=B:RETUR
N ELSE IF B=132 THEN B=255:R=B:R
ETURN
360 GOTO330
370 '
380 '****CHECK VALUE 'N'****
390 PRINT:PRINT" (N=1 T
O 127)":PRINT
400 INPUT" N=";I#:GO
SUB160
410 IF I<1 OR I>127 THEN GOSUB23
0:GOTO380 ELSE RETURN
420 '
430 '****ON OR OFF?****
440 PRINT:PRINT:PRINT"

```

Artwork By Jack Kehler



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MISSION EMPIRE! A strategic wargame/strategy game. Starting with one planet, incomplete intelligence and limited resources, you must conquer the rest of your galaxy. Play takes 2-5 hours and is DIFFERENT EVERY TIME! All versions offer GAME SAVE option. Specify 32K disc or 16K-The 32K versions require Extended Basic, the 16K does not. The disc version is shipped on a cassette with instructions for transferring to disk. If you want disc, add \$3.00.

 **\$19.95**

Cassette

```

ON = 1"
450 PRINT"                OFF = 0"
460 PRINT:INPUT"          SELECT 0
N/OFF";I#:GOSUB160:RETURN
470 '
480 B#="**1-SKIP PERF**":GOSUB14
0
490 PRINT:PRINT:PRINT" YOU MAY S
ELECT 0 TO 127 LINES"
500 PRINT:INPUT"        SKIP HOW MAN
Y LINES";I#:GOSUB160
510 IF I<1 GOTO 530 ELSE IF I>12
7 GOSUB230: GOTO490
520 GOSUB 250:PRINT#-2,Z#"N"CHR#
(I):RETURN
530 GOSUB250:PRINT#-2,Z#"O":RETU
RN
540 '
550 B#="**2-SET HEADER**":GOSUB1
40
560 PRINT:PRINT:PRINT" YOU MAY
SELECT 1 TO 16 LINES"
570 PRINT:INPUT"        HOW MANY HEAD
ER LINES";I#:GOSUB160
580 IF I<1 GOSUB 230:GOTO570 ELS
E IF I>16 GOSUB 230:GOTO570
590 GOSUB 250:PRINT#-2,Z#"R"CHR#

```

```

(I):RETURN
600 B#="**3-SET L MARGIN**":GOSU
B140
610 L=0:PRINT:PRINT:PRINT"YOU MA
Y SELECT";L;:PRINT"TO";R;:PRINT"
COLUMNS"
620 PRINT:PRINT"                HOW MANY
COLUMNS"
630 INPUT"                TO THE LEFT MARGI
N";L#:L=VAL(L#):I#=L#:GOSUB160
640 IF L=0 THEN GOTO680
650 IF L<0 THEN GOSUB230:L=0:GOT
O610 ELSE IF L>B THEN GOSUB230:G
OTO610
660 IF L>R THEN GOSUB200:GOTO610
670 GOSUB250:PRINT#-2,Z#"M"CHR#(
L):RETURN
680 GOSUB250:PRINT#-2,Z#"M"CHR#(
0):RETURN
690 '
700 B#="**4-SET R MARGIN**":GOSU
B140
710 R=B:PRINT:PRINT:PRINT"YOU MA
Y SELECT";L;:PRINT"TO";R;:PRINT"
COLUMNS"
720 PRINT:PRINT"                HOW MANY
COLUMNS"
730 INPUT"                TO THE RIGHT MARG
IN";R#:I#=R#:GOSUB160:R=VAL(R#)
740 IF R<L THEN GOSUB210:GOTO710
ELSE IF R>B THEN 710
750 GOSUB250:PRINT#-2,Z#"Q"CHR#(
R):RETURN
760 GOSUB250:PRINT#-2,Z#"Q"CHR#(
0):RETURN
770 '
780 B#="**5-FORM LENGTH**":GOSUB
140
790 PRINT:PRINT:PRINT"        SET FORM
BY LINES OR INCHES?"
800 PRINT:INPUT"                (L OR
I)";IQ#
810 IFQ#="X" THEN SOUND50,5: GOT
O2100 ELSE IFQ#<>"L" THEN A=32 E
LSE A=127:CLS
820 IF A=32 THEN CLS:GOSUB140:PR
INT:PRINT:PRINT" YOU MAY SELECT
1 TO 32 INCHES" ELSE GOTO 860
830 PRINT: PRINT"                HOW MANY
INCHES":INPUT"                (WHOLE INTE
GER)";I#:GOSUB160
840 IF I>A THEN GOSUB230:GOTO830
ELSE IF I<1THEN GOSUB230: GOTO8
30
850 GOSUB250:PRINT#-2,Z#"C"CHR#(
0)CHR#(I):RETURN
860 GOSUB140:PRINT:PRINT:PRINT"
YOU MAY SELECT 1 TO 127 LINES":P

```




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```

PRINT
070 INPUT "      HOW MANY LINES";
I$:GOSUB160
080 IF I>A THEN GOSUB230:GOTO0870
ELSE IF I<1 THEN GOSUB230: GOTO
070
090 GOSUB250:PRINT#-2,Z#"C"CHR*(
I):RETURN
900 '
910 B$="**6-LN FD LENGTH**":GOSU
B140
920 PRINT:PRINT:PRINT" SELECT FR
OM THE FOLLOWING LINE":PRINT" FE
ED SIZES:"
930 PRINT:PRINT"      1/8 INCH
= 0
940 PRINT"      7/72 INCH = 1
950 PRINT"      1/6 INCH = 2 (D
EFAULT)
960 PRINT"      N/72 INCH = 3
970 PRINT"      N/144 INCH = 4
980 PRINT:INPUT"      SELECT LINE
FEED SIZE";I$:GOSUB160:IF I<0 TH
EN GOTO 980 ELSE IF I>4 THEN GOT
O 980
990 IF I=3 THEN GOTO 1040 ELSE I
F I=4 THEN 1060
1000 GOSUB250:IF I=0 THEN GOTO 1
010 ELSE IF I=1 THEN GOTO 1020 E

```

```

LSE GOTO 1030
1010 PRINT#-2,Z#"0":RETURN
1020 PRINT#-2,Z#"1":RETURN
1030 PRINT#-2,Z#"2":RETURN
1040 GOSUB140:PRINT:PRINT:PRINT"
SELECT N/72 INCHES"
1050 GOSUB380:GOSUB250:PRINT#-2,
Z#"A"CHR*(I):RETURN
1060 GOSUB140:PRINT:PRINT:PRINT"
SELECT N/144 INCHES"
1070 GOSUB380:GOSUB250:PRINT#-2,
Z#"3"CHR*(I):RETURN
1080 '
1090 B$="**7-HOR TAB SET**":GOSU
B140:H=25
1100 PRINT:PRINT:PRINT" YOU MA
Y SET UP TO";:PRINTH;:PRINT"TAB
S
"
1110 PRINT:PRINT"      HOW MANY T
ABS DO YOU":INPUT"      WANT TO
SET";T$:T=VAL(T$):I$=T$:GOSUB16
0
1120 IF T<1THEN GOSUB230:GOTO111
0 ELSE IF T>H THEN GOSUB230:GOTO
1110
1130 FOR TT=1TOT
1140 INPUT"      SET TAB =" ;I$
:GOSUB160: IF I>R THEN GOSUB220
ELSE IF I=0 THEN GOSUB220 ELSE I
F I=128 THEN GOSUB220 ELSE GOTO
11601150 GOTO1140
1160 X$=CHR*(I):Y$=Y$+X$:NEXT TT
:IF HA=0 THEN GOTO1180
1170 GOSUB250:PRINT#-2,Z#"D" Y$
CHR*(0):RETURN
1180 GOSUB250:PRINT#-2,Z#"P" Y$
CHR*(0):RETURN
1190 '
1200 B$="**8-VERT TAB SET**":GOS
UB140:HA=0:H=20:GOTO1100
1210 '
1220 B$="**9-SLASHED ZERO**":GOS
UB140
1230 PRINT:PRINT:PRINT"      DO YO
U WANT SLASHED ZERO":PRINT"
ON OR OFF?":GOSUB430
1240 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"V"CHR*(0):RETURN
1250 IF I<>1 THEN GOTO1220 ELSE
GOSUB250:PRINT#-2,Z#"V"CHR*(1):R
ETURN
1260 '
1270 B$="**10-UNDERLINE**":GOSUB
140
1280 PRINT:PRINT:PRINT"      DO Y
OU WANT UNDERLINE":PRINT"
ON OR OFF?":GOSUB430
1290 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"-"CHR*(0):RETURN
1300 IF I<>1 THEN GOTO1270 ELSE

```

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```

GOSUB250:PRINT#-2,Z#"-"CHR$(1):R
ETURN
1310 '
1320 B#"**11-DOUBL STRIKE**":GO
SUB140
1330 PRINT:PRINT:PRINT" DO YOU
WANT DOUBLE STRIKE":PRINT"
ON OR OFF?":GOSUB430
1340 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"H":RETURN
1350 IF I<>1 THEN GOTO1320 ELSE
GOSUB250:PRINT#-2,Z#"G":RETURN
1360 '
1370 B#"**12-ITALIC CHARS**":GO
SUB140
1380 PRINT:PRINT:PRINT" DO YOU W
ANT ITALIC CHARACTERS":PRINT"
ON OR OFF?":GOSUB430
1390 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"5":RETURN
1400 IF I<>1 THEN GOTO1370 ELSE
GOSUB250:PRINT#-2,Z#"4":RETURN
1410 '
1420 B#"**13-PROPOR CHARS**":GO
SUB140
1430 PRINT:PRINT:PRINT" DO YO
U WANT PROPORTIONAL":PRINT"
CHARACTERS ON OR OFF?":GOSUB430
1440 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"Z"CHR$(0):RETURN

```

```

1450 IF I<>1 THEN GOSUB1420 ELSE
GOSUB140
1460 PRINT:PRINT:PRINT" SEL
ECT 1 TO 0 SPACES":INPUT" B
ETWEEN CHARACTERS";I
1470 IF I<1 THEN GOTO1460 ELSE I
F I>0 THEN GOTO1460
1480 GOSUB250:PRINT#-2,Z#"Z"CHR#
(I):RETURN
1490 '
1500 B#"**14-SUPERSCRIP**":GOS
UB140
1510 PRINT:PRINT:PRINT" DO YO
U WANT SUPERSCRIP":PRINT" C
HARACTERS ON OR OFF?":GOSUB430
1520 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"T":PRINT#-2,Z#"H":RETURN
1530 IF I<>1 THEN GOTO1500 ELSE
GOSUB250:PRINT#-2,Z#"S"CHR$(0):R
ETURN
1540 '
1550 B#"**15-SUBSCRIP**":GOSUB
140
1560 PRINT:PRINT:PRINT" DO Y
OU WANT SUBSCRIP":PRINT" CH
ARACTERS ON OR OFF?":GOSUB430
1570 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"T":PRINT#-2,Z#"H":RETURN
1580 IF I<>1 THEN GOTO1550 ELSE
GOSUB250:PRINT#-2,Z#"S"CHR$(1):R
ETURN
1590 '
1600 B#"**16-10 CHARS/IN**":GOS
UB140
1610 GOSUB250:PRINT:PRINT:PRINT"
10 CHARACTERS PER INCH"
1620 PRINT#-2,Z#"B"CHR$(1):GOSUB
290:RETURN
1630 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"B"CHR$(1)
1640 '
1650 B#"**17-12 CHARS/IN**":GOS
UB140
1660 GOSUB250:PRINT:PRINT:PRINT"
12 CHARACTERS PER INCH"
1670 PRINT#-2,Z#"B"CHR$(2):GOSUB
290:RETURN
1680 B#"**18-COMPRESSED**":GOSU
B140
1690 GOSUB250:PRINT:PRINT:PRINT"
COMPRESSED"
1700 PRINT#-2,Z#"B"CHR$(3):GOSUB
290:RETURN
1710 '
1720 B#"**19-EXPANDED**":GOSUB1
40
1730 PRINT:PRINT:PRINT" DO Y
OU WANT EXPANDED":PRINT" CHA
RACTERS ON OR OFF?"
1740 GOSUB430:IF I=0 THEN GOSUB2

```

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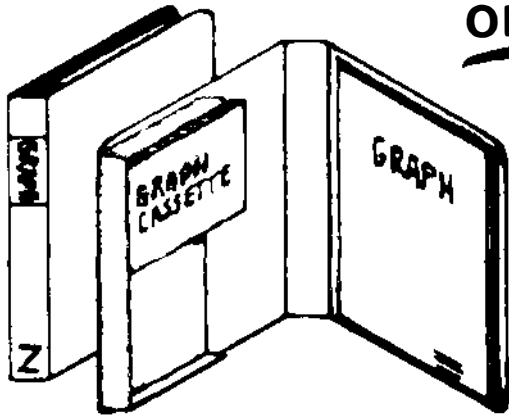
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```

50:PRINT#-2,Z#"W"CHR*(0):RETURN
1750 IF I<>1 THEN GOTO1720 ELSE
GOSUB250:PRINT#-2,Z#"W"CHR*(1):R
ETURN
1760 '
1770 B*="**20-EMPHASIZED**":GOSU
B140
1780 PRINT:PRINT:PRINT" DO YO
U WANT EMPHASIZED":PRINT" CH
ARACTERS ON OR OFF?"
1790 GOSUB430:IF I=0 THEN GOSUB2
50:PRINT#-2,Z#"F":RETURN
1800 IF I<>1 THEN GOTO1770 ELSE
GOSUB250:PRINT#-2,Z#"E":RETURN
1810 '
1820 B*="**21-UNIDIRECT**":GOSUB
140
1830 PRINT:PRINT:PRINT" DO YOU
WANT UNIDIRECTION":PRINT" P
RINT MODE ON OR OFF?":GOSUB430
1840 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"U"CHR*(0):RETURN
1850 IF I<>1 THEN GOTO1820 ELSE
GOSUB250:PRINT#-2,Z#"U"CHR*(1):R
ETURN
1860 '
1870 B*="**22-PRNT PPR OUT**":G0
SUB140
1880 PRINT:PRINT:PRINT" DO Y

```

```

OU WANT 'PRINT IF":PRINT" PA
PER OUT' ON OR OFF?":GOSUB430
1890 IF I=0 THEN GOSUB250:PRINT#
-2,Z#"9":RETURN
1900 IF I<>1 THEN GOTO1870 ELSE
GOSUB250:PRINT#-2,Z#"0":RETURN
1910 '
1920 B*="**23-FORM FEED**":GOSUB
140
1930 GOSUB250:PRINT#-2,CHR*(12):
GOSUB290:RETURN
1940 '
1950 B*="**SOFTWR RESET**":GOSUB
140
1960 PRINT:PRINT:PRINT" REIN
ITIALIZES FORMAT
1970 PRINT" TO POWER UP SETT
INGS
1980 GOSUB250:PRINT#-2,Z#"@":G0S
UB290:RETURN
1990 '
2000 GOSUB250:CLS:PRINT@200,"***
*****
2010 PRINT@232,"* EXIT *
2020 PRINT@264,"*****
2030 GOSUB290:GOTO2300
2040 CLS
2050 PRINT:PRINT:PRINT"
GEMINI 10/15": PRINT" PRI

```

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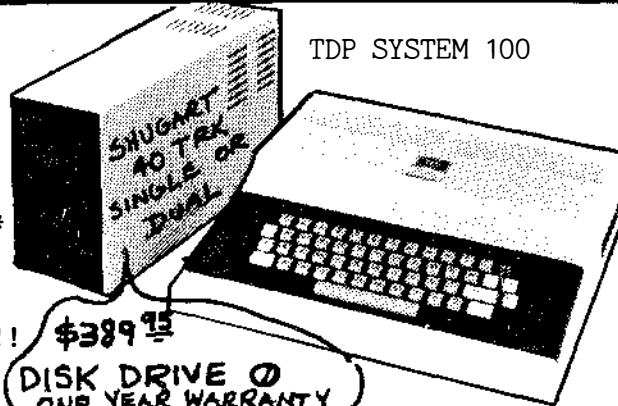
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```

NTER FORMATTER"
2060 PRINT"          COPYRIGHT 19
03"
2070 PRINT"          BY BILL BOH
NE"
2080 PRINT:PRINT:PRINT:INPUT"
  PRINTER ON LINE <Y/N>";Q$
2090 IF Q$<>"Y" GOTO 2040
2100 CLS:GOSUB320:CLS
2110 PRINT@102,"MAKE YOUR SELECT
ION
2120 PRINT@169,"FROM THE MENU
2130 PRINT@233,"YOUR SELECTION
2140 PRINT@294,"WILL BE SENT TO
THE
2150 PRINT@364,"PRINTER
2160 PRINT@421,"<'X' RETURNS TO
MENU>
2170 GOSUB290
2180 '*****PRINT FORMAT MENU****
*
2190 RESTORE
2200 CLS
2210 PRINT"* * * * * FORMAT MENU
* * * * *"
2220 FOR X=320416 STEP32
2230 READA$:PRINT@X,A$:NEXTX
2240 FOR X=480432 STEP32

```

```

2250 READA$:PRINT@X,A$:NEXTX
2260 PRINT:INPUT"  SELECT FORMA
T NUMBER";A
2270 IF A<1 THEN2100 ELSE IF A>2
5THEN 2100
2280 ON A GOSUB480,550,600,700,7
80,910,1090,1200,1220,1270,1320,
1370,1420,1500,1550,1600,1650,16
80,1720,1770,1820,1870,1920,1950
,2000
2290 GOTO2100
2300 CLS:END
2310 DATA" 1-SKIP PERF"," 2-SET
HEADER"," 3-SET L MARGIN"," 4-SE
T R MARGIN"," 5-FORM LENGTH"," 6
-LN FD LENGTH"," 7-HOR TAB SET",
" 8-VERT TAB SET"
2320 DATA" 9-SLASHED ZERO","10-U
NDERLINE","11-DOUBL STRIKE","12-
ITALIC CHARS","13-PROPOR CHARS",
"14-SUPERSCRIPT","15-SUBSCRIPT"
2330 DATA"16-10 CHARS/IN","17-12
CHARS/IN","18-COMPRESSED","19-E
XPANDED","20-EMPHASIZED","21-UNI
DIRECT"
2340 DATA"22-PRNT PPR OUT","23-F
ORM FEED","24-SOFTWR RESET","25-
EXIT PROGRAM"," "

```

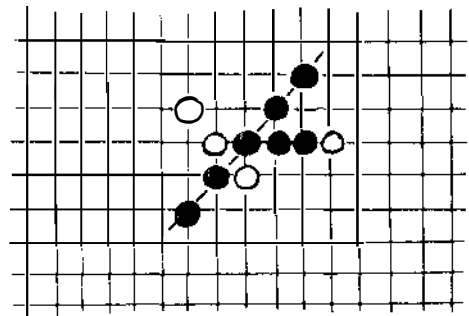
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Get 5 in a row before your opponent. 19 x 19 playing matrix. This is the favorite relaxation game for Japanese Go players. Two-player version and 4 computer skill levels for one player: also Tic-Tac-Toe on the same tape.

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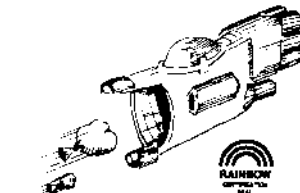
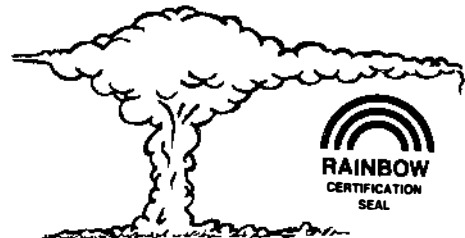
Successfully develop your country in a resource-limited world. Form a world government, sign treaties, go to war: anything goes. This is a two - to six - player game which combines computer and board play (board and pieces provided).

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Be a Cosmic Trash Collector, fight a mighty space battle, or surround your opponent in Trap'em — all this and more on one tape. The RAINBOW says, "Great fare for the family with young children."

\$15.95 16K Ext. Basic cassette.



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"TRS-80 COLOR COMPUTER PRODUCTS" "THE 1248-EP EPROM PROGRAMMER"

The 1248-EP EPROM PROGRAMMER is a full function unit that is compatible with virtually all popular 1K, 2K, 4K & 8K -by-8, 24 pin, 5 volt EPROMS. Compatible devices are 2508's, 2758 -0/1's, 2516's, 2716's, 2532's, 68732-0/1's, 68764's, and 68766's. Components 2732, 2732A, 2564, and 2764 are compatible via adapters (not supplied). The programmer is totally menu driven by resident position independent firmware in EPROM, which makes it suitable for experienced computer operators and novices alike.

Select the device type to be programmed from the device menu. Next, select the function to be performed from the function menu. On your command the 1248-EP will verify EPROM erasure, compare EPROM contents to specified contents of RAM or ROM, program blocks or individual bytes of EPROM memory or copy an EPROM's contents to user specified RAM.

The 1248-EP plugs into the cartridge slot of the Color Computer and is invoked by the user with the "EXEC & HCOOD" BASIC command. The 1248-EP contains its own on-board programming power supply, and has a quality "Zero Insertion Force" socket.

The combination of the TRS-80 Color Computer, an editor/assembler/monitor such as the Micro Works SDS80C-XX and the 1248-EP EPROM programmer, makes a high performance, cost effective software development station for MC-6800/6809 microprocessor based systems. Use the system to store your own games or utility programs in EPROM's for execution from the cartridge slot using the CK4 PROM/RAM card described below.

The cost of the 1248-EP EPROM PROGRAMMER, instructions and adapter diagrams is just \$99.95.

"THE CK4 PROM/ROM CARD"

The CK4 works with 2K, 4K or 8K-by-8 ROM's or EPROM's of the 5 volt only variety in 24 pin packages. In addition, the CK4 may be used with 4 static RAM's such as 6116's to expand the computers memory work space by 8192 bytes. Each of the four on-board sockets can be decoded to any 2K block of the memory map from \$C000 through \$F800 of the Color Computer. In addition, each socket can be configured to respond to address blocks from 2K to 8K bytes in length, thus accommodating 2K, 4K or 8K-by-8 ROM's, EPROM's or RAM's. ROM and RAM can be mixed on the card as well. RAM, on the card, can be written to and then "write protected" via dip switches on the CK4 to emulate ROM.

The instructions include information on how to set up the socket decoding circuitry and how to provide battery backup for programs stored in CMOS static RAM on the CK4 with the computer off or the cartridge removed.

The popular CK4 PROM/RAM card is now available in three versions.

1) The full featured CK4 remains the standard of cartridge board flexibility with the added capability of providing battery backup for CMOS static RAM's such as 6116's. Cost of the CK4 is still just \$29.95.

2) The CK4-1 is a ROM only version of the CK4 card for use with CoCo's with later than "E series" circuit boards. These later versions of CoCo are not able to write to cartridge based RAM without modification. Cost is \$27.95 for the CK4-1.

3) The CK4-2 is the unpopulated CK4 series circuit board only. Buy this version of the CK4 and configure them to meet your specific requirements at a price designed to stretch your dollars value. Cost is \$15.95 each.

"MORSE ENCODER/DECODER KIT"

The MEDK80 Morse En/Decoder Kit consists of a machine code software driver on tape, a schematic diagram of the interface circuitry, component parts, a printed circuit board (PCB), packaging suggestions and complete instructions for building a Morse code transmission and reception system that is compatible with 4K RAM and up models of the TRS-80 Color Computer.

The transmitter/receiver interface circuitry is totally optically isolated and is, therefore, compatible with all receivers and transmitters. Transmitter and receiver both connect to the interface unit and to the Color Computer via the RS-232 port.

The MEDK80 Morse En/Decoder kit operates at speeds up to 70 words per minute and automatically adapts to speed variations of the sender. When transmitting, words are transmitted only when fully formed, i.e., followed by a space, and the transmit text buffer gives visual notification to the operator of what word/character is currently being sent. In addition, the text buffer is 512 characters deep, which is sufficiently large to keep up with the best of "rag-chewers".

Potential purchasers of this product should have previous kit building experience. However, this is not a kit of great complexity, and is well within the abilities of those actively involved in amateur radio or electronic hobbies to construct. To reduce the chance of wiring errors, component placement is indicated on the PCB and detailed assembly instructions are included.

The cost of the MEDK80 software, parts, and instructions is \$39.95.

"COCO" GETS A BREADBOARD

The COCO BREADBOARD is a circuit board that plugs directly into the cartridge slot of the Color Computer and provides the user with 16 square inches of predrilled breadboarding area for circuit development, interfacing experiments, motherboard implementation, or whatever your imagination conjures up. The plated thru holes in the breadboard are wirewrap pin compatible and on 0.10 inch centers.

The COCO BREAD BOARD brings all of the data, address, and control signals available at the cartridge slot outside of the body of the computer and the signal lines are appropriately labeled to facilitate error free wiring of breadboards. A ground plane is provided on the top side of the board and solder pads are provided on the bottom of the board, thus facilitating circuit grounding and point-to-point wiring. In short, the COCO BREADBOARD was designed with the experimenter in mind.

The COCO BREADBOARD is attractively priced to justify its use for even the lowest budget projects. It is an ideal vehicle for learning interfacing techniques. Buy extras to have on hand for those rainy weekends.

The COCO BREADBOARD costs just \$19.95. Price for two (2) or more is \$16.95 each.

FACTORY FRESH COMPONENTS:

ITEM	DESCRIPTION	PRICE
2716 EPROM	2K by 8 Bit, 350 ns	\$4.50 ea.
2532 EPROM	4K by 8 bit, 350 ns	\$6.50 ea.
6821P	P.I.A.	\$3.50 ea.
74LS156	Open collector decoder	\$1.70 ea.
Socket	ZIF, 24 pin, Aries	\$7.95 ea.

Minimum component order: \$25.00

ORDERING INFORMATION:

Add \$3.00 to all orders to cover shipping and handling. Allow two weeks for personal checks. Canadian residents add 5% to cover special handling. Arizona residents add 4% sales tax. Sorry! No charges accepted. All items shipped UPS.

Make checks payable to:

**COMPUTER ACCESSORIES OF ARIZONA
5801 E. VOLTAIRE DRIVE
SCOTTSDALE, ARIZONA 85254
(602) 996-7569**

* TRS-80 is a trademark of TANDY CORP.
** SOS80C is a trademark of the MICRO WORKS.
Prices subject to change without notice.

this program is that you do not need to be a skillful performer in order to enjoy the results of your efforts.

Music is prepared for playing by adding DATA statements to the main program as follows:

3010 DATA R1R1R1C2Q
3020 DATA C5G4E4C2H

Each statement above represents a group of four voices and a note length. In the first statement shown the R1s stand for rests and C2 as C directly below the bass clef. The Q indicates that the group will be sounded as a quarter note. In this statement a single note will be played, as three notes are indicated as rests. The second statement will sound a C major chord. The letters stand for pitch names and numbers for octave placement. The H stands for a half note. Inclusion of sharps and flats, and a variety of note lengths are possible. The manual contains an easy to use chart showing the appropriate symbols and numbers for keying in of pitches and lengths. Key and tempo variations may also be keyed in. Contained in the manual are a number of examples illustrating various possibilities. Up to 230 four-voice chords are possible with a 16K CoCo and 720 for 32K.

After DATA statements are prepared, your music must be compiled into a machine level program before playing is possible. This is done automatically through the program's main menu and takes approximately one second for each group of four voices. An excellent feature available is that, once compiled, the prepared music may be saved as a self-contained program for instant playback. This feature also allows the music to be incorporated into other programs.

Do not expect the sound produced to match the quality of

your component hi-fi system. This is not the fault of the program being reviewed, though. In order to produce sound, the CoCo uses a digital-to-analog converter (DAC) to convert number values to varying voltage levels. This results in a stepped waveform driving the speaker being used. The Color Computer contains a six-bit DAC which allows a maximum of 64 step levels in a 5-volt range. An eight-bit DAC would allow a maximum of 256 steps in the same 5-volt range resulting in a much better quality sound. A musician seriously interested in musical applications of computers requires a minimum of an eight-bit DAC for acceptable sound quality. Hopefully, the *rumored* new Color Computer will have an upgraded digital to analog converter.

Other features of *The Composer* include editing aids, recording sounds directly to tape, and addition of low resolution random graphics. There are some capabilities such as loudness and softness control, and tone color controls which I would have liked to have seen. However, these features would normally be found only on a more expensive program. In fact, similar programs to this program for other computers generally cost much more and often require additional hardware expenses. Again our CoCo comes through by demonstrating an amazing versatility for a low cost. This program is well worth the price and if you have disk drive and 32K, definitely do spend the little extra for the disk version.

(Speech Systems, 38W255 Deerpath Road, Batavia, IL 60510, \$24.95 on tape or \$29.95 for disk)

—Larry Konecky

The Original FLEX for Color Computers

- * Upgrade to 64K
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Languages Available

Pascal, Fortran, RS Basic, RS Assembler, TSC Basic, TSC Assembler, Relocating Assembler, Macro Assembler, Mumps

If you are tired of playing games on your TRS-80C™ Color Computer, or find that you are handicapped by the limitations of the RS BASIC in trying to write a Program that will allow you to actually USE the Color Computer as a COMPUTER, YOU ARE READY TO MOVE UP TO THE FLEX9™ Operating System. If you want to have REAL PROGRAMMING POWER, using an Extremely Powerful Business BASIC, PASCALS, C Compilers, a full-blown Macro Assembler with a Library capability so you are not continuously "reinventing the wheel", YOU ARE READY TO MOVE UP TO THE FLEX9™ Operating System. If you would like to see if YOU REALLY COULD USE A COMPUTER IN YOUR BUSINESS, or begin to make your Computer start PAYING IT'S OWN WAY by doing some Computer Work for the millions of small businesses around you, such as Wordprocessing, Payroll, Accounting, Inventory, etc., then YOU ARE READY TO MOVE UP TO THE FLEX9™ Operating System. How?? DATA-COMP has the way!

DATA-COMP's FLEX9™ Conversion for the TRS-80C™ Color Computer was designed for the SERIOUS COMPUTER USER; with features like greatly increased Display Screens, WITH Lower Case Letters, so you can put a FULL Menu on ONE Screen, or see SEVERAL Paragraphs at the same time; with features like providing a FULL Keyboard so you have FULL Control of your Computer AND it's Programs NATURALLY, without needing a chart to see what Key Combination will give you what function; with USER ORIENTED functions to make using the Operating System natural, like having the Computer AUTOMATICALLY determine what type of Disk is being used in what type of Disk Drive and working accordingly, rather than you have to specify each and every thing for it, or like having the Computer work with the Printer you have been using all along without you having to tell the new Operating System what is there, etc., etc., etc.

DATA-COMP has everything you need to make your TRS-80C™ Color Computer WORK for YOU; from Parts and Pieces to Full, Ready To Use SYSTEMS. DATA-COMP designs, sells, services, and SUPPORTS Computer SYSTEMS, not just Software. CALL DATA-COMP TODAY to make your Computer WORK FOR YOU!

System Requirements

FLEX9 Special General Version x/Editor & Assembler (which normally sell for \$50.00 ea.)	\$150.00
F-MATE(RS) FLEX9 Conversion Rout. for the RS Disk Controller when purchased with Special General FLEX9 Sys.	\$69.95
when purchased without the General FLEX9 Sys.	\$79.95
Set of Eight 64K RAM Chips w/Mod. Instructions	\$69.96
Color Computer with 64K RAM and EXT. BASIC	\$499.95
Color Computer with 16K RAM	\$289.95
Color Computer with 16K RAM and EXT. BASIC	\$389.95

SPECIAL SYSTEM PACKAGES

64K Radio Shack COLOR COMPUTER, Radio Shack COLOR DISK CONTROLLER, a Disk Drive System, Special General Version of FLEX9™, F-MATE(RS)™ and a Box of 10 Double Density Diskettes; a COMPLETE, ready to run SYSTEM on your Color TV Set. \$1249.95

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Double Drive Cabinet with Power Supply	\$109.95
Single Drive Disk Cable for RS Controller	\$34.95
Double Drive Disk Cable for RS Controller	\$34.95
Micro Tech. Prods., Inc. LOWER CASE ROM Adapter	\$74.95
Radio Shack BASIC Version 1.1 ROM	\$34.95
Radio Shack Extended Basic ROM	\$89.95

DATA-COMP

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Adding With Carry Gets Positive Response

When personal computers first appeared, they seemed to have the potential to revolutionize education. That hasn't happened *yet*, but many good educational programs have appeared. *Carry*, from B5 Software, is among them.

Carry gives practice in addition in which carrying, or regrouping, is required. There are four levels of difficulty. The easiest gives two-digit numbers to add with no carrying required, and the hardest gives three-digit numbers with carrying. The problem is displayed in large numbers that are easy for small children to read. You enter the answers from right to left, just as you would on paper. When a carry is required, pressing the 'C' key draws a box above the problem, in the right place for the carry to be entered. You then type the '1' to be carried, and add the next column. Typing in the carry is optional, by the way; you may just carry mentally.

After each correct answer, a happy face appears at the top of the screen. If any wrong number is entered, a sad face appears, and a low tone is sounded—and the incorrect answer does not appear on the screen. When the correct answer is finally entered, the sad face disappears. After each set of ten problems, a little "pac-face" chomps across the screen and eats a numeral.

The program is very carefully and professionally done. Graphics and sound are used effectively throughout, and help hold the child's interest. The program comes with a well-prepared, 12-page booklet, which describes the operation of the program, and give some useful tips on helping your child learn addition.

The program is designed for children in grades two through four. My six-year old son enjoyed the program, and played it several afternoons, in preference to watching TV! When I asked his advice about this review, he said, "Tell'em it's a good program." *It is a good program.*

(B5 Software, 1024 Bainbridge Place, Columbus, OH 43228,
\$19.95, 16K)

—David Finkel

Soooper Pac — Super Program

Soooper Pac is a pac-maze game to use with your TRS-80C or TDP-100 systems. It takes 16K non-extended BASIC.

When loading *Soooper Pac*, you first load in a small BASIC program. This program clears enough memory space for the game and automatically loads the machine language program which is the game. The game then starts automatically.

The main object, as in most other similar games, is to get as many points as possible.

You have several game options such as: which mazes you want (1, 2, or 3), what skill level you want for each maze (with the exception of the first), the choice of using joysticks or your keyboard to control the *Soooper Pac*. You can also control how often the monsters change their pattern of attack, the speed of all moving objects (1-6), and how long you have to eat the monsters after eating one of the large objects in the corners of each maze. There are a total of 30 skill levels.

If you are skillful enough to master two mazes, you will get to see an intermission in which a monster chases a *Soooper Pac* across the screen which is very much like the arcade game. Then play will resume.

The three-page instruction booklet is rather skimpy in explaining the game, as it just gives the facts on it. I was really disappointed in this, because someone could buy the program and never understand it.

The graphics were similar to the arcade game and the sound effects were good, too.

Despite the instruction booklet, I think the game is good and I recommend it for your software library.

Good luck with *Soooper Pac*.

(Bear Bones Software, Inc., G-3117 Corunna Road, Suite
108, Flint, MI 48504, \$21.95 for cassette)

—Wayne Shepherd

AUDIO AND VIDEO INTERFACE

Provides SWITCHED color or monochrome 75ohm, 1 volt p-p video from CoCo.

If you wish to use a high resolution monitor this interface is a must.

Separate enhancements are provided for color and monochrome outputs.

This is not a simple emitter-follower add-on.

- *UNIT DOES NOT REQUIRE SOLDERING
- *INTERFACE IS ASSEMBLED AND TESTED
- *400mw AUDIO @ 8 ohms
- *TWO YEAR WARRANTY

Price \$49.95 (Includes Shipping)

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Peripherals For The Color Computer 'Joystick Dilemma'

By David Macali
Rainbow Education Writer

In our never-ending search to find quality equipment for the Color Computer we believe we have found the best joysticks available.

Equipment purchased for use in schools must meet the demand of constant use. We have found what we believe to be the best joysticks available for the Color Computer: the Wico Command Control Joystick system. Wico Corporation is the largest designer and manufacturer of control devices for commercial arcade games. Wico has now developed the command control system for use in schools and with home color computers. Owners can enjoy all the excitement, challenge and durability found only at the arcade until now.

Wico has developed three joysticks, a trackball and a Color Computer adapter. The three joystick models are Joystick 15-9714, Joystick Deluxe 15-9708, and Famous Red Ball Joystick 15-9730.

These joysticks are designed for superior control, pin-

point firing accuracy and durability. In addition, Wico joysticks are backed by a one-year limited warranty.

Each command control joystick has two fire button locations; one at the top of the stick and the other on the base. Fire buttons are activated by a base-mounted switch. A long five-foot cord is standard for the joystick but extension cords are also available in six- or 12-foot lengths.

The handles on the regular and deluxe model are extra-long arcade-style that allow for smooth movement into all eight standard positions. The red-ball model is designed like the arcade-type joystick. All joysticks are made with a heavy-duty plastic base. A feature which we found to be beneficial is the use of rubber stops on the bottom corners. This eliminates the problem of sliding and falling joysticks.

The Command Control Trackball features a phenolic ball that enables 360° movement with an infinite number of positions. The Color Computer trackball seems only to lack quality programs. If anyone is aware of any exciting programs what would work well with a trackball, please write: David Macali, 3269 Driftwood, Nortown, Ohio 44203.

The adapter necessary to connect the joysticks to the Color Computer has a unique feature. All Wico adapters are factory adjusted to a center point of thirty-one. However, the Wico adapter can be readjusted to accommodate variations in computer hardware. This is accomplished by typing in a simple ten-line program and opening the adapter to locate the four trimpots. Pictures and directions to complete this procedure are simple, concise and included with the manual.

We highly recommend the use of the Wico Command Controls for educational or home use. They have passed all of our tests with excellent ratings. In fact, we have found only two minor concerns.

First, it would be beneficial if Wico supplied a method to hook the adapter to the computer table. (We've found that masking tape alleviates the problem.)

The second concern exists because the Wico System(s) are of the switch-type and give only directional readings. This means they work with software that uses direction only. The joysticks will not work with programs that require joysticks which look for screen position. This limitation has caused us difficulty only in accessing Math Bingo. However, Wico has assured us that they are developing a potentiometer joystick that is to be released this spring.

The potentiometer joystick should alleviate the software problem, and if the quality of their new command control joysticks are equal to current models, we believe they will be the finest available.

(Mr. Macali is coordinator of instructional services with Norton City Schools, Norton, Ohio.)



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Print It Bigger

This Character Graphics Your Printer Into

By Richard A. White
Rainbow Contributing Editor

Signs began as a set of letters done in *DRAW* commands. It was an interesting challenge. But when the letters were done at the first cut level, and some code to put them on the graphics screen had demonstrated that the system worked, I moved on to other things. David Steyer's article on "Non-graphic Printer Graphics" in the September, 1982 *Rainbow* caught my interest. This program could print the letters from the *PMODE 3* screen, but the results weren't what I wanted. Basically, David had his program start at the right side of the screen and, using *PPOINT*, looked at each pixel to see what it was set. The set value was then converted to a printer character like "*", "\$," "." or a space and added to a string. When the proper string length was reached, the string was set to the printer and the process repeated one line of pixels to the left until the entire screen had been transferred. (Steyer's *Banner* and *Sign* were featured in the January, 1983 *Rainbow*. White's *Signs* produces an in-between sign.)

PMODE 3 is 128 pixels across so the picture covers almost two 11-inch sheets. It takes three such sheet pairs to handle the full screen vertically. The sheets can be taped or glued together to form a sign or poster. If *PMODE 4* had been tried, the full width would have been over 40 inches. But, just a minute. My line printer VIII supports half line feeds as do some others. In *PMODE 4*, at half line feeds, a sweep across the screen can be done on the two sheets of paper. One routine in *Signs* does just this.

I was talking about this to Lonnie Falk and he mentioned that he would like to print large letters on an 8½ x 11 for title and cover sheets. Here was another good idea, right up there with the Bird Wash. It is implemented using condensed type and half linefeeds. Unfortunately, when all is done, a 32K machine is needed. If you only have 16K, check the ads and get more memory. *Signs* also needs a printer that supports half line feed or its equivalent.

On *RUN*, *Signs* is initialized and goes to the main menu where options to start a new screen, return to the old screen, go to the printer, load from tape and save to tape are offered.

A ">" points to *START NEW SCREEN*. After a *RUN*, there is no old screen and there is nothing to print, but you may have a file on tape. You may load a picture or diagram made by another program with the *GRAPHICS SCREEN ONLY* choice or load a *Signs* generated file with *GRAPHICS SCREEN & TEXT*. The characters for each line that *Signs* puts on the screen are saved in a string which is read to obtain cursor position information. The strings need to be saved and read in if the screen is to be edited later. If you are saving the screens to be part of a series of screens for say, a presentation, you would want to save only the graphics onto the presentation tape, though both files might be saved on another tape for later reference. In any case, make your choice by using the up and down arrows to move the ">" next to the option you want and press *ENTER*.

When you select *START NEW SCREEN*, you will be asked letter scale for the first line. The 1X letters will be about ⅝ inch tall on the printed sheet and the others scaled as indicated. All letters on a single line must be the same scale, but each line can be scaled to your choice. You choose the same way as on the *MAIN MENU*, move the ">" and hit *ENTER*. After choosing the scale, you are asked if you want a 22 INCH WIDE SIGN or an 8½ x 11 SHEET. The 22-inch choice uses the whole screen. The area available for the 8½ x 11 is more limited.

You are now presented a bordered screen with a single pixel flashing cursor in the upper left. This always marks the upper left corner of the next letter. The space bar moves the cursor right and *ENTER* moves it down. The left and right arrows move the cursor over previously entered letters. The up arrow moves the cursor to previous lines while *ENTER* moves it back down. Whenever you move the cursor to a new line for the first time, you have the option to change scale. If you choose not to change scales by either typing letters, spaces or *ENTER* to move down again, the scale of the previous line is used and can no longer be changed for that line.

To change scale, press shift and the up-arrow. This sends

Than You Can

Print Program Can Turn A Sign Maker

you to a menu that offers MAIN MENU, PRINT SIGN and CHOOSE NEW SCALE if this is allowed. If you choose a scale, even the current one, you are returned to the graphics screen.

Letters are entered by typing at a modest rate. A skilled typist can out-type the code, particularly at the larger scales. There are some tick marks along the borders to help you format your sign. The top and bottom marks are placed every 10 pixels across. The tick marks on the side show the bottom of the first and second sheets when printing 22 inches wide. There are three letter widths with *l*, *!*, *I*, *i*, *:*, *;*, *'*, *,*, and *.* in the narrow category. *W*, *M*, and *&* are extra wide. The rest are the same mid-size.

Editing is done by erasing the line from the cursor point to its right end. Position the cursor at the beginning of the portion you want to delete and press the "@" key.

When you are ready to print results, use the shift and up-arrow and choose PRINT SIGN. The Print Routines menu tells you the current computer baud rate setting. If you choose RESET BAUD RATE and press ENTER you will be asked to enter the baud rate wanted. You may choose 300, 600, 1200, 2400, and 4800—just type in the rate and hit ENTER. You can choose to print the test strings in normal type as a reference to content of signs on tape.

To print a sign, set the print head just below the top of the paper, make sure the printer is on and choose PRINT SIGN. Sign printing takes time, so you will have a chance to get a beer or sweep the floor. After printing, control returns to the PRINT ROUTINES menu. Get to other portions of the program through the MAIN MENU option.

You are offered a choice of characters to use in making the sign. This could be any character that can be entered from the keyboard. I like the "0," the "\$" works well as does "#" and "*." The program is initialized with the "0" as print character. Printer codes in Lines 650 set the LPVIII to half-space data processing mode so each carriage return causes half a line feed while codes in Line 692 set the printer back to full line feeds. Codes in Lines 685 and 690 set the

printer to condensed (132 characters per line) and back to normal 10 pitch characters. Many printers support these features, but have different print codes. You will have to work out how to change these lines to fit your printer. (A printer control code conversion chart appears in this issue of *the Rainbow*.)

The BASIC *INSTR* command was invaluable in developing both the ">" operation on the menus and in reading and reacting to keystrokes in the graphics mode. On the Main Menu, we want to be able to position the ">" at certain lines and not others depending on the value of the count variable CT. When ENTER is pressed, CT is then used in an *ONCT GOTO* statement to send the program to the chosen function. CT should range from 1 to 7. Using *INSTR* in Line 1010, a multiplier LO is found that is used to calculate a *PRINT** position corresponding to the text that CT represents. This basic method was used in all menus except the print character choice.

In the graphics mode, the input character was used in an *INSTR* statement to obtain a number. Depending upon the range the number falls into, the program may move into tests to move the cursor or go directly to entering a character on the screen. If the number returned by *INSTR* represents a character, it also tells whether the character is narrow, average or wide so the cursor can be properly advanced. The same technique and string is used in the backspace subroutine to control cursor movement back over the text. Consult Lines 30 and 145. ST\$ is defined in Line 2110.

When we were writing *TIMS*, Gary Davis of Sugar Software wanted a way to change baud rate up to 4800. Rather than using a lot of space consuming *IF THEN* statements, we merely provided a means for the user to type in the value to be *POKEd* to set the higher rates. In *Signs*, I have worked up a code to convert a *PEEDED* value to the then set baud rate and print it on the menu. If a new baud rate is selected, it is converted to the appropriate value and *POKEd* into 150. *IF THEN* is not used but *INSTR* is. The code is in Lines 600-625. Have fun figuring it out.

36.....0296
 400.....0720
 610.... 0B48
 667.... 0F51
 1000... 13A9
 2030... 177E
 2100... 1C3A
 END... 1F3E

The listing:

```

0 GOTO10100
10 CLEAR2500:PCLEAR4:PT#=STRING#
(37,"*"):DIMG$(100),SC$(19):GOSU
B2000:GOTO1000
17 IFZS*60>TIMER THEN 17 ELSE RE
TURN
18 PRINT"****TO PROCEED TOUCH AN
Y KEY****";
19 Z#=INKEY#:IFZ#=""THEN 19 ELSE
RETURN
20 PRINT"TO SET TAPE RECORDER AN
D POSITION TAPE TO SAVE O
R LOAD, PRESS ANY KEY FOR MOTOR
ON ON ANDTHEN ANY KEY FOR MOTORO
FF"
21 GOSUB19
22 AUDIOON:MOTORON:GOSUB19:MOTOR
OFF:RETURN
30 I#=MID$(SC$(LN),CC+DR,1):I=IN
STR(1,ST$,I#):IFI=0THENXI=IC*7*S
C ELSEIFI<18THENXI=IC*4*8C ELSEX
I=IC*9*8C
31 IFX+XI>254THENSC$(LN)=LEFT$(S

```

```

C$(LN),LEN(SC$(LN))-1):OV=1:RETR
RN
32 CC=CC+IC:X=X+XI:X#=STR$(X)+",
":Y#=STR$(Y):IFLT=1THENRETURNELS
EDRAW"BM"+X#+Y#:RETURN
34 CC=0:LN=LN+IC:I#=LEFT$(SC$(LN
),2):SC=VAL(I#):Y=Y+2*IC+IC*0*8C
:X=2:X#=STR$(X)+",":Y#=STR$(Y):D
RAW"BM"+X#+Y#:RETURN
36 IFX>2THENIC=-1:DR=2:GOTO30ELS
EReturn
38 IFLEN(SC$(LN))>CC+2THENIC=1:D
R=3:GOTO30ELSEReturn
40 IFLN>1THENIC=-1:GOTO34ELSERET
URN
42 IFLEN(SC$(LN+1))>0THENIC=1:GOT
O34ELSEReturn
44 IC=1:IFLEN(SC$(LN+1))=0THENSC
$(LN+1)=LEFT$(SC$(LN),2):GOTO34E
LSE34
46 I#=LEFT$(SC$(LN),2):SC=VAL(I#
):SH#=LEFT$(SC$(LN),CC+2):YE=8*S
C:LS=LEN(SC$(LN)):Y#=STR$(Y):X#=
STR$(X):H#=STR$(SC*4)
48 I#=MID$(SC$(LN),CC+3,1):I=INS
TR(1,ST$,I#):IFI=0THENXI=7*8C EL
SEIFI<10THENXI=4*8C ELSEXI=9*8C
50 YE#=STR$(YE):XI#=STR$(XI-1):D
RAW"C1S4":FORK=0TOXI-1:DRAW"D"+Y
E#+R"1U"+YE#:NEXT:CC=CC+1:IFL8>C
C+2THEN40ELSECC=LEN(SH#)-2:SC$(L
N)=SH#:DRAW"BM"+X#+",":Y#+C08"+
H#:RETURN
100 FORK=1TO19:SC$(K)="" :NEXT TA
RGET LINE
110 PRINT:PRINT:GOSUB400:DM=0:PM
ODE4,1:PCLS1:DRAW"C0":GOSUB190
120 PMODE4,1:SCREEN1,0:COLOR0,1:
LN=1:SC$(1)=STR$(8C)
125 X=2:Y=2:DRAW"BM2,2"+SC$
130 POKEHP,0:PP=PPOINT(X,Y)
135 P=PPOINT(X,Y):IFP=0THENPSET(
X,Y,1)ELSEPSET(X,Y,0)
140 I#=INKEY#:FORK=1TO5:NEXT:IFI
#=""THEN135ELSEPSET(X,Y,PP):A=AS
C(I#)
145 I=INSTR(1,ST$,I#):IFI>0ANDI<
10THENONI GOSUB36,38,110,44,160,
40,450,160,46:GOTO130
150 DR=3:SC$(LN)=SC$(LN)+I#:IC=1
:LT=1:GOSUB30:LT=0:IFOV=0THENDRA
WG$(A):GOTO130ELSEOV=0:GOTO130
160 RETURN
190 IFFO=0THENDRAW"S4BM0,0;D79R1
L1D80R1L1D32":FORW=1TO25:DRAW"R1
0U1D1":NEXT:DRAW"R5U32L1R1U80L1R
1U79L5":FORW=1TO25:DRAW"D1U1L10"
:NEXT:RETURN
195 DRAW"S4BM0,0;D132":FORW=1TO1
3:DRAW"R10U1D1":NEXT:DRAW"R3U132

```

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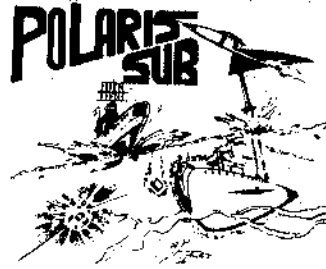
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```

L3":FORW=1TO13:DRAW"D1U1L10":NEX
T:RETURN
400 CLS:PRINT@46,"SIGNS",,,
LETTER SCALE (1ST LINE)",TAB(6)"
1X",,TAB(6)"2X",,TAB(6)"3X":CT=1
:FG=0:GOSUB490
410 PRINT@LP,"X":PRINT@260,"PAP
ER FORMAT",,,TAB(6)"22 INCH WIDE
SIGN",TAB(6)"S 1/2 IN. X 11 IN.
SHEET":CT=0
420 LP=(CT+10)*32+2:PRINT@LP,">"
:GOSUB19:PRINT@LP," ":IFZ#=CHR
*(10)AND CT=0THENCT=1:GOTO420ELS
EIFZ#=CHR*(94)AND CT=1THENCT=0:G
OTO420ELSEIFZ#<>CHR*(13)THEN420E
LSEFO=CT:RETURN
450 CLS:PRINT@46,"SIGNS",,,
MAIN MENU",,,," PRINT SIGN",,
,,:CM=2:CT=1:IFLEN(SC*(LN))=2AN
DSC*(LN+1)=" "THENPRINT CURRE
NT SCALE IS"SC*(LN)"X", " CHOO
SE NEW SCALE",TAB(6)"1X",,TAB(6)
"2X",,TAB(6)"3X":CM=5
460 Z#=HEX*(CT):LO=INSTR(" 1 2
345",Z#):LP=LO*32+2:PRINT@LP,"
>":GOSUB19:PRINT@LP," ":
465 IFZ#=CHR*(10)ANDCT<CM THENCT
=CT+1:GOTO460ELSEIFZ#=CHR*(94)AN
DCT>1THENCT=CT-1:GOTO460ELSEIFZ#

```

```

<>CHR*(13)THEN460ELSEONCT GOTO10
00,600
470 CT=CT-2:IFCT<1THENSCEEN1,0:
GOTO130ELSEGOSUB495:SC*(LN)=STR*
(SC):SCREEN1,0:GOTO130
490 LP=(CT+3)*32+2:PRINT@LP,">";
:GOSUB19:PRINT@LP," ":IFZ#=CHR*
(10)ANDCT<3THENCT=CT+1:GOTO490EL
SEIFZ#=CHR*(94)ANDCT>1THENCT=CT-
1:GOTO490ELSEIFZ#<>CHR*(13)THEN4
90
495 SC=CT*4:SC#="S"+STR*(SC):SC=
CT:DRAWSC#:RETURN
600 TARGET LINE
605 POKE65494,0:BP=PEEK(150):BU=
INSTR(1,"61841 87 180",RIG
HT*(STR*(BP),LEN(STR*(BP))-1):B
U=4800/BU
610 CLS:PRINT@73,"PRINT ROUTINES
",,,," CURRENT BAUD RATE ="BU,
TAB(6)"RESET BAUD RATE",,,," P
RINT SIGN",,,," PRINT TEXT ST
RING",,,," MAIN MENU":CT=1
615 CT#=RIGHT*(STR*(CT),1):LP=IN
STR(1," 1 2 3 4",CT#):LP=LP*3
2+2:PRINT@LP,">":GOSUB19:PRINT@
LP," ":IFZ#=CHR*(10)ANDCT<4THEN
CT=CT+1:GOTO615ELSEIFZ#=CHR*(94
)ANDCT>1THENCT=CT-1:GOTO615ELSEI
FZ#<>CHR*(13)THEN615ELSEONCT GOT
O620,640,630,695
620 PRINT " ":INPUT"ENTER NEW BA
UD RATE";BU#:BU#=LEFT*(BU#,1):BL
=INSTR(1,"36124",BU#):IFBL=0THEN
PRINT"baud rate error":SOUND100,
50:GOTO605
625 BU(1)=180:BU(2)=87:BU(3)=41:
BU(4)=18:BU(5)=6:BU=BU(BL):POKE1
50,BU:GOTO605
630 FORK=1TO19:PRINT#-2,SC*(K):N
EXT:GOTO610
640 CLS:PRINT@73,"PRINT GRAPHICS
",,,," CURRENT PRINT CHARACTER
",," IS "A#,,,,," KEY YOUR C
HARACTER OR",," <ENTER> FOR "A
#:GOSUB19:IFZ#=CHR*(13)THEN630EL
SEA#=#Z#
650 PMODE4,1:SCREEN1,0:PRINT#-2,
CHR*(19)CHR*(27)CHR*(28):DRAW"C1
":GOSUB190:DRAW"C0":IFFO=1THEN68
5
660 FORU=255TO0 STEP-1:POKEHP,0:
B#=STRING*(80,32):FORV=0TO79:IF1
=PPPOINT(U,V)THENMID*(B#,V+1,1)="
":ELSEMID*(B#,V+1,1)=A#:CT=V+1:
C=1
664 NEXT:POKE65494,0:IFC=0THENPR
INT#-2," ":NEXTELSEPRINT#-2,LEFT
*(B#,CT):C=0:NEXT
665 CLS:PRINT@194,"PRESS 'C' TO

```

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```

PRINT NEXT", " SCREEN SECTION", "
PRESS ANY OTHER KEY TO STOP":8
0SUB19: IFZ<>"C" THEN 692 ELSE SCREE
N1, @: FORU=255 TO @STEP-1: POKEHP, @
666 FORV=@ TO 159: V1=V-79: IF1=PPO
INT(U,V) THEN MID$(B$, V1, 1)=" ": EL
SEMID$(B$, V1, 1)=A$: CT=V1: C=1
667 NEXT: POKE65494, @: IFC=@ THEN PR
INT@-2, " ": NEXT ELSE PRINT@-2, LEFT
$(B$, CT): C=@: NEXT
67@ CLS: PRINT@194, "PRESS 'C' TO
PRINT LAST", " SCREEN SECTION", "
PRESS ANY OTHER KEY TO STOP":8
0SUB19: IFZ<>"C" THEN 692 ELSE SCREE
N1, @: FORU=255 TO @STEP-1: POKEHP, @:
FORV=16@ TO 192
671 V1=V-159: IF1=PPOINT(U,V) THEN
MID$(B$, V1, 1)=" ": ELSE MID$(B$, V1
, 1)=A$: CT=V1: C=1
674 NEXT: POKE65494, @: IFC=@ THEN PR
INT@-2, " " ELSE PRINT@-2, LEFT$(B$,
CT): C=@
675 NEXT: GOTO 692
685 PRINT@-2, CHR$(27) CHR$(20): FO
RV=@ TO 131: POKEHP, @: B$=" ": CT=@: FO
RU=@ TO 131: IF1=PPOINT(U,V) THEN B$=
B$+" " ELSE B$=B$+A$: CT=U
69@ NEXT: POKE65494, @: PRINT@-2, LE
FT$(B$, CT+1): NEXT: PRINT@-2, CHR$(

```

```

27) CHR$(19)
692 PRINT@-2, CHR$(27) CHR$(54): GO
SUB19@: GOTO 695
695 GOTO 1@
9@ CLS' ***LOAD FILE***
91@ PRINT@1@3, "LOAD FILES": IFCT
=4 THEN PRINT@199, LEFT$(MT$, 21), EL
SE PRINT@198, RIGHT$(MT$, 23)
915 POKE65494, @: GO SUB 99@: CLOADMC
L@: IFCT=5 THEN OPEN"I", @-1, F@: INPU
T@-1, X, Y, LN, SC$, SC$: FORK=1 TO 1@: IN
PUT@-1, SC$(K): NEXT: CLOSE-1
92@ PMODE4, 1: SCREEN1, @: COLOR@, 1:
DRAW"C@": GOTO 13@
95@ CLS: ' ***SAVE FILES***
955 PRINT@1@3, "SAVE FILES": IFCT
=6 THEN PRINT@199, LEFT$(MT$, 21), EL
SE PRINT@198, RIGHT$(MT$, 23)
96@ POKE65494, @: GO SUB 99@: 80 SUB 99
4: FORJ=1 TO 2: CSAVE MCL$, 1536, 7679,
1536: MOTORON: Z8=2: TIMER=@: 80 SUB 1
7: IFCT=6 THEN NEXT ELSE OPEN"O", @-1,
F@: PRINT@-1, X, Y, LN, SC$, SC$: FORK=1
TO 19: PRINT@-1, SC$(K): NEXT: CLOSE-
1: TIMER=@: MOTORON: 80 SUB 17: NEXT
965 MOTOROFF: 80 TO 1@
99@ PRINT@262, "" : INPUT" FILE NA
ME": F@: IF LEN(F@) > 7 THEN F@=LEFT$(F
$, 7)

```

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PCLEAR 80 Software...

Thanks RAINBOW readers for the continued support. We had to go back to the "endless list" type ad because there's a lot of new stuff and we want you to know what we have. But the new catalog is going to the printer today. We put a few hints and tips in there, including how to PCLEAR @ with disk.

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```

992 IFF$(<)" THENCL$=F$+"M":F$=F$
+"T":RETURNELSECL$="":RETURN
994 PRINT:INPUT" RUN PAST LEA
DER";Z$:IFZ$="Y" THENMOTORON:ZS=1
0:TIMER=0:GOSUB17:MOTOROFF:RETUR
NELSERETURN
1000 CLS 'MAIN MENU
1010 PRINT@13,"SIGNS",,, " STA
RT NEW SCREEN"," RETURN TO OL
D SCREEN"," PRINTER",,, "
LOAD FROM TAPE",TAB(6)MT$,,, "
SAVE TO TAPE",TAB(6)MT$,,,CH$;:
CT=1
1020 Z$=HEX$(CT):LO=INSTR(1," 12
3 45 67",Z$):LP=LO*32+2:PRINT@
LP,">";:
1030 GOSUB19:PRINT@LP," ";:IFZ$=
CHR$(10)ANDCT<7THENCT=CT+1:GOTO1
020ELSEIFZ$=CHR$(94)ANDCT>1THENC
T=CT-1:GOTO1020ELSEIFZ$(<)>CHR$(13
)GOTO1020
1040 ONCT GOTO100,1050,600,900,9
00,950,950
1050 IFSC$(1)=" THEN1010ELSESCRE
EN1,0:GOTO130
2000 'LETTER STRINGS SUB
2010 A$="0":B$="":X=0:Y=0:U=0:V=
0:BI$="D6R3E1":CI$="BR4BD1H1L2G1
D4F1R2E1":LI$="D6R4":LE$="BR3BU6
":G$(65)="BD6U4E2F2D1L4R4D3BR3BU
6":G$(66)=BI$+"U1H1L3R3E1U1H1L3B
R7"
2020 G$(67)=CI$+"BR3BU5":G$(68)=
BI$+"U4H1L3BR7":G$(69)=LI$+"BU3B
L1L3U3R4BR3":G$(70)="D6U3R3L3U3R
4BR3":G$(71)=CI$+"U2L2BU1BR5BU2"
:G$(72)="D6U3R4D3U6BR3":G$(73)="
BR1D6BR3BU6":G$(74)="BD4D1F1R2E1
U5BR3"
2030 G$(75)="D6BR4H3L1R1E3BR3":G
$(76)=LI$+LE$:G$(77)="D6U6F3E3D6
"+LE$:G$(78)="D6U5F4D1U6BR3":G$(
79)=CI$+"U4BR3BU1":G$(80)="D6U3R
3E1U1H1L3BR7":G$(81)=CI$+"BL1F2B
H1BU1U4BR3BU1":G$(82)="D6BR4H3L1
R3E1U1H1L3BR7"
2040 G$(83)="BD5F1R2E1H4E1R2F1BR
3BU1":G$(84)="R2D6U6R2BR3":G$(85
)="D5F1R2E1U5BR3":G$(86)="D4F2E2
U4BR3":G$(87)="D6E3F3U6BR3":G$(8
8)="D1F4D1BL4U1E4U1BR3"
2050 G$(89)="D1F2D3U3E2U1BR3":G$
(90)="R4D1G4D1R4BR3BU6":G$(49)="
BD1E1D6BR3BU6":G$(50)="BD1E1R2F1
D1G4R4"+LE$:G$(51)="BR1G1BD4F1R2
E1U1H1L2R2E1U1H1L2BR6":G$(52)="B
D6BR3U6G3R4BU3BR3":G$(48)=CI$+"U
4G4BR7BU5"
2060 G$(53)="BD5F1R2E1U2H1L3U2R4
BR3":G$(54)=CI$+"U1H1L3BE1BR6BU2

```

```

":G*(55)="R4D1G4D1BR7BU6":G*(56)
="BR1G1D1F1G1D1F1R2E1U1H1L2R2E1U
1H1L2BR6":G*(57)="BD5F1R2E1U3G1L
2H1U1E1R2F1D1BR3BU2"
2070 G*(32)="BR7":G*(33)="BR1D3B
D2D1BR3BU6":G*(34)="BR1D2BR3U2BR
3":G*(35)="BD2R4BD2L4BU3BR1D4BR2
U4BU1BR4":G*(36)="BR4BD2H1L2G1F1
R2F1G1L2H1BR2D2U6BR5"
2080 G*(37)="D1R1U1L1BR4D1G4D1BR
3R1U1L1D1BR4BU6":G*(38)="BF4BR2G
2L2H1E4H1L1G1D1F4BR3BU6":G*(39)=
"BR1D2BR3BU2":G*(40)="BR3G2D2F2B
R4BU6":G*(41)="BR1F2D2G2BR6BU6"
2090 G*(42)="BR2BD1D4BH2R4BU1BL1
G2BU2F2BR4BU4":G*(43)="BR2BD1D4B
H2R4BR3BU3":G*(44)="BD5BR1L1U1R1
D2G1BR4BU7":G*(45)="BD3BR1R3BR3B
U3"
2100 G*(46)="BD6BR1L1U1R1D1BR3BU
6":G*(47)="BR4D1G4D1BR7BU6":G*(6
1)="BD2R4BD2L4BR7BU4":GC*="BD2R1
U1L1D1BD3R1U1L1D1":G*(58)=GC*+"B
R4BU5":G*(59)=GC*+"BR1D1G1BR4BU7
":G*(60)="BR4G3F3BR3BU6":G*(62)=
"BR1F3G3BR6BU6":G*(63)="BD1E1R2F
1G2BD2D1BR5BU6"
2110 ST*=CHR*(8)+CHR*(9)+CHR*(12
)+CHR*(13)+"\ "+CHR*(94)+CHR*(95)
+CHR*(10)+"@I1:;!,'.&MW":MT*="BR

```

```

APHICB SCREEN ONLY BR
APHICB SCREEN & TEXT":CH*="UBE U
P OR DOWN ARROW TO CHOICE AND
PREGS <ENTER>"
2130 DATAD6,6F,C1,FE,27,03,7E,02
,73,F6,FF,22,54,25,FA,GA,00,BD,0
E,0C,01,0D,27,00,0C,9C,D6,9C,D1,
9B,25,02,0F,9C,32,62,39
2200 'POKE PRINTER DRIVER
2210 :RESTORE:GOSUB2220:FORB=A T
O(A+36):READL*:L*="&H"+L*:L=VAL(
L*):POKEB,L:NEXT:RETURN
2220 L*="":VP=0:A=0:B=0:L=0:VP=V
ARPTR(PT*):A=PEEK(VP+2)*256+PEEK
(VP+3):RETURN
10000 AUDIOON:POKE65494,0:GOSUB9
94:FORC=1TO2:CSAVE"SIGNS":MOTORO
N:FORX=1TO600:NEXT:NEXT:MOTOROFF
10100 CLS:PRINT@99,"***** S
IGNS *****",,TAB(15)"BY",,,
TAB(8)"RICHARD A. WHITE",TAB(11)
"44 DOW CT.",TAB(6)"FAIRFIELD, O
H 45014",TAB(10)"513-829-5163",
,,TAB(7)"(C) COPYRIGHT 1982":PRI
NT:PRINT" HIGH SPEED POKE Y/N"
;
10110 GOSUB19:IFZ*="Y"THENHP=654
95:PRINT" YES";GOTO 10 ELSEHP=6
5494:PRINT" NO";GOTO 10

```

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Pro-Color-File 'Jazzy' File Management

By Ed Lowe

I spend a lot of time at my CoCo pounding out programs—applications programs. Mostly, data manipulation programs. My fingertips actually seem to have grown mallet-like and I'll bet the wife, kids and friends look upon me as some kind of mutant. "Weird Ed" is what I imagine they call me as I disappear for hours on end into my inner sanctum to commune with my computer. No matter of great concern to me, though!

In the past three months, I have written several programs for our young but rapidly growing Color Computer club. Among them are one with many features except a record deletion capability (optimism) to index information on members and a very versatile programs library. Even wrote a couple for my wife to let her make up a week's menu in advance and do her grocery shopping list in a matter of minutes. (Those also served as a way to get her in front of the computer.) I also hold a structured programming class for the club. I spend a lot of time pounding the keyboard.

It occurred to me recently, however, as I launched into yet another files management program, that I probably was reinventing the wheel a mite too often. I decided I needed to take a new approach and try to come up with one program which would allow me the flexibility to create and manage any file from it. Such a program would also have to permit generation of a number of different reports from a single file. It would be designed to allow any desired number of record fields with headings to be stipulated by the user. A really jazzy, all-purpose "this is it" files management system. I had all its features laid out in my head. But I only got as far as the conceptualizing stage before *the Rainbow* sent me another product for review. I could see right away that I had been beaten to the punch. The wheel had not only already been invented, but perfected! But I don't mind too awfully much because such a project would have taken me a long time to complete anyway.

What beat me to the punch is *Pro-Color-File*, released just this year by Derringer Software and already upgraded to version 2.0. It is exactly what I had in mind! And this system is disk-based for single or multiple drives.

Pro-Color-File can be described as a complete files management system for the Color Computer. With it, one can enter, store, search, update, and get various printer reports from his information. Club listings, student grades, job reports, church funds, mailing lists—the litany could go on and on. No longer will you find yourself using those single-purpose programs you thought were the ultimate. This one is designed to handle it all for you.

It might be interesting to note that the programs which make up *Pro-Color-File* are all in BASIC! These programs, all run and controlled from a master menu, are:

- Define data segments
- Define screen formats
- Define equations
- Define report formats
- Pro-Color-Files
- Enter/update records
- Index records
- Print reports
- Exit program

In addition to these system programs, the registered master disk comes with a number of already created demonstration files, screens, and reports to be used in the tutorial phase. (One of them is a club membership file!) After you progress beyond the tutorial stage, you can kill them on your backup working diskette, leaving just the necessary working programs.

I would try to describe for you what each program does, but because they rarely work in isolation, this wouldn't prove very much. Consider each subordinate program as a large subroutine or module within the overall program, and we'll have a better chance at perspective.

The package I received, version 2.0, came with two addendum inserts: revisions for owners of 1.0; and a couple of added features for the current version. I also received a call advising of another change. All changes can be easily made by the owner/user.

The manual accompanying the product impressed me a lot. Not just because of its polished look—neatly right-justified print within a heavy paper blue roll binder—but in its layout and approach to instruction. It is apparent that the author put as much thought into the manual as into the

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program package. It actually teaches you how to use the product, and with a minimum of confusion and "say what?" Repetition is tactfully used throughout to drive points home.

The manual is broken down nicely into a page of "thanks for buying my product" and the usual copyright and sales contract notices, two pages covering a really comprehensive table of contents, and introduction, 31 pages of tutorial, a good quick reference and some comments on how to get a well-functioning data base through planning and proper preparation.

The format of the tutorial section itself is commendable. Generally, it follows a scheme of program feature (module) introduction, explanation, and then actions for you to take. Bold print is used very effectively throughout. Because of this hand-holding approach, I had little real difficulty stepping through the various stages of creating a file. High marks for documentation alone!

Don't get me wrong, though. *Pro-Color-File* is not a simple "open, load and run" program. It's not the kind of program you order the day or week after first getting your 32K CoCo with disk drive and printer. It couldn't be, given the expected results. *Pro-Color-File* is for the person with a need for a good, sophisticated, user-controllable files management system, *but* that person must have some knowledge of what files management is all about. (The author includes a short primer on files management in the accompanying manual.)

Some of *Pro-Color-File's* features, like formatting a report using screen "windows" and a unique method of defining equations, take some getting used to. But, get used to them you will, because you'll find yourself delving into this program. And it's not hidden from your view. After backing up the master diskette and putting it away for safekeeping, you might ask how a program was designed which can:

- allow as many as 60 different entries per record (you define);
- index a file by any three fields simultaneously for rapid direct access in under 10 seconds for a 1,000 record file (with re-indexing possible at any time);
- have four screens for entering information with optional password protection, custom color design and rapid switching during entry and review;
- have five printer report formats with built-in features like selection of line width, lines per page, page numbering, control codes, and password protection;
- design screen report formats to get totals and averages or to review only selected fields;
- have 14 user-defined math equations to do addition, subtraction, multiplication or division of numeric data;
- and, allow multiple disk drives for maximum storage.

If you've got enough printer paper and want to take the time, you can look over the program code and perhaps find the answers to your questions. In fact, the author encourages you to adapt *PCF* to perform special functions by *LISTing* the appropriate programs and *EDITing* them.

After several days of playing with *PCF*, I finally printed out several reports on my Line Printer VII using different formats. When each was exactly as I wanted it, I then went back and recorded (saved) that particular format to disk. Now all I have to do is call up a specific screen and report format and I'm off and running.

I wanted to try some other printers, notably the MX/FX-

80 and Okidata 82A, to test and verify the reported ease with which they are supported, but, as Murphy's Law would have it, I couldn't get my hands on them. Judging by the system for embedding control codes in the printer report program, though, I have no doubt that *Pro-Color-File* will in fact support all of the popular printers.

What problems did I meet? Only two. The section on defining math functions left me scratching my head for a few days because I could not see exactly what the point was. As is usual with us cyberphiles (like that word?), dogged persistence paid off. The result: ability to enter numerical data in records and get some outstanding results with ease. (Notice how I keep using that phrase "with ease?") Kind of like a spreadsheet within a file. The second? Well, I get kind of fumbly-fingered swapping out system and data disks in my single-drive system. No doubt, I'll get used to it fast, though, unless Drive 1 drops to below \$99.95 (including tax byte) soon!

I don't suppose you can fully sense my somewhat understated enthusiasm for this product. If you can't, then I'll say it. I like *Pro-Color-File*. I like what I can do with it. I like the fact that now I won't have to write a program for each unique filing problem anymore. I like the overall professionalism attained by its creator. And I agree with him when he says, perhaps with a little bias, in his full-page ad, "If you're through playing games and are ready to get serious about software, then *Pro-Color-File* is for you." I like it and think you will too. It's definitely a gigantic step for the serious CoCo users.

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Outlook Is Bright For 'Smart' DMP-200

By John Fernald

I feel that it is appropriate for me to preface this review with a brief overview of my experience, to assist the reader in assessing the relative value of my comments.

I consider myself to be a rank novice in the field of computing, having owned a 32K Extended Color Computer for somewhat less than 10 months. My initial "set-up" included the computer, the CTR-80A cassette recorder and a Line Printer VII. After about six months of operation I acquired a Disk 0 system, and several weeks ago I further strained my wife's patience as well as the family budget by purchasing a new DMP-200. If my "expertise" only matched the quality of my equipment, I am certain that this would be a much more probative review. The one thing I feel that is favorable to my viewpoint lies in the fact that my experience level probably equates to that of a sizeable portion of the magazine's readership. At any rate, I hope that the following comments will be meaningful, or, more importantly, *helpful* to those readers interested in this hardware item.

Last week, after what seemed like an intolerable wait, I began unpacking the newly arrived object of this submission. The first unpacking steps (Numbers 1-9) are outlined in a set of instructions which include an exploded view of the printer and the associated packing materials. The directions are okay, but I recommend a review of pages 1-5 of the

enclosed operator's manual upon reaching unpacking instruction number 7.

When you have successfully released your new "pride and joy," set it aside, get a cup of coffee or something and sit down with the operator's manual. If you are anything like me, afflicted with a terminal case of "I want to see it work"-itis, take a deep breath, a tranquilizer or whatever helps, and thoroughly read pages 7 through 18 of the manual. This activity will take you from a power-up checklist through tractor and ribbon installation, paper loading, print function and character switch selection, and finally a power-up and self test sequence. By the way, if you are using standard 8½"-by-11" fan fold paper, the "self-test sequence" (which requires 10-inch wide paper) will work just fine. A successful "self-test" can be used to print sample lines of each type character by employing the yellow rotary character selection switch on the rear of the printer, but more on this in a moment. A completion of the test sequence calls for computer hook-up, which is via the standard 4-pin DIN cable (RS No. 26-3020) for Color Computers, followed by complete system power-up, and you're "off to the races."

At this point, I think it would be appropriate to provide you with a description of the features which make this printer a quantum jump ahead of my old Line Printer VII. The DMP-200 is a high density, dot-matrix printer, capable of creating characters on dot-matrixes ranging from 9X8 to a variable 15X9. This flexibility permits construction of Proportional spaced, Monospaced (Normal, Condensed and Compressed), Correspondence quality, and Graphic characters. It does this at print speeds ranging from 120 cps (Standard) or 70 cps (Correspondence Quality) to 35 cps (Elongated Correspondence Quality) on roll, single sheet or tractor feed paper. The DMP-200 will print one original and two copies on (11 lb) non-carbon type paper, a significant improvement over the LP VII.

Externally, the 200 is about 50 percent larger than the 100, and weighs a few more pounds. While the LP VII and DMP-100 are conspicuously free of external controls, the 200 sports several very nice user-operated function switches. These controls are found in two external areas on the printer. First, on the upper left front of the device you will find the "Paper Feed Switch" and the "Power On" & "Alert Indicator" lights. The right side of the device houses the "Platen Pressure Lever," "Paper Bail Lever," and the "Paper Feed Knob." The only other "easily accessible" control, the "Power On-Off Switch," is slightly recessed on the lower left side of the unit.

The balance of the operator controls are far less accessible and, in my opinion, represent the printer's most undesirable characteristic. These controls include the "Function Selection (DIP) Switch" and the "Rotary Character Selector Switch." The DIP switch is actually a small (very small!) panel containing eight (even smaller!) up-down/on-off toggle type switches. These switches control the following: (1) Carriage Return and Line Feed operation, (2) Data/Word Processing mode, (3) 1200/600 Baud operation (serial interface mode), (4) Parallel/Serial Interface, (5) European Symbol/Japanese KANA mode, while switches (6), (7), and (8) are not used. Generally speaking, the user will be faced with changing only two of these switches, the "Data/Word Processing" switch and the "Baud Rate" switch. When the printer is connected and ready for use with either roll or tractor-feed paper, these switches are virtually inaccessible. After turning off the printer and moving the paper or printer (or both), you must first position yourself to see the panel

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and then use a slender pointed article (i.e. a pen or pencil) to reposition the appropriate switch(es). Fortunately, these operations can be changed through computer inputs. A review of pages 45-47 (Appendix A/Control Code Summary) in the operator's manual indicates a *PRINT* #-2, *CHR\$19* entry will place the device in the "Data Processing" mode, while *CHR\$20* changes the mode to "Word Processing," regardless of the DIP switch setting. Since the 80CC defaults to 600 baud on a power-up and in view of the printer's ability to operate at 1200 baud or 600 baud, the operator must do one of the following. Set the printer to 600 baud with the DIP switch and operate in this manner. Set the DIP switch to 1200 baud and employ software (i.e. word processor or terminal program) which provides for baud rate selection. Or set printer to 1200 baud and after computer start-up enter "POKE 150,41" placing your CoCo in the 1200 baud output mode, allowing you to *LLIST* programs at 120 cps in the "Standard" mode with no software support.

The "Rotary Character Selector Switch" is located next to the DIP switch panel, between the cable connector and the DIP panel. This switch is also quite small and equally inaccessible. It has 10 positions, ranging from 0 to 9, producing the following character/styles; 0-Standard/10cpi, 1-Compressed (Elite)/12cpi, 2-Condensed 16/7cpi, 3-Proportional, 4 through 7-Correspondence quality/10cpi, 8-Standard/10cpi, and 9-Compressed (Elite)/12cpi. Although this switch is difficult to reach, with or without paper installed, it can be positioned by touch since each of the 10 selections has a "feelable" detent position. The printer defaults on start up to the mode selected, however, as in the DIP selector, the character mode can be changed through software or user program inputs. As indicated above, the print cable connects at the center rear of the printer and

cannot help but interfere with tractor-feed paper placement and operation. This may also be a problem, albeit a smaller one, with roll paper in use. I cannot understand, perhaps because I am not a design engineer, why it would be so difficult to install the cable connection on the right side of the printer where it would be more convenient for a "printer on the left" arrangement. Before leaving the area of "external controls" I should mention the fact that the same people who put the cable receptacle, DIP and Character Selector switches on the back have installed a miniature DIP and Character Selector switch instruction sheet underneath the printer's top cover. This is a very beneficial feature as it saves a lot of looking around for the manual while trying to print out a letter or list a program.

Under the protective cover of the printer we also find two additional operator controls. First, the tractor feed assembly, which can be easily removed or reinstalled as the need arises for paper type changes (roll, fan-fold or single sheet). Secondly, the "Print Head Control Lever," which controls print head to paper pressure during ribbon change and printing operations. It must be properly adjusted by the user to preclude damage to the print head, resulting from too little pressure or print smudging, caused by excessive pressure. The printer comes with a "ribbon cassette" assembly which is easily installed and replaced (RS Refill Pack No. 26-1489). The ribbon life will depend on the type (graphics, text, program listings, etc.) and frequency of printer operations. Similarly, the print head life will vary with use but is projected by Radio Shack for 2,000 hours. According to the manual, this figure equates to 32 months, with an average utilization of two hours per day. I feel that most home computer enthusiasts operate their printers at less than a two hour per day average and should therefore anticipate a print head life in excess of three years.

The final and perhaps the most important area I should like to address centers on the DMP-200's status as one of a number of "smart" printers. As a "smart" printer the 200 has the ability, through software program control, to change virtually all print functions during normal operation. The device utilizes a 2,000-byte buffer to store, and transmit to the print head, a total of 330 ROM based, dot matrix, character patterns, and over 30 printer control codes. Appendix A and Appendix B of the manual provide complete listings of "control codes" and "character sets," along with their respective decimal and hexadecimal equivalents. For example, sending the printer a control code of DECIMAL 15 (HEX OF) during print operation will immediately invoke the underline function. This function will continue until the printer receives a control code input of DECIMAL 14 (HEX OE). Each of these functions is attainable as long as the printer is functioning in either the data or the word processing mode, but not in the graphics mode. Some of the more important software control codes found in the table provide back spacing, variable line feeds, print elongation, print head positioning, bold type, reverse line feeds, and repeat print.

In addition to these tools the 200 offers software access to the full set of ASCII characters, a set of block graphic codes and a set of European symbols. This means that in addition to all the ASCII characters normally available through computer keyboard entry (upper and lower case), a large number of other characters are available through software or program manipulation. In other words, documents which require a "one fourth" fraction, "Pound Sterling," "Trade Mark," or "Copyright" symbol can be prepared with professional reproductions of these characters. Many of the char-

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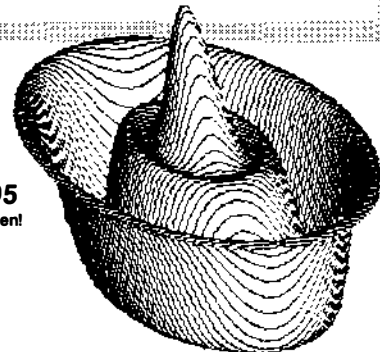
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acters available will probably not be used by the average home or small business operator, but those documents which do require them will be much more professional in appearance.

The Radio Shack people have provided us with what I believe to be a well constructed and versatile printer, capable of producing high quality, dot matrix style documents. However, the 200's ability to provide the user with optimum support will depend heavily on the type and quality of software support employed. At this point, I would like to give credit to the company whose software I have employed to complete this review. The article, as well as the hardware testing functions conducted during its preparation, were completed using the *Super Color Writer II* by Nelson Software Systems. My "SCW" (disk version) is an outstanding product, designed to support the "smart" printer through use of software selectable control codes, which are easily imbedded in the text during document preparation. This permits effective use of those characters which are not available on the keyboard, as well as functions like underlining and bold printing.

This review has intentionally provided little in the way of comparative data between the DMP-200 and other printers of similar cost and construction. Those minor comparisons with the LP VII and the DMP-100 were provided for those readers who, like me, may consider this product as a potential replacement for, or alternative to, one of these units. I feel that the 200 will prove to be a reasonably priced, fast, and dependable printer, having the added benefit of being a product of the company which has created the most powerful and reasonably priced personal computer marketed today.

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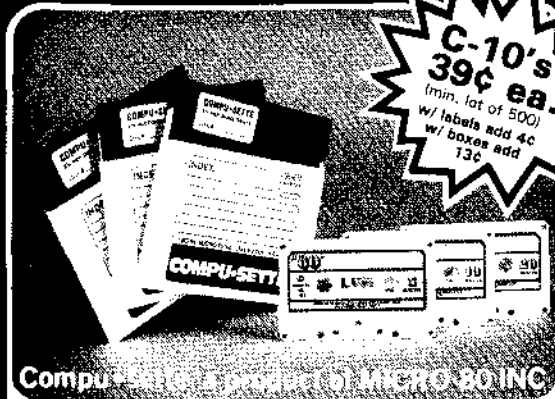
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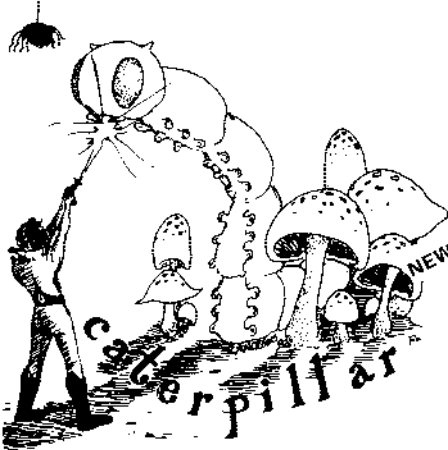
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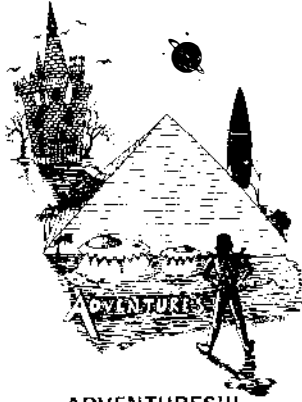
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Telewriter-64: Big Time, 'Big K' Word Processing

The prime goal of a text/word processor is to facilitate the processing of textual data for the purpose of documentation, communication or text editing functions. Most text editors do an adequate job of preparing text files for input to various compilers and assemblers. However, they leave a lot to be desired when it comes to performing such functions as documentation and written communication. A good word processor will perform both of these functions very nicely. *Telewriter-64* is a full word processor offering all the standard functions expected in a full-sized processor.

Telewriter-64 comes in either a cassette or disk version. The version being used for this review is the disk version. The processor comes on a 5¼" floppy. The manual is divided into two sections. The first section contains a tutorial on the use of *Telewriter-64*. This section is well written and is designed to walk someone, who has had absolutely no experience with word processors, through its application. The tutorial section is 53 pages long. The first 18 pages are dedicated to using the Editor function, the heart of the processor. The remaining pages go into a detailed description of the other processor functions. The tutorial section follows the reference manual in layout and provides an adequate description of each function and its use. The second section is a reference manual designed for those who are already familiar with word processors and need only to

know the command syntax being used.

Telewriter-64 is a screen editor. A screen editor is one in which the data is always present and can be scrolled through both backwards and forwards. Thus, if for some reason you should decide you want to change a sentence or word in any of the text, it is a simple matter to do so. All one has to do is position the cursor to the section of text to be modified and perform the desired function. Then move the cursor back to the original point and proceed. *Telewriter-64* offers all the standard text processing commands of insert, delete, block copy, block delete, block move, paging, string find, page forward, and adjustable tab stops. In addition, it also offers a speed mode, high density mode, search for special characters, global search and replace, and a wild card search.

The high density function offers three different screen displays. The normal display is 51 x 24. That is, each line is 51 characters wide, with 24 lines being displayed at one time. The other displays offered are 64 x 24 and 85 x 24. The 51 x 24 is easily readable on a standard TV screen. The 64 x 24 is still readable, but has started to lose some of its sharpness. The 85 x 24 is very hard to read, but it serves a very special purpose. If the document you are preparing is to contain any form of tabular data or specially prepared diagrams, the 85 x 24 display will allow you to examine the display without actually having to print it.

Another departure from other word processors is *Telewriter-64's* absence of a moving window. Use of the different display sizes and the ability to reformat the text at any time makes the moving window unnecessary. If you are using a line length longer than 85 characters, the editor uses a continuation line to show where the right margin is. It requires some getting used to, but once you have made the adjustment it is very smooth.

The wild card search allows you to perform a find on a given string with *I don't care* positions in the string. Suppose you wanted to find all occurrences of "thier" or "their." You would specify a wild card search using the caret for the *I don't care* positions. The search word would be "th(caret) (caret) r." The speed mode is used when the text buffer becomes quite large and you are typing quite fast. Suppose you had a large buffer of data already entered and you discovered you had omitted a paragraph way back at the beginning. When you go back to perform the insert function, and you are entering data at a pretty good pace, you may notice that not everything you typed is getting entered. The reason for the lost data is *Telewriter-64* cannot get the large screen repositioned in time to be ready for your next character, thus some characters are missed. To overcome this problem they have incorporated a speed mode. The data is entered, in the case of our paragraph, as if it were the only text in memory. When you are finished the entire block is entered and the large text buffer is reformatted just once.

Telewriter-64 performs its own I/O handling. One nice feature incorporated into its routines is its ability to handle cassette errors. Suppose the tape is in the middle of a file and you want to locate a different file you know is further down the tape. In BASIC, you are required to continually re-enter the *SKIPF* command until you reach the header record for a file. *Telewriter-64* knows how to search down the tape looking for the header record of the file you are looking for. It will only "error out" when it cannot find any data on the tape, ie a blank tape. The I/O functions include saving a file, partial save to a file, read-in a file, append files and verify a file. The last function, verifying a file, is important to cassette based systems. The verify command allows you to

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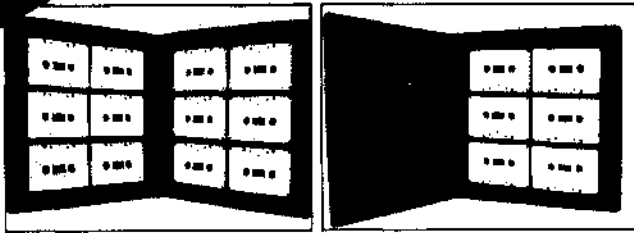
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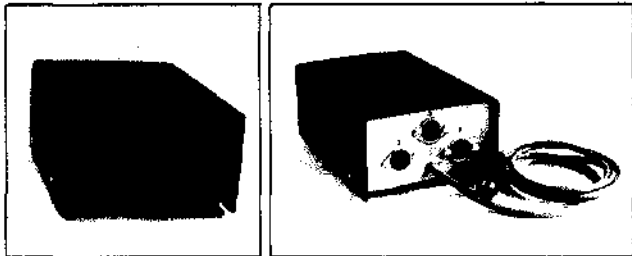


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CoCo-Writer comes with excellent documentation. The clearly written manual includes a table of contents and an index. A separate, sturdy, laminated card contains a summary of all commands for quick reference.

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verify the integrity of the file just saved or any other file on the tape. It gives the user peace of mind. No surprise drop-outs on the tape to be found at a later date.

Telewriter-64 has three menus. The first is the main menu and it is the one the user will see the most of. Its functions are to provide general information on the processor operation, perform cassette I/O functions, lead to disk I/O menu and the printer format menu. The disk I/O menu handles all the disk read/write functions. It offers the same options as are offered for cassette I/O with the exception of the verify command. *Telewriter-64* also provides for the listing of files on disk to either the screen or the printer. You can also rename a file as well as kill or delete a file from this menu. You are also reminded of the last file accessed, the amount of free memory left, the default drive number. The third menu is the format menu and is used to set the print parameters. You can set line spacing, left margin, line length, upper margin, lower margin, lines per page, printer baud rate, control codes, page numbers, right justification, printer queue and header information from this menu.

Telewriter-64 is a well-written word processor which I believe does an excellent job. It is simple to learn to use and has a very desirable format. It provides for upper/lower case displays. The lower case descenders are not true descenders in that they do not go below the line. However, that is a function of the display only, as the output of the printer is controlled by the printer itself.

There is one feature which I found quite nice. *Telewriter-64* assumes that all text editing should be done in the insert mode. That is, when you go back into the text, you are automatically in the insert mode. Most other word processors will be in an overstrike mode at this point. Thus, instead of deleting text and rewriting it, one just types over it. With the insert mode, anything entered in previous text is auto-

matically inserted, thus there is no lost data because of inadvertent overstrikes. It took me a short time to get used to it, but once past that initial stage I fell in love with it. The response to cursor positioning is excellent. The time it takes to scan a line is very good. Cursor movement is smooth and consistent. I find *Telewriter-64* lacking in only one aspect. It would have been nice to have an auto-repeat function, which, by simply holding a key down, would generate that character at a given rate until the key is released.

I like *Telewriter-64*. I find it to be an excellent word processor and it does perform as described in its advertisements. The no window-continuation line concept required some getting used to, but the adjustment was minor. The end of text is always marked by a large black cursor. The position of the cursor during an edit function consists of a single underline character symbol. Thus during editing of existing text, a character is never hidden under the cursor.

Telewriter-64 is a full-sized word processor offering all the features one would expect to find in the more expensive processors. *Telewriter-64* is a stand alone processor that knows how to use all 64K of your system memory should you have it installed. There is approximately 16K of free memory when running *Telewriter-64* on a 32K system. *Telewriter-64* will produce documents of good quality. I believe every home computer system should own a word processor of one form or another. *Telewriter-64* makes it relatively inexpensive to own a first-rate quality processor. This review was written using *Telewriter-64* and it was really a joy to do.

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— Frank J. Esser

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CO-EXISTENCE The Good And The Bad

CO-EXISTENCE is a geopolitical game for two to six players. It runs on 16K and is non-graphic. Each player controls the destiny of his country by developing its natural resources. The goal is to achieve a stable economy without losing population to war or famine. Each player attempts to reach stability for his country by developing farms, mines, oil wells, steel mills, and factories. The population of each country starts expanding immediately as the game begins and consumes goods at a predictable rate.

In addition to worrying about producing enough food and other goods for his fellow men to consume, each player must develop a transportation system that will support a growing economy and train the unskilled workers in order to reduce unemployment. This would be enough to keep any ruler busy fulltime, but this game has more.

There are neutral countries and islands that can be used to develop additional resources for a country. A player can develop his armed forces to become a bully and take what he wants, or at best, defend his own country from being seized.

If a country has a good foreign policy, it can export and import goods with other countries. Two or more countries can join forces to overthrow other countries either by peace-

ful trade boycotts or by using military force.

The computer, of course, does all the number crunching and keeps track of each country's population, resources, etc. In fact, it even collects taxes each round. The game is played on a game board that has a map showing all the countries and locations of development sites. Each player keeps track of where he has farms, mines, military forces, factories, etc., by placing colored markers on the map.

Now that I've given you the good news about *CO-EXISTENCE*, I will tell you what I don't like about it. The overall appearance of the materials I received were not professional looking at all. The map that was enclosed was actually two pieces of a grid-type paper taped together. The way the countries were drawn on the paper made it very difficult to distinguish borders between countries. The lettering that was done to identify the countries and their resources was readable, but not very neat. The documentation which is 11 pages long is pretty well written, but there were a few items which I just could not understand. The second screen, displayed when the game starts, has two words broken up without any hyphens. I know this may sound nitpicky but, at \$24.75, I think we deserve higher quality.

If you have a lot of patience and are not concerned about the appearance of the game and documentation, then I would recommend you buy the game; otherwise, forget it.

(Intercept Enterprises, P.O. Box 4016, Cherry Hill, NJ 08034, \$24.75)

—Michael Hunt

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BASIC Programming Primer: 'Good Reference, Tutor'

The book *BASIC Programming Primer* (Second Edition) is a "tool" worth owning. This 368-page, soft-cover book serves two functions: it teaches BASIC programming to the neophyte, while it also serves as a reference book for the experienced programmer. This book is *not* written specifically for the Color Computer; it describes the commonly used statements and functions of Microsoft BASIC. (Microsoft is the company which wrote most of the BASIC versions presently in use—for Color Computer, the TRS-80 Models I & III, Apple, Commodore, etc.) Because special functions (graphics and sound) and disk input/output procedures differ so greatly between systems, these topics are not covered.

This book is comprised of seven chapters and seven appendices (including a removable BASIC Reference Card). Each chapter concludes with a series of review questions to test the reader's comprehension of the subject matter; all answers (with explanations) are included in Appendix G. The reader begins writing *useful* programs in Chapter I (a loan amortization program); each subsequent chapter expands on the preceding. To give the reader some idea of the book's contents, here is a *brief* summary of the seven chapters:

Chapter One: Basic BASIC. Definitions, system commands, simple output formatting, direct mode operation.

Chapter Two: Program Control. Loops, branches, simple mathematical functions, subroutines.

Chapter Three: Getting Organized. Arrays and matrices.

Chapter Four: Adding More Power. DATA/READ,

Numeric functions, string functions.

Chapter Five: Variations. Statements and functions that differ from system to system. System commands, including debugging aids.

Chapter Six: Advanced BASIC. Program structure. Error handling. Advanced input/output. Advanced string functions. Variable types—integer, single and double precision. Number base conversions.

Chapter Seven: Rubik's Cube. Applies previously learned principles to develop a program for the popular puzzle.

The seven appendices explain in detail the following subjects:


- Appendix A: Numbering systems
- Appendix B: Numerical conversion table
- Appendix C: Conserving space in long programs
- Appendix D: Speeding up a program
- Appendix E: Removable Reference Card
- Appendix F: Exponential (scientific) notation
- Appendix G: Answers to review questions

This book is well-organized with a detailed table of contents and index to facilitate the location of specific information. The authors' style is casual rather than pedantic; their sense of humor is displayed throughout the book. Numerous illustrations—cartoons, annotated program listings, flowcharts, and line drawings—amplify principles presented in the text.

This is an excellent book for any newcomer who seriously wishes to learn programming, and an excellent reference book for the experienced programmer. Just keep your Radio Shack manuals handy for answers to those specific questions concerning disk operation and graphics or sound applications.

(BASIC Programming Primer (Second Edition) by Mitchell Waite and Michael Pardee, Howard Sams & Co., Indianapolis, IN, Book No. 22014, \$17.95)

—Jerry Oefelein




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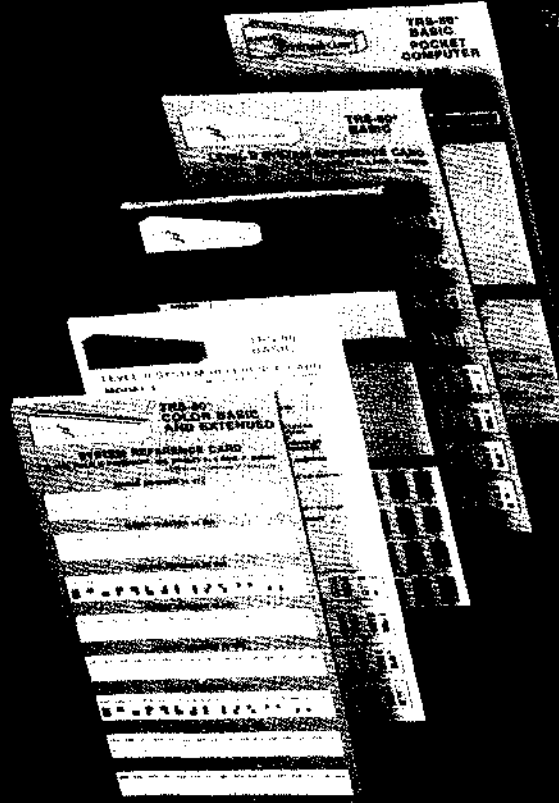
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M & M Makes A Good D & D Introduction

I, Thorafin Crimsonblade, sword in hand, bravely faced the unknown perils that lay before me in my great quest to free my people from the evil dungeon lord. *Monsters and Magic* pits your character against many hideous creatures that would simply love to munch on your bones for a tasty midday snack.

As a person with three years of Dungeons and Dragons (trademark of TSR Hobbies, Inc.) experience, I was delighted to have been selected to review *Monsters & Magic*, a game that claims to be similar to D&D.

At the beginning of the game you are given a set of characteristics which affect your character's ability to perform assorted spectacular feats. If you do not like your "roll," you may easily reroll until you find a character that you take a liking to. (After all, he's going to be you!)

Next, you pick your valiant Warriors' name. (I like mine.) After you have settled upon the adventurer's name, you will be assigned gold pieces, which you will need to purchase items at the market.

The hardy adventurer must then take a trip to the market to buy items no true (or smart) gladiator would do without—armor and weapons. After your adventurer has purchased these needed supplies, he is off to the dungeon!

Inside the dungeon the adventurer is given a menu of choices to perform in each location of the dungeon. The adventurer may fight any monsters that are in the room,

check status, take inventory, go on, search the area, run, open anything in the room, or buy supplies. This last choice was found humorous by some of my friends because it gives your adventurer the ability to buy items in the midst of a dungeon. It was often needed, however, because of an evil cleric running around with a knack for turning your armor into paper. Because of the limited choices that are presented on this menu, I would not call this game an adventure, but a simulation.

The reason you are in the dungeon is to try to defeat the number of monsters you selected at the start of the game. In your quest to defeat the number of monsters, you will probably gain a level, which aids in your efficiency against monsters.

While stumbling through the rooms, you will eventually be lucky (?) enough to run into one of the fifty monsters in the monster gallery. If you choose the fight option, then you will be asked to select a weapon from your arsenal. If the evil cleric has visited your weapons lately, then you will be forced to use your bare hands, which, needless to say, are not quite as effective as a sword. Next, you are asked to roll to see which one of the contenders goes first—you or the monster. Then, depending upon who won the roll, that person (thing) rolls to see if he/she (it) "hits" or "misses." If you or (gulp!) the monster manages to hit, you (or it) will roll for damage. I did enjoy rolling my own dice on the computer and it adds some enjoyment and action to the game.

If you defeat the number of monsters, you must try to defeat the evil dungeon lord in the final confrontation. If you manage to defeat the dungeon lord, you have saved your people! The Kingdom is, once again, safe!

My only complaint about the game is one others have remarked on: the game does not seem to be a game of skill, but one of chance that does not require much sleuthing around. My friends and I believe this because you may only choose your actions from a group of choices. This seemed to make the game a little too easy. However, this may be seen as an advantage as it allows an inexperienced fantasy role-player to learn the combat system. My suggestions to the game designers would be twofold: 1) create different skill levels, and 2) develop individual characteristics among the monsters.

I would not recommend *Monsters & Magic* to an experienced fantasy-game player. However, it would be an excellent tutorial to the novice game player who is trying to learn the combat system. Also, this game, which requires 32K ECB, would be right for any one who enjoys a simulation. This is a good one; just don't expect a D&D copy.


(Prickly Pear Software, 9822 E. Stella Road, Tucson, AZ 85730, \$19.95 tape, \$24.95 disk)

—Eric Oberle

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If you count yourself among the aficionados of the word games, you've already guessed that the word for this game is *Crosswords*, which, as Webster says in his Third New International Dictionary, is a game in which letters "appear in such a way that they read across and down and so that usually most letters appear as part of two words."

The principle of Radio Shack's version is the same, except for a few interesting variations: you receive no clues and,

depending upon your whim, you may play against the clock and up to three other players. You also may select from two modes—combination or single—and use either joysticks or the directional keys on your keyboard (which should help cut down on the number of pencils found lying around the house). It also comes in a convenient ROM format.

After you have inserted the cartridge and indicated the number of players, you type in the name of each player—a feature I found very convenient in keeping track of whose turn was next, since some letter combinations are likely to lead to some long and heated discussions. You then select the playing mode: Combination, which allows you to create one word per turn by combining seven letters selected by the computer with those already on the playing field (each letter may be used only once in the eventual word), or Single Plan, which begins with a clear field after each turn and your challenge is to make up as many words as possible.

The computer randomly selects seven letters each turn and the combination is sometimes mind-boggling. How many words, for example, can you compose from a selection of "QQRIETV?" I came up with only "TIER" myself, but I would suspect that long-time word-gamers could supply all sorts of variations (send your letters to Roy G. Biv, please).

The player's name appears in the upper left corner. If a time limit (30, 60, or 90 seconds) has been selected, a clock and score appear in the upper right corner. Below the name are the letter list and two arrows (left and right). You create a word by using either the joystick or the directional keys (not to be confused with the arrows on the screen) to move the cursor over the respective letters. Pressing the fire button or the space bar moves the letter to the right side of the screen. If you make a spelling error or want to delete a letter, moving the cursor over the left arrow and pressing the appropriate button or key will move the letter back to its original position, allowing you to begin anew. When you've completed a word, the cursor is moved to the right arrow, the word entered and placed at random near the center of the screen. From this point the game proceeds as each player's words are added to the board. Once a word has been selected, it cannot be changed. A turn continues until time elapses or until a player quits by selecting the right arrow with no word on the right side of the screen.

Upon completion of each turn, the competition is given the opportunity to accept or reject the validity of the word by positioning the cursor on "OK" or "NO." The rules specify that there should be no proper nouns, foreign words, misspellings or contractions (but it's not difficult to imagine those rules being bent).

Puzzle lovers, who are unaccustomed to time limits, will find it a bit difficult in the beginning to adjust to the idea of competing against the clock. In addition to needing to think fast, some dexterity is required in the use of the joystick and/or directional keys. That's really no problem, however, since you do have the option of playing without the timer.

Crosswords provides an infinite number of challenges, including some good educational experiences for children, and some lively competition for the gamesman. No cross words here for *Crosswords*.

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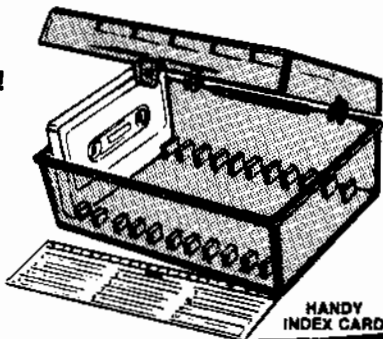
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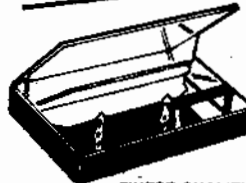
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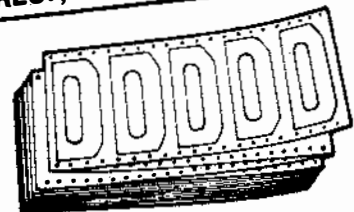
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Colortext: A Powerful Programming Utility

By
A. Buddy Hogan

How would you like to be able to create text and graphics characters for use in your own programs? Or control the scroll speed, or the size of text and graphic characters, access the Model I/III graphics set, control foreground and background colors, have an animation mode at your fingertips, and do all of this while mixing text and graphic characters with everything in colors selected by you? *COLORTEXT* allows you to do all of this and more.

COLORTEXT is a very powerful programmer's utility developed by Bob Rue for Bertamax, a company that specializes in educational software for microcomputers. They use the utility to assist in the development of the programs that they market (currently there are 46 CoCo titles for grade school youngsters and one CoCo title for teachers: *COLORTEXT*).

COLORTEXT is a graphics-text driver which can be used to assist in the development of any kind of program. Game developers should be aware, however, that its use is somewhat limited for them because of a quirk that disables the

joystick if the *BREAK* key is also disabled. More on this later. Whether you are a new programmer or an old hand, you'll enjoy the ease of use and power of *COLORTEXT*.

DESCRIPTION

COLORTEXT consists of a series of separate driver programs, a PRACTICE program, an edited PRACTICE program, a DEMO program, and a program that allows you to edit text and graphic characters and/or create new ones. All *COLORTEXT* products can be incorporated into your own program. "But how much memory does all this take?" you ask. *COLORTEXT* is a machine language program that occupies slightly more than 1.6K of memory. If you don't use the character set, it uses only 1K, but that would be like eating a peanut butter and jelly sandwich without the bread. Added characters take a minimum of 3 bytes, and a maximum of 14 bytes. Stack use is 30 additional bytes maximum, depending upon options in use.

Upon execution, *COLORTEXT* links into the standard text print and input character drivers, disabling the automatic resetting of the display to the text screen, and supports the translation of all later *PRINT*ed characters onto the high resolution page. In its most basic mode, it emulates the text screen handling on a *PMODE 4* page (including *PRINT@* and scrolling) but allows high resolution graphics to be drawn on the same display. Its more versatile modes include *PMODE 3* support, color text, color background, size multiplication, animation and character set switching and definition. The default character set is upper/lower case (with descenders), with many Model I/III control and graphic codes. With this program, you can also change the cursor character to anything you like and you can also disable the *BREAK* key. The program is relocatable, but is not exactly ROMable (the options selected at copying would be frozen in; it would work but you couldn't change the options). A ROMable version is available if you supply the exact specifications.

But how does all this work? All options are activated by *PRINT*ing the graphic control prefix, *CHR\$(1)*, followed by various characters that define sub-codes and parameters. For example, *CHR\$(1)CHR\$(5)CHR\$(1)* increases the size of all text and graphic characters on the screen twofold. Since you aren't likely going to be ready with a program of your own into which *COLORTEXT* has been inserted, a PRACTICE program is provided. Upon execution, it loads and executes *COLORTEXT* and you are ready to follow along as the manual takes you step-by-step through the use of all the commands and functions. I will summarize these briefly.

DISPLAY COLORS

You can change foreground and background colors, reverse each or reverse all colors in both. You can also change display colors within lines as well as between lines. All of this occurs while you are mixing text and graphic characters.

CHARACTER SIZE

The size of all displayed characters may be increased from double to 15 times original size. As you can imagine, this takes some doing. When you double the size of the characters, the cursor disappears and along with it a majority of the characters that were on the screen. Their untimely disappearance is not magic, but occurs because you are really only able to see the upper left ¼ of the display now. Successively larger increases in character size produce smaller screen

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display windows for viewing. But, not to worry. Even though you can't see them, the cursor and the other characters are still out there—somewhere. This feature is very powerful and makes for magnificent displays of the characters that can be viewed. You return to normal size by typing in the proper codes even though you can't see the cursor or what you are typing. Talk about blind faith! But as soon as you hit the *ENTER* key, you are rewarded with the reappearance of the regular-size OK and the flashing cursor in a sea of oversized characters.

RESOLUTION

While all four *PMODEs* are available, 0 through 3 are not generally readable on the display. If you increase the character size, though, *PMODE 3* works fine. This is important because *PMODE 3* gives you the use of four colors instead of the two available with *PMODE 4* (red and blue).

GRAPHICS CHARACTERS & UPPER/LOWER CASE

COLORTEXT has the standard ASCII character set with the upper and lower case option. In addition, it has the Model I/III character set. So what? Well, if you have a library of Model I/III programs, you no longer have an excuse not to buy a CoCo. You can convert those programs to the magic of CoCo with a little elbow grease and the help of *COLORTEXT*. There is an extensive tutorial in the manual of Model II/III program translation. This program, however, will *not* load Model I/III programs into CoCo. To do that you either need a program listing or another utility program that allows direct loading.

SCROLL SPEED

You can control the scroll speed from a snail's pace to a blur. This feature can be used to fill a room slowly with "water" while other things are going on in the room. In fact, that effect is used dramatically in the DEMO program.

ANIMATION MODE

This mode allows you to cause text and/or graphics characters to march across the display screen. As they pass through stationary characters on the display, they merge with them rather than replace them, so that when they have passed, the original characters are still there. Does that give you some ideas?

CURSOR

The flashing cursor in the program is really two characters being alternately *PRINTed*. You may change these characters to any text or graphic character(s) you want. Make both characters the same if you want the flashing to stop.

CHARACTER EDITING/CREATION

ADDCHR is a powerful driver that allows you to redefine all but the control characters and to create new characters. There are 11 single character commands and edits available. The result of editing or adding characters to the character set is the creation of an edited *COLORTEXT* file that is written to the disk for your future use. The manual does an excellent job of walking you through the use of *ADDCHR*.

THE BREAK KEY

The *BREAK* key may be disabled with a simple code. But, beware! This code also disables the *INKEYs* function and the joystick. A subroutine has been included in the program to replace *INKEYs* (it returns the ASCII value of any keyboard character except the SHIFT key). Entering a "9" exits this subroutine. If you are going to use *COLORTEXT* in a game program requiring the joystick, either do not disable the *BREAK* key or wait for the necessary *USR* promised by Bertamax in the next version of *COLORTEXT*.

DEMO PROGRAM

This program ties together most of the sophisticated features of *COLORTEXT* into a "user" program that is quite impressive. *LIST* the DEMO program to learn just how it is done. While you're at it, edit line 32767 to get rid of the IE error.

DOCUMENTATION

The documentation consists of a 75-page spiral bound 8½ x 11 manual. The program disk is nicely contained in a vinyl binder page that is bound into the manual. Another convenient feature is that the back of the manual serves as a ready reference card for all of the program commands and functions. The manual is divided into three major sections: 1) Getting Started; 2) *COLORTEXT* Technical Reference Manual; and 3) *ADDCHR* Technical Reference Manual.

While the documentation is very well written, let me stress that *COLORTEXT* is not intended for the beginning CoCo user with no knowledge of BASIC programming. You don't need to be a machine language programmer, but if you don't write programs or have any desire to do so, this program is not for you.

Not only does the manual tell you what the program does and how you use it, it also tells you in the reference sections



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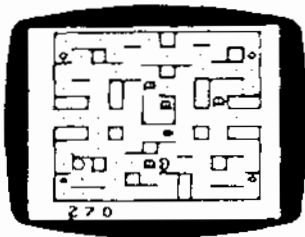


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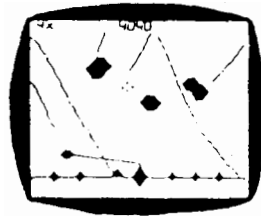
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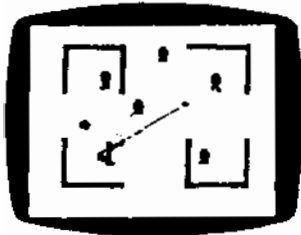
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how each driver works (in detail). This is disclosure beyond the call of duty and will surely be appreciated by the programmer who really wants to get into the program. The major drawback in the manual is that it did not keep up with the development of the program. The most powerful driver, ADDCHR, used to be available only as a separate program and the manual has not been updated to reflect the fact that it is now included with COLORTEXT. There is also a tedious program insertion that you are instructed to type into PRACTICE to demonstrate the animation mode. Upon further investigation, I found a version of PRACTICE on the disk that had already been modified for this purpose. This fact is never referenced in the manual. There are also a couple of typographical errors, one of which causes a SN error upon program execution. I would still rate the documentation above average for its detail and ease of use.

CONCLUSION

I am quite impressed with the quality and power of COLORTEXT (the price is reasonable for what you get) and commend Bob Rue and Bertamax for their support of CoCo.

(Bertamax, Inc., 101 Nickerson Street, Suite 202, Seattle, WA 98109, \$79.80 on disk)

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"Wow! That's really *rad* man!" That is how my younger brother, using the truncated form of the word "Radical," would say: "Gee, that's interesting" and *rad* fully describes the GPG-II that I have had the opportunity to review. This unique graphics program lets you draw on the Hi-Res screen with the keyboard. But the really *rad* part is that this one will create a *BASIC program to redraw your graphics!* I got a big kick seeing my doodles redrawn before my eyes. "Like *Narly!*"

One of the more fun features is the text command. It is an ML subroutine that is truly powerful. In the text mode, all keys have auto repeat and screen wraparound. You also can place the cursor any place on the screen. You have full control of the cursor with the arrow keys. This lets you do some neat special effects, as you can see in the sample print. I do have to point out that this font is a little hard to read. Some of the letters, such as 'N' and 'S,' are a little iffy. But, aside from this, the text is very easy to use.

I wish I had some good things to say about the documentation. All I ask is to have all the information I need there. My biggest shock came when the instructions for the Circle Command told me to read the Extended BASIC manual for an explanation. Understandably, good documentation takes time. But the extra effort and expense will always pay off. This is a good tool, but beginners will not find much help here.

One plus I must mention. This package comes with a complete listing of both BASIC and ML. This made customizing very easy (who leaves their programs untouched?). The first thing I tried was to have it save to disk. To do so, remove the minus sign from lines 333 and 345. Then drop the 'C' from line 329. There is also a chapter on how to make a backup of the package.

When you are ready to save your picture, the fun starts. You have the option to save in ASCII or binary. The ASCII option will save the commands to draw your graphics. You also specify the starting line number. This makes merging to an existing program easy. The binary option saves all the information on the screen in binary format. This is the only way to save the text with your pictures. There is also included in the documentation a short program to reload a binary screen.

In summary, I feel the GPG-II is a very good tool to create graphics and graphics programs. Beginners will have a rough start. But it's not that hard to learn. I would like to see a different font for the text. Maybe we will see a GPG-III? If anything, get this for the text feature. It really is powerful and a breeze to use.

(CoCoDATA Enterprises, 1215 Emerald Drive, Orlando, FL 32808, GPG-I \$11.95, GPG-II \$16.95)

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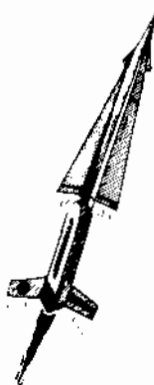
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Education And The Color Computer

By
Dr. Paul Kimmelman

It is amazing to find out how many of you are so enthusiastic about your Color Computer. I have heard from several Color Computer users who want their local school districts to purchase Radio Shack computer equipment rather than other brands.

If we are to continue to help the popularity of the Color Computer, it will be necessary to demonstrate to school officials the amazing amount of software available for school use. One quick review of a copy of *the Rainbow* would support anyone who doubts there is software currently available for serious educational use.

I can also say that Radio Shack is preparing some exciting software for Color Computer users. I recently visited Tandy headquarters and met with educational director Bill Gattis and many other fine people from Radio Shack. The future of the Color Computer is exciting.

Programs such as *Color Chemistry*, *Author I* and a new *Talk Tutor* on astronomy are only a small part of a future plan to build a Color Computer curriculum. Gattis recog-

nized the potential of the education market and this can only solidify future development of software for those of you who work either by yourself or with your children on the Color Computer.

LOGO

I still believe LOGO is an essential beginning for the young computer user. In talking with George Gerhold, one of the authors of Color LOGO, I learned more about the application of LOGO in schools. Gerhold noted that while LOGO is an appropriate language for young children, its use does not restrict it to beginners. As a matter of fact, Gerhold's college students work with LOGO using structured programming, problem-solving exercises, recursion, animation, and multi-tasking.

Further, maybe Color LOGO is in a league of its own and those who compare it to Apple LOGO are making an unfair comparison. Who said Apple should set the standards for LOGO software? Interestingly enough, those who use Apple LOGO don't have as much user memory as Color LOGO. Another criticism may even be a moot point for elementary school use, the floating decimal.

I am yet to hear an elementary teacher indicate that a floating decimal is important or even used. I verified this by asking a representative from the Houston, Tex., schools who teaches LOGO how many times he has used a decimal. His response: "Never."

Color LOGO is a great program. Every Color Computer owner should purchase the ROM version which will soon be (if not already) in the stores. Look for Radio Shack to follow the ROM LOGO release with teacher and parent use manuals. These manuals are excellent and will assist every LOGO user.

I plan to devote a portion of each monthly column to LOGO. Our school district is in the process of establishing "Color Computer LOGO Learning Labs." Please send me copies of your programs and comments.

EDUCATION

One aspect of computer use in the schools that is getting some serious attention is word processing. I hope to explore this in a future column.

For now, however, be advised that one of *the Rainbow's* advertisers, Cognitec, is willing to donate some copies of its early Telewriter version to schools or charitable institutions. If you are interested, send a letter with your request and number of copies needed to Howard Cohen in care of Cognitec.

Cohen has indicated that you will be able to reproduce the early version and its manual. And, while it may be necessary for you to pay shipping and handling, it would certainly be a small charge for a generous offer.

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Who Is This One Called 'CVCVC' ?

By Bob Albrecht and George Firedrake
Rainbow Contributing Editors

Millions of young people, and many not-so-young, are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, adventure master, or dungeon master (DM).

Most people who play role playing games use a formal rule system. Some of the best known are shown below.

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

RuneQuest (RQ). From Chaosium, P.O. Box 6302, Albany, CA 94706.

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

Worlds of Wonder (WOW). From Chaosium, P.O. Box 6302, Albany, CA 94706.

BEGINNERS BEWARE! The rulebooks are very difficult to understand. If you are a beginner, first try *Worlds of Wonder* or *Tunnels & Trolls*.

Also try this excellent book:

Through Dungeons Deep by Robert Plamondon. From Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.

True Names and Other Names

Here is our program to generate random names such as ROKAR, BARAK, or MIKOS. These names all have the form: CONSONANT, VOWEL, CONSONANT, VOWEL, CONSONANT.

100 REM**RANDOM NAMES

300 REM**MAKE & PRINT 28 NAMES

310 CLS

320 FOR K=1 TO 28

330 : GOSUB 610

340 : PRINT NAME\$,

350 NEXT K

500 REM**TELL HOW TO DO AGAIN

510 PRINT

520 PRINT "FOR MORE NAMES, PRESS
SPACE";

530 IF INKEY\$ = " " THEN 310 ELSE
E 530

600 REM**MAKE A NAME SUBR.



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```

610 NAME$ = ""
620 GOSUB 810
630 GOSUB 910
640 GOSUB 810
650 GOSUB 910
660 GOSUB 810
670 RETURN

```

```

800 REM**ADD A CONSONANT SUBR.
810 C$="BCDFGHJKLMNPQRSTVWXYZ"
820 RC = RND(21)
830 RC$ = MID$(C$, RC, 1)
840 NAME$ = NAME$ + RC$
850 RETURN
899 :
900 REM**ADD A VOWEL SUBR.
910 V$="AEIOUY"
920 RV = RND(6)
930 RV$ = MID$(V$, RV, 1)
940 NAME$ = NAME$ + RV$
950 RETURN

```

We ran several bunches of names. Here are some of the ones we like: SYREL, KUMUN, GANYZ, XUMEK, TIRIM, JEDUN, ZENIB, ZYRIV, PAXUN, KEZE, DORUN, GULUM, DUNAM, LYLAN, JEDOV, and SAKEM.

You can easily modify the program to get names with a different consonant-vowel structure. Change only block

600. However, why not write a program that is more general? For example, it might go like this:

```
NAME STRUCTURE? CVCVC
```

```
20 names
```

```
FOR MORE NAMES, PRESS SPACE
FOR NEW STRUCTURE, PRESS 'S'
```

Consonant, vowel,
consonant, vowel,
consonant.



If we press the space bar, we get 20 more names of the form CVCVC. But if we press the 'S' key, we can enter a new structure.

Game Master's Dice

Last time, we challenged you to write a program to roll N dice, each with S sides. We suggested that a RUN might go like this.

```

DICE? 3D6   Three six-sided dice
           12
DICE? 2D6   Two seven-sided dice
           6
DICE? DD    Digit Die (0 to 9)
           4
DICE? P     Percentile roll (0 to 99)
           73
DICE? D20   One twenty-sided die
           16
DICE? and so on.

```

We are going to use this problem to explore a bunch of

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programming techniques. We will begin with a primitive program and explain how it works, piece by piece. Here are the first pieces, blocks 100 and 300.

```
100 REM**GAMEMASTER'S DICE
110 CLS
```

```
300 REM**ASK WHAT TO ROLL (D$)
310 PRINT
320 INPUT "DICE"; D$
330 IF LEN(D$)=0 THEN 310
```

We expect the user to type something recognizable such as 3D6 or P or DD or D20 or . . . ? Whatever he or she types is assigned to the string variable D\$.

First, let's take care of the easy stuff. If you type 'P' and press *ENTER*, we know you want a Percentile roll. If you type 'DD' and press *ENTER*, we know you want a Digit Die roll.

```
400 REM**PERCENTILE ROLL
410 IF D$<>"P" THEN 510
420 ROLL = RND(100) - 1
430 PRINT ROLL: GOTO 310
```

```
500 REM**DIGIT DIE ROLL
510 IF D$<>"DD" THEN 610
520 ROLL = RND(10) - 1
530 PRINT ROLL: GOTO 310
```

If you don't type 'P' or 'DD,' you get to line 610. Now we assume you typed 3D6 or 2D7 or D20 or something similar. Remember, 3D6 means *three* dice, each with *six* sides. D20 means *one* die with *twenty* sides.

So, let's find the position of the letter D in D\$. Call the position PD.

```
600 REM**FIND 'D' IN D$
610 FOR PD=1 TO LEN(D$)
620 : X$ = MID$(D$, PD, 1)
630 : IF X$="D" THEN 710
640 NEXT PD
650 PRINT "I DON'T UNDERSTAND"
660 GOTO 310
```

- *If D\$ is 3D6, then PD is 2
- *If D\$ is D20, then PD is 1
- *If D\$ is 10D8, then PD is 3

Having found the position of 'D' with D\$, we move on. Next, we want to find out how many dice to "roll."

```
700 REM**NUMBER OF DICE, N
710 IF PD=1 THEN N=1
720 IF PD>1 THEN N=VAL(D$)
```

Aha! If the first character of D\$ is 'D,' we will roll *one* die. Otherwise, we assume someone wants more dice rolled or has specified one die, as in 1D6 or 1D10. Of course, you people who like to crunch stuff into the smallest memory space might combine lines 710 and 720 into one incomprehensible line:

```
710 IF PD=1 THEN N=1 ELSE N=VAL(D$)
```



Always feel free to crunch our programs!

Now we want to find the number of sides (S) for each die. This, of course, is to the right of 'D.'

```
800 REM**NUMBER OF SIDES
810 LD = LEN(D$)
820 S$ = RIGHT$(D$, LD-PD)
830 S = VAL(S$)
```

Here are some examples:

D\$	PD	LD	LP-PD	S\$	S
3D6	2	3	1	"6"	6
2D12	2	4	2	"12"	12
D6	1	2	1	"6"	6
10D6	3	4	1	"6"	6
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The time has arrived to roll the dice, print the result, and go back for another request.

```
900 REM**ROLL NDS
910 IF N=0 THEN ROLL=0:GOTO 1010
920 IF S=0 THEN ROLL=0:GOTO 1010
930 ROLL = 0
940 FOR KK=1 TO N
950 : DIE = RND(S)
960 : ROLL = ROLL + DIE
970 NEXT KK
999 :
1000 REM**PRINT ROLL & GO BACK
1010 PRINT ROLL
1020 GOTO 310
```

There is always another way. We will explore other ways to do this program. In the meantime, YOUR TURN:

- CHARACTER FINDER begins at line 1000. To run type RUN and press ENTER.
- SCAN CHARACTER FILE begins at line 2000. To run it, type RUN 2000 and press ENTER.
- To stop either program, press BREAK.
- The programs both use three subroutines, located at lines 10000, 11000, and 12000.
- Both programs use a common data base, beginning at line 30000.


Compare these programs with their earlier versions in the March and April issues. We have chosen line numbers to

help you easily compare. If you don't have the March and April issues, send a self-addressed, stamped envelope to Bob and George, P.O. Box 310, Menlo Park, CA 94025. We'll send you copies of both programs. While you are at it, let us know what you like or don't like about "GameMaster's Apprentice."

First Program:

```
1000 REM**CHARACTER FINDER
1200 REM**WHO* IS CHARACTER
1210 CLS
1220 INPUT "NAME OF CHARACTER";
WHO*
1300 REM**BEGINNING OF FILE
1310 RESTORE
1400 REM**READ RECORD, EOF?
1410 GOSUB 11010
1420 IF NAYM*="ENDFILE" THEN 143
0 ELSE 1510
1430 PRINT "I DON'T KNOW " WHO*
1440 GOSUB 10010: GOTO 1210
1500 REM**IS IT WHO* ?
1510 IF NAYM*=WHO* THEN 1610 ELS
E 1410
```

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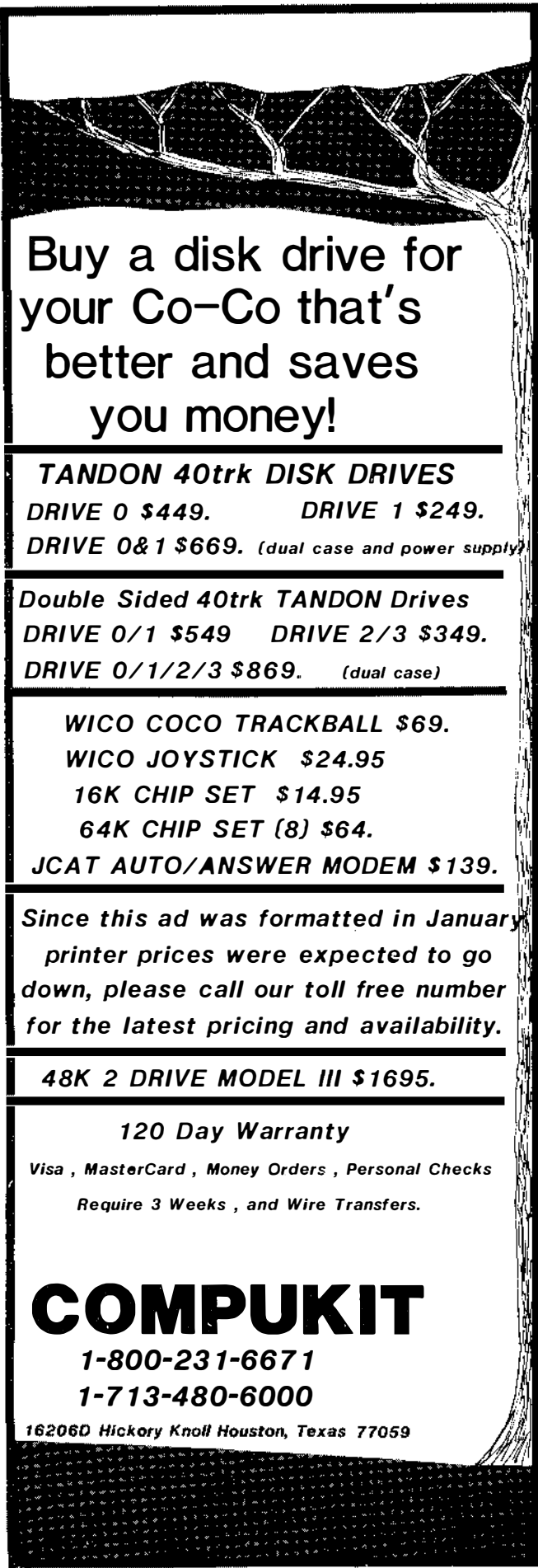
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1600 REM**TELL HOW TO DO AGAIN
1610 GOSUB 12010

1700 REM**TELL HOW TO DO AGAIN
1710 GOSUB 10010: GOTO 1210

Second Program:

2000 REM**SCAN CHARACTER FILE
2010 CLS

2300 REM**BEGINNING OF FILE
2310 RESTORE

2400 REM**READ A RECORD
2410 GOSUB 11010

2500 REM**DISPLAY RECORD
2510 GOSUB 12010

2700 REM**TELL HOW TO DO AGAIN
2710 GOSUB 10010

2800 REM**START OVER IF ENDFILE
2810 IF NAYM\$="ENDFILE" THEN 231
0 ELSE 2410

Three Subroutines:

10000 REM**DO AGAIN SUBROUTINE
10010 PRINT
10020 PRINT "TO DO AGAIN, PRESS
ANY KEY";
10030 IF INKEY\$="" THEN 10030 EL
SE RETURN

11000 REM**READ RECORD SUBR.
11010 READ NAYM\$
11020 READ STR, CON, SIZ, INQ, P
OW, DEX, CHA
11030 RETURN

12000 REM**PRINT RECORD SUBR.
12010 CLS
12020 PRINT NAYM\$: PRINT
12030 PRINT "STR", STR
12040 PRINT "CON", CON
12050 PRINT "SIZ", SIZ
12060 PRINT "INT", INQ
12070 PRINT "POW", POW
12080 PRINT "DEX", DEX
12090 PRINT "CHA", CHA: RETURN

Data Base:

30000 REM**CHARACTER RECORDS
30010 DATA ALOYSIOUS, 10, 11, 10
, 12, 10, 12, 9
30020 DATA BAROSTAN, 17, 17, 13,

0, 7, 15, 6
~~30030~~ DATA BRIDLA, 11, 12, 10, 1
 5, 6, 11, 6
~~30040~~ DATA DERNFARA, 13, 13, 0,
 13, 4, 17, 6
~~30050~~ DATA JOLEEN, 13, 11, 7, 13
 , 0, 17, 13
~~30060~~ DATA ROKANA, 9, 9, 9, 17,
 10, 9, 10
~~30070~~ DATA ENDFILE, 0, 0, 0, 0,
 0, 0, 0

Although we didn't try it, we believe this program will run okay on a TRS-80 Model I or Model III. That's why we used NAYM\$ instead of NAME\$, which is a reserved word on Models I & III. If someone out there checks this out, please let us know what happened.

YOUR TURN - Combine the two programs into a single program with a menu that lets the user select which program he or she wants. Also modify each program so a user can elect to continue to use the program or get back to the menu.

A run might begin like this:

YOU CAN FIND A CHARACTER RECORD
 BY NAME OF CHARACTER OR YOU CAN
 SCAN ENTIRE RECORD FILE.

MENU:

TO FIND A RECORD, PRESS '1'
 TO SCAN FILE, PRESS '2'
 TO RETURN TO MENU, PRESS '0'

In each sub-program, use the space bar to continue within the program and the zero key

0

to return to the menu. Tell the user about this. For example, after displaying a record, the CoCo might say:

TO DO AGAIN, PRESS SPACE
 TO RETURN TO MENU, PRESS '0'

Coming Attractions

Surely, but slowly, we will explore the following things:
 The elusive *RUN*.

GameMaster's Dice.

Looking up stuff in files. First, files of information in *DATA* statements and arrays. Next, cassette files. Eventually, disk files.

Whatever else comes to mind or is suggested by you.

What do *you* want? If it fits into the general idea of "GameMaster's Apprentice," we might do it. Send your suggestions, complaints, kudos, requests, whatever . . . to George & Bob, P.O. Box 310 Menlo Park, CA 94025.



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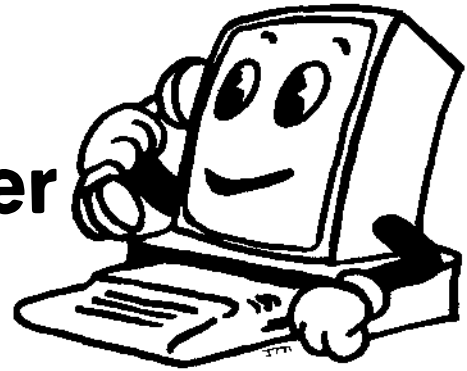
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Data Communications And Your Color Computer

By Harry Hardy



Last month we got familiar with START and STOP bits and the parity bit. We saw what some of the problems can be if our connection to a remote device is faulty. Specifically, transmission errors can occur. The parity method of error detection helps identify some errors; however, you may recall that this method was far from foolproof. The no-parity method, the method most likely used by the communications software for the Color Computer, offers no error detection at all, other than echoing the character you transmit back to you. Finally, I said that to implement some of the more sophisticated error detection and recovery methods is costly.

Before we get into another error detection method and

destroy three bits at this slower speed. Remember my example last month of how if two bits got changed we could still have a valid character and parity bit, but the character would not be the one sent? Well, the VRC method can only detect errors on an odd number of bit alterations. That is why this method works as well as it does at 300 BPS or slower.

Let me add something here. I know you must be thinking if an even bit per second rate is being used, VRC can't detect a lot of errors. This is true; however, let's consider your modem a moment. The manufacturer's rating may state that it can operate at any speed from 0 to 300 BPS. This should mean, then, that it can operate at 200 BPS, and no doubt it probably can. However, the speed of transmission is determined by the DTE, in our case, the Color Computer. I don't know of any devices that operate at speeds like 200 BPS. Normally at speeds less than 300 BPS they will operate at 75 or 110 which is a carry-over from the old teletype machines. As you can see, 75 and 110 BPS will still give us an odd number of bits that can be affected by a transmission error.

In the late '60s as data transmission speeds began to increase, particularly at 2400 BPS and above, the number of undetected errors began to increase. Not only was it due to the increase of speeds but more and more data was being transmitted in blocks or messages as opposed to a character at a time. The reason for the increase of message transmission is simple. To create a message and hold it on some type of storage media, then transmit the message in its entirety is much more cost effective than having an operator pound away at a keyboard one character at a time. Consider, if you will, transmitting at 2400 BPS. This is really transmitting at about 300 characters a second. I certainly can't type that fast.

In order to circumvent the limitations of the VRC method of error detection another method of parity checking was implemented called Longitudinal Redundancy Checking (LRC). How this differs from VRC follows.

Using VRC, we have seen that we simply count the 1 bits in a character and set the parity bit accordingly. LRC, as used for block or message transmission, adds to the end of that block or message an additional character so that an even or odd parity is created for each longitudinal row of bits.

Confused? Look at these three-bit patterns for the letter A, the number 7, and the ? symbol in that order, using even parity: 01000001. 10110111, 00111111. Now number these bits in each string 1-8 counting from right to left with the

"When transmitting data one character at a time at relatively slow speeds, such as 300 bits per second (BPS), this method works fine and is very reliable."

look at why implementing them is expensive, let's look at what causes some of these errors. Noise can be caused by such things as lightning hitting a telephone line, crosstalk from adjoining cable pairs, or just a bad connection if we are using the switched network. There can be other reasons, but let's not try and list them all here. We already looked at parity checking last month. As you may recall, that was referred to as either *even* or *odd* parity checking. What that meant was that bit 8 was set to either a 1 or 0 depending on the number of one bits in the character. This method was the first parity checking method used and is called character parity of *Vertical Redundancy Checking* (VRC). When transmitting data one character at a time at relatively slow speeds, such as 300 bits per second (BPS), this method works fine and is very reliable. Remember *noise* from above? If it was to occur for only .01 of a second it would sound like just a simple click on the line, however, it could

eight bit being the parity bit. The way LRC works is this: it looks at each bit position for each character in the block, if the number of 1 bits in this position for the entire block is odd then the corresponding bit position in the LRC or added character at the end of the block is set to a one to give us an even number of bits for that bit position. If the number of 1 bits in this bit position is even, then the corresponding bit position in the LRC character is left 0. This continues through the parity bit position for the entire block.

Example: looking at our three characters we can see that the 1 bit, right to left, in each character is set to a 1, since I said we're using even parity, bit position 1 in the LRC character will be set to a 1. Position 2, character 1, has a 0, characters 2 & 3 have a 1 in bit position 2. Since we have an even number of 1 bits in this position, position 2 of our LRC character will be set to 0. This continues for each bit position, therefore, our LRC character will look like this: 11001001.

The sending end would now transmit these four-bit patterns: 01000001, 10110111, 00111111, and 11001001. The receiving end would go through the same procedure to check if the LRC character it developed was the same as the one transmitted. If it were not, we would now have an error for that entire block of data.

How is this more effective than VRC? Try changing some bits around in each of the three characters and see if you can develop an LRC character that will match the one given. It can be done, but it isn't easy. About the only way you can fool LRC is by having corresponding bit positions of opposite value being changed.

As you can see, the LRC method can detect a lot more errors than the VRC method. To improve the error detec-

“LRC, as used for block or message transmission, adds to the end of that block or message an additional character so that an even or odd parity is created for each longitudinal row of bits.”

tion success rate some manufacturers employ both methods together, while some go so far as having two LRC characters, one for the odd-numbered characters (1, 3, 5, etc.) and one for the even-numbered characters (2, 4, 6, etc.), thus, almost totally eliminating all undetected transmission errors.

This should give you an idea of the cost involved to implement these more advanced error-detection methods. While VRC and LRC may not be the most sophisticated methods, they are almost always used for asynchronous ASCII transmission. The other methods, which we will not get into here, are usually used for other types of data transmission.

How about error recovery? We have seen that error detection can be costly to your system; well, error recovery can also add to the cost of software and hardware. What we do

at the receiving end once an error is detected is easier explained than the error detection methods.

If we are the receiving end and the received data checked out okay, no matter which method of error detection we're using, all we will have to do is send some indication of a positive acknowledgement to the sending end. If, however, we detect an error, we simply send some indication of a negative acknowledgement. That doesn't sound like too big a deal. We will have to have some more logic in our software to accommodate this, but what about the sending end? That end not only has to be able to recognize our negative acknowledgement, it will also have to be able to re-send the data. This isn't bad if we're sending one character at a time, but sending a block at a time will require some type of buffer for the data to be stored in to be retransmitted, probably RAM. This could be an added expense depending on the size of your machine and buffer size requirements.

One more thing, then we'll quit on error recovery. We will also need some method to abort a transmission after X number of unsuccessful retransmissions. This could simply involve notifying the operator (you) of the unsuccessful tries, then you would have to make some decision as to what to do.

Now you can understand why our communications software package uses the no-parity transmission method. No error detection and no error recover helps keep the cost of our data communications cost to a minimum. We don't have to pay for the implementation of more sophisticated software for our Color Computer or at the other end. Besides, as I said last month, who needs this level of error detection to access CompuServe or our local bulletin boards? Not me.

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Last month, I believe I promised to introduce you to some new terms and their meaning. As you read the instructions on how to hook up your modem and they say to put it in the *full duplex* mode, maybe you were wondering what that means.

Well, *full duplex* is one of three modes of transmitting data. The other two are *simplex* and *half duplex*. To explain these I will just give you their definitions for I think they are self-explanatory.

First, *simplex*. Using this mode of transmission you only have the ability of transmitting data in one direction. This implies that the receiving device will never be sending data to the transmitting station. This method is not used extensively today.

Half duplex operations are those that have the ability of sending data in both directions, but only in one direction at a time. For example, I could send you a message, but before I could receive your response you would have to wait for my transmission to end.

Full duplex operations are those methods employed that have the ability to transmit and receive data simultaneously. That is, while you were receiving my transmission, I could also be receiving your transmission. This is the method normally used by CompuServe and probably most of the local bulletin board services around the country.

This concludes my two-part series on asynchronous data transmission and how data communications relates to your Color Computer. The material that does not relate was presented so that you will have a better idea of how asynchronous transmission works, and what is involved in implementing them. I hope these articles have been of some benefit to you.

Database Manager II A Powerful Tool For Flex

By Brian James

The Color Computer has a great number of database programs, but few if any of them have come close to the sophistication of the programs available for some of the higher priced microcomputers. The constraints of memory and the limits of the Radio Shack DOS have in turn limited most of the available database programs to relatively low record capacity and few "bells and whistles." The advent of the 64K Color Computer and the addition of the Flex operating system is changing all of this. One example of the "new" world of database for the Color Computer is the subject of this review, *Database Manager II*, by Universal Data Research Inc.

For those readers not familiar with what a Database program is, a quick explanation is in order. A Database is, in effect, a generic file system. Users define what records they want to put in the file and in what order they want to put them. Later, a user should be able to retrieve information on the screen or produce a written report. The user should also



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be able to sort out information in a variety of ways and be able to search easily for a record or records that fit certain conditions. Additionally, it is helpful if the files made by the database system can be read by other programs so that typing and ordering by the user is kept to a minimum.

Database Manager II is a sophisticated set of programs that requires a rather heavy hardware and software commitment from the user. A 64K Color Computer with Flex operating system is a must in addition to a language called *TSC Extended BASIC* (not to be confused with Radio Shack Extended BASIC). Although one could probably make do with one disk drive, two drives or more are certainly preferred. It would also be helpful to have a monochrome monitor attached to the computer as the program is formatted for the 64 x 24 character screen. I used the 51 x 24 character screen however, without too many problems. A printer, of course, is needed for the report-writing and label-making functions included with the program.

The review copy of *Database Manager II* came in two parts. Part I included programs to create a master file, edit and add to the master file, sort the master file, change the master file header and print selected parts of the master file to screen or line printer. Part II included programs to print data on labels, sort, print or alter a key file, globally modify data in the master file, and compress the master file to get rid of "holes" made by deleted files. Although the basic programs are all included in Part I, the utilities included in Part II are worth the extra expense.

The documentation that comes with *Database Manager II* is very well organized and, if carefully read by the first time user, it should do a complete job of instructing how to use the system. Each part has its own manual and each manual begins with program specifications, overview, and definitions of terminology. The programs are based on menus and prompts and the manuals are structured in the same way. Thus if the user doesn't understand what the program is asking for, a quick look in the documentation will provide an explanation in most cases. There was no "demonstration file" included with *Database Manager II*, but I found the programs and documentation so well-structured and easy to understand that a demonstration file was not needed.

Since all Database managers basically set out to achieve the same purpose (organization of data), the capacity and special features of a system are important factors in deciding which one to buy. *Database Manager II* will theoretically hold up to 32,000 records, 252 characters long. Each record may be divided into 36 different "fields" (individual pieces of information) which may be alphanumeric (words and numbers), integer numeric (whole numbers) or floating

point numeric (for use with dollars and cents). In reality, the capacity of this system is more a function of how many records the user can fit on a disk. For example, if you are using a Radio Shack drive (with 35 tracks) and define a record 60 characters long, you should have enough space for about 2,200 records. A 40- or 80-track drive (both supported by Flex) will yield a higher capacity.

A special feature of *Database Manager II* tells the user how much space is being wasted in a particular file so the user may make the best use of all disk space. Another nice feature of this system is that your database grows as you input more data. Thus, there is no need to predefine how many records your database is going to be, as with some other systems.

If you purchase both Part I and Part II, you have two methods of sorting (ordering) data. In Part I, the records are physically reordered on your disk by whatever field you choose. A sort of 60 records on one of my databases took about two and a half minutes. Part II includes a "keyfile" that generates a mini-file on your disk of the sorted field and record number from the main data file. You may use your line printer to make a hardcopy index of your database or you may use this keyfile to generate your final report. The keyfile sort method is much faster and makes a strong argument to purchase the Part II package.

Database Manager II has limited options when it comes to report writing format and mathematics. A Part I program will allow the user to list reports vertically or horizontally on a line printer or monitor screen. The user may also set up "conditions" to tell the report writer which records to print and which records not to print. Part II includes a program to print records on labels up to ten lines. The only math function supported in Part I is an option that will total the numbers in any field or group of fields. Part II allows the user to globally add, subtract, multiply or divide a number in a numeric field. I am told that Universal Data Research will be releasing an optional/extra "Report Writing" package for this system that will give the user almost limitless ways to configure a report. In addition, Universal Data Research is producing General Ledger, Inventory, and many other specialized programs that work with *Database Manager II* and provide special math features. Since *Database Manager* is written in TSC Extended BASIC, enterprising programmers could also write their own programs to run with the system. A section of the documentation includes some information on such program writing.

It is hard to do justice in a short review to such a sophisticated program as *Database Manager II*. In addition to earlier mentioned features, the system will protect the user against unauthorized use of data files through a "password" system. The system will also merge files together and it has an extensive and workable error-checking system. As the prospective buyer looks at the hardware/software commitment needed for this system, it should be remembered that good things don't come easily and cheaply, even with the Color Computer. Here, indeed, is some heavy-duty, business-oriented software that many have been looking for since the Color Computer was introduced. If you are ready to make the commitment, *Database Manager II* is a good place to start.

(Universal Data Research Inc., 2457 Wehrle Drive, Buffalo, NY 14221, Part I and II are \$99.95 each on disk)

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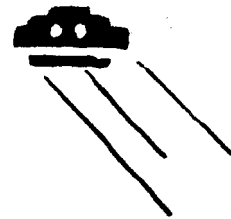
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Printer Spooling Will Increase Your Throughput

By Steve Good

A printer spooler is a utility program that allows BASIC and your printer to run at the same time. This is done by putting the printer characters into a buffer and then printing one character to the printer after each interrupt. Allowing your printer and computer to run at the same time increases the throughput of your system.

The reason I wrote the spooler utility was because of the extremely slow print rate of my Radio Shack Line Printer VII. It seemed like years before it got finished printing. Currently, I am running a bowling league secretary program where I would enter data and wait for a printout. Now, I can enter the data for the next league while the printer prints the stats for the last league.

To run the program you need to type `PCLEAR 4:CLOADM "SPOOLER"`

The `PCLEAR 4` statement reserves 6K for the program and buffer to reside. However, if you plan to use graphics, the spooler must be offset loaded to avoid memory conflicts with the graphics pages. The program is written in position independent code so offset loading is no problem, just remember, if you offset load it, you must protect the program from BASIC with the `CLEAR` statement.

Once the program has been loaded and executed, all characters printed using the `PRINT #-2` or `LLIST` statements will be spooled through the buffer to the printer. Machine language programs that print output, like word processors and editor/assemblers, can only use the spooler if they print their output using the standard BASIC output routine called by a `JSR [$A002]` and leave the interrupts enabled and unchanged.

Three programs or parts are needed to spool output to the printer. The first program, called `ENTRY`, is the routine entered upon an `EXEC` which gets things started. This first program changes the print hook in RAM so that the `HOOK` program is entered every time a character is to be printed. Also, this program initializes the buffer's beginning and ending and the pointers to where the characters in the buffer are. Lastly, the interrupt vector is changed so that the `START` program is entered every time there is an interrupt.

The second program, called `START`, checks to see if there are any characters to be sent and checks to see if the printer is ready. If both are ready, then one character is sent to the printer and then Disk BASIC's interrupt routine is entered. This program uses Extended BASIC's output routine, so Extended BASIC's baud rate must be set. This is done in the `ENTRY` program. If you have a baud rate different than 600, you must set the baud rate before you execute the entry program, otherwise it's taken care of. LP VII and LP VIII users with 1.0 BASIC ROM can send graphic characters while the spooler is running because the Extended BASIC output routine sends eight bits instead of seven.

The third program, called `HOOK`, is entered whenever a character is to be printed. If the character is not to go to the printer, then Disk BASIC's print routine is entered. If the printer is the device to be printed to, then the character is put into the buffer. If the buffer is full, then this routine will stop and wait for the printer to catch up. This routine also changes carriage returns to line feeds so that non-standard printers will work (hopefully!). The print head variable is also updated by this routine so that `LLIST` will work.

The buffer size is about 6K; this is set up by line 200. If you have a 32K machine, you could change line 200 to `LEAX $2FFF,X` to make the buffer 12K. `POKE`ing `&HE12,&H2F` before you execute would also accomplish this. If you do use the 12K buffer, you must type `PCLEAR 8` instead of `PCLEAR 4` to reserve enough space.

The following will cause the spooler to crash:

- 1) Disabling the IRQ permanently.
- 2) Changing the IRQ vector.
- 3) Changing the print hook (the RS screenprint program will do this).
- 4) Using graphics with the program loaded normally.
- 5) A `PCLEAR` less than 4.
- 6) Loading a ML program over the spooler for tape or disk.
- 7) `POKE &HDDF7` (the vitamin E).

The following *will not* crash the spooler if the above is followed:

- 1) Disk reads or loads.
- 2) Tape reads or loads.
- 3) Two different programs printing output.
- 4) Pressing the RESET button.

To see the power and worth of a printer spooler, type in the BASIC program below. On a LP VII, it takes 60 seconds to run. Next, load and execute the spooler program. Now rerun the BASIC program. This time it will only take 36 seconds! Quite an improvement.

The listing:

```
10 FOR I=1 TO 10
20 PRINT #-2, "SPOOLING CAN PRINT TO THE
  PRINTER";I
30 NEXT I
40 FOR I=1 TO 999
50 PRINT "AND TO THE SCREEN AT ONCE";I
60 NEXT I
```

---- PAGE 001 SPOOLER

```

00010          NAM  SPOOLER
00020 0E00     ORG  $0E00
00030          OPT  0,NOP
00040          ATH  STEVE   GOOD
00050          **** THE ENTRY ROUTINE SETS UP THE CC FOR SPOOLING ****
00060          **** FIRST IT CHANGES THE PRINT HOOK TO THE HOOK PROGRAM ****
00070          **** THEN SETS EXT. BAS BAUD TO BASICS BAUD ****
00080          **** THEN IT SETS UP THE END OF BUFFER POINTER ****
00090          **** AND LASTLY IT CHANGES THE IRQ VECTOR TO THE PRINT PROGRAM ****
00100          **** AFTER THE PROGRAM IS LOADED A 'EXEC' WILL RUN THE ****
00110          **** ENTRY PROGRAM TO ALLOW SPOOLING ****
00120          ****
00130          ****
00140 0E00 34 12      ENTRY  PSHS  A,X
00150 0E02 30 8D 004F  LEAX  HOOK,PCR ;PRINT TO BUFFER ROUTINE
00160 0E06 BF 0168    STX   $168   ;PRINT HOOK LOCATION
00170 0E09 96 96     LDA   $96    ;BASICS BAUD RATE DELAY
00180 0E0B 97 E6     STA   $E6    ;EXT. BAS BAUD DELAY
00190 0E0D 30 8CF0    LEAX  ENTRY,PCR
00200 0E10 30 89 17FF LEAX  $17FF,X ;POINT TO END OF BUFFER
00210 0E14 AF 8D 0078 STX   ENDBUF,PCR
00220 0E18 30 8D 007A LEAX  BEGBUF,PCR ;GET START OF BUFFER
00230 0E1C AF 8D 0072 STX   BEGINP,PCR ;SET BEGIN POINTER
00240 0E20 AF 8D 0070 STX   ENDP,PCR ;SET END POINTER
00250 0E24 30 8D 0005 LEAX  START,PCR ;INTERRUPT PRINT ROUTINE
00260 0E28 BF 010D    STX   $10D   ;INTERRUPT POINTER
  
```

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By Cary D. Perttunen

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```

00270 0E2B 35 92          PULS  A,X,PC  ;RETURN
00280      ****
00290      ****
00300      **** THE START PROGRAM IS ENTERED WITH EVERY IRQ THAT OCCURS ***
00310      **** IF THERE ARE CHARATERS IN THE BUFFER AND THE ****
00320      **** PRINTER IS READY THEN A CHARACTER IS SENT TO THE PRINTER ****
00330      ****
00340      ****
00350 0E2D AE 8D 0061 START LDX  BEGINP,PCR  ;CHECK FOR SPOOLING
00360 0E31 AC 8D 005F      CMPX  ENDP,PCR  ;IF EQUAL THEN NO
00370 0E35 27 1B          BEQ   NOSPOO
00380 0E37 F6 FF22        LDB  $FF22    ;CHECK PRINTER STATUS
00390 0E3A 54              LSRB
00400 0E3B 25 15          BLO  NOSPOO  ;IF NOT READY THEN NO
00410 0E3D A6 84          LDA  ,X       ;GET CHARACTER TO PRINT
00420 0E3F BD 8E0C        JSR  $8E0C   ;PRINT IT
00430 0E42 30 01          LEAX 1,X     ;INCRIMENT POINTER
00440 0E44 AC 8D 0048      CMPX  ENDBUF,PCR
00450 0E48 26 04          BNE  OK
00460 0E4A 30 8D 0048      LEAX  BEGBUF,PCR ;START AT BEGINING
00470 0E4E AF 8D 0040 OK   STX  BEGINP,PCR ;STORE NEW POINTER
00480 0E52 7E D7BC        NOSPOO JMP  $D7BC    ;DISK BASIC INTERRUPT HANDLER
00490      * ;JMP $894C FOR EXT. BAS
00500      ****
00510      ****
00520      **** THE HOOK PROGRAM IS ENTERED EVERY TIME A CHARACTER ****
00530      **** IS TO BE PRINTED. ****
00540      **** IF THE CHARACTER IS TO GO TO THE PRINTER IT IS ****
00550      **** PUT IN THE BUFFER (IF IT'S NOT FULL), OTHERWISE ****
00560      **** DISK BASICS ROUTINE IS ENTERED ****
00570      ****
00580      ****
00590 0E55 34 02          HOOK  PSHS  A

```

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```

00600 0E57 96 6F LDA $6F ;GET OUTPUT CHANNEL
00610 0E59 81 FE CMPA #254 ;IF PRINTER THEN CONTINUE
00620 0E5B 27 05 BEQ YES
00630 0E5D 35 02 PULS A ;RESTORE A
00640 0E5F 7E CB4A JMP $CB4A ;DISK BASIC PRINT ROUTINE
00650 * ;CHANGE TO JMP $8273 FOR EXT. BAS
00660 0E62 35 02 YES PULS A
00670 0E64 0C 9C INC $9C ;INCRIMENT PRINT POSITION
00680 0E66 81 0D CMPA #$0D ;CHECK FOR CR
00690 0E68 26 04 BNE STACK
00700 0E6A 0F 9C CLR $9C ;ZERO PRINT POSITION
00710 0E6C 86 0A LDA #$0A ;CHANGE TO LF FOR NON STANDARD PR
00720 0E6E 32 62 STACK LEAS 2,S ;REMOVE HOOK RETURN
00730 0E70 34 10 PSHS X
00740 0E72 AE 8D 001E LDX ENDP,PCR ;GET END POINTER
00750 0E76 A7 84 STA ,X ;STORE CHARACTER IN BUFFER
00760 0E78 30 01 LEAX 1,X ;INCRIMENT TO NEXT BYTE
00770 0E7A AC 8D 0012 CMPX ENDBUF,PCR ;PAST THE END?
00780 0E7E 26 04 BNE OK2
00790 0E80 30 8D 0012 LEAX BEGBUF,PCR
00800 0E84 AC 8D 000A OK2 CMPX BEGINP,PCR
00810 0E88 27 FA BEQ OK2
00820 0E8A AF 8D 0006 STX ENDP,PCR ;MAKE NEW END POINTER
00830 0E8E 35 90 PULS X,PC
00840 *****
00850 0E90 25FF ENDBUF FDB 9727
00860 0E92 0E96 BEGINP FDB **4
00870 0E94 0E96 ENDP FDB **2
00880 0E96 0E96 BEGBUF FDB *
00890 0E00 END

```

TOTAL ERRORS 00000

™ TRS80 color

From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer™. Devoted to S5-50 6800 and 6809 machines up to now. 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

NOTE: This and other interesting and needed articles for the Radio Shack TRS-80 color computer™ are being included monthly in 68 Micro Journal—The Largest specialty computer magazine in the world!

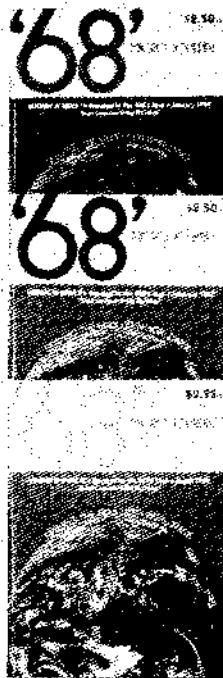
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Currently, and even before the Color Computer™ hit the stores, 68 Micro Journal™ was devoting more space to the TRS-80C Color Computer™ and information concerning the Motorola 6809 (which is the CPU in the Color Computer™) than ANY OTHER Computer Magazine. Examples include:

REVIEWS of the three major Disk Control Systems for the Color Computer™, most of the Monitors, Assemblers, and Disassemblers, word Processors and Editors, "Terminal" Programs (for use with Modems, Communications with other Computers, etc.), and of course, Games.

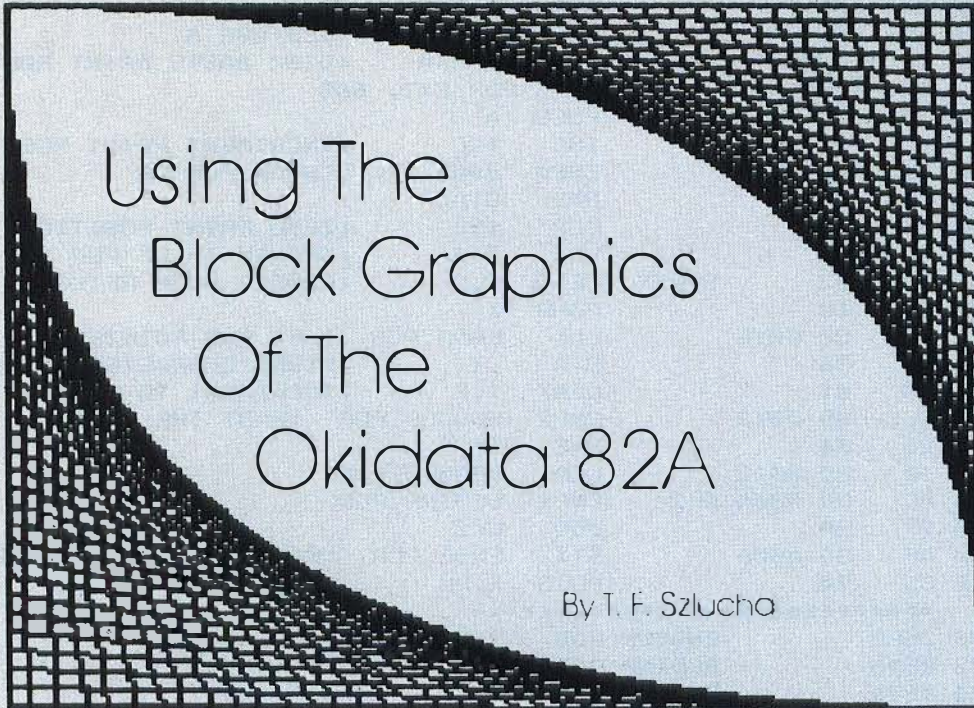
HINTS for Expanding Memory, Power Supply Cooling, repairing sticky keyboards, disabling the ROM PAK "Take Over", hooking up to Printers, etc.

DISCUSSIONS of the 6883 Synchronous Address Multiplexer, using the Color Computer™ with 64K and 96K memory (which it is ALREADY capable of handling), thoughts on Programming, etc.

I suggest that you subscribe to 68 Micro Journal™, SOON, as many back issues are sold-out.

We still, and will continue to, lead in the type information you need to FULLY UTILIZE the POWER of the 6809 in the Radio Shack TRS-80 Color Computer™.

Bob Nay
Bob Nay
Color Computer Editor



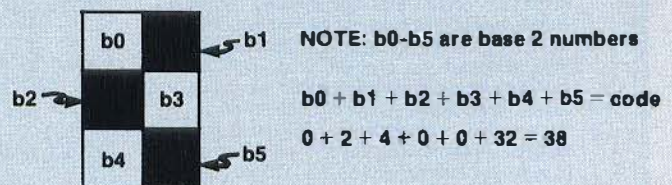
The Okidata 82a represents a good choice of a printer for the Color Computer. At 120 cps, it is very fast. It has lower case descenders, and allows both pin and friction feed. It has both a serial and parallel interface built-in. The serial interface connects directly to the 80C allowing data transfer at 1200 baud. Perhaps the only feature missing is the ability to do high resolution graphics. This feature is available for this printer as an optional plug-in ROM called *Okigraph*, but it only works in the parallel interface mode. The alternative to buying the optional ROM, parallel interface, and supporting software is to use the block graphics characters which this printer can generate. Without a doubt though, one of the shortcomings of this printing machine is its instruction book. The very poor description of the technique required to access and use these graphics has probably discouraged many from exploring their use. This article describes in detail how these block graphics work on the 82a and how to use them to obtain a screen dump of pictures you have drawn with the Color Computer. Reasonably accurate graphics can be drawn with this printer. In fact, the resolution of these graphics can approach the resolution on the screen in PMODE4.

The block character which can be printed with the 82a consists of a 2 x 3 matrix of segments similar to those used to create graphics on the Radio Shack model I and III computer. Each of these segments can be printed "on" or "off" depending on the character code received by the printer. This code can be explained with the help of figure 1. The secret of the matrix is that it is treated as a 6 bit binary

(Mr. Szlucho, a technical specialist in Product Development at Xerox Corporation, holds several patents relating to xerography. Microcomputing is a hobby enjoyed by his whole family.)

number. Each segment determines the value of a bit, the upper lefthand segment is b0, the lower righthand segment is b5. The total value of the 6 bit binary number is used to establish the code required to print the block character. In the example in figure 1 the binary number would equal 38. All the segment combinations can be created with codes from 0 to 63 with a blank character represented by a 0 and a completely filled in block having a value of 63.

Figure 1
Segment Bit Pattern



To actually print a graphics character the printer must be told that it is going to be printing in graphics instead of alphanumeric. This is done by sending a control code 14 (shift out alphanumeric) to the printer. The basic command to do this is `Print#-2.CHR$(14)`. Once this is done, any new codes sent to the printer, with the exception of control codes, will be interpreted as graphics. It is important to note that the 82a is expecting character codes in the range of 32-96 and the code described above calculated from the segment has a range from 0-63. The segment code is converted to the character code by adding 64 to the segment code if it has a value from 0-31 if the segment code has a value from 32 to 63 then it is left alone. This is not obvious in the instruction manual, I discovered it by trial and error.

Now that the method for sending graphics codes to the printer has been explained, consider how the 2 x 3 segment block characters can be used. Each of these graphics blocks are printed in columns available for the particular character size in use. In the smallest character set there are 16.5 cpi; therefore, 33 'pixels' per inch because there are two segments per column. Likewise, the smallest increment in linefeed is eight lines/inch. Each of these lines can have three vertical graphics segments therefore there can be 24 'pixels' per inch in this dimension. Table 1 shows a chart of the required codes to program the various functions available with the 82a.

**Table 1
Printer Control Codes**

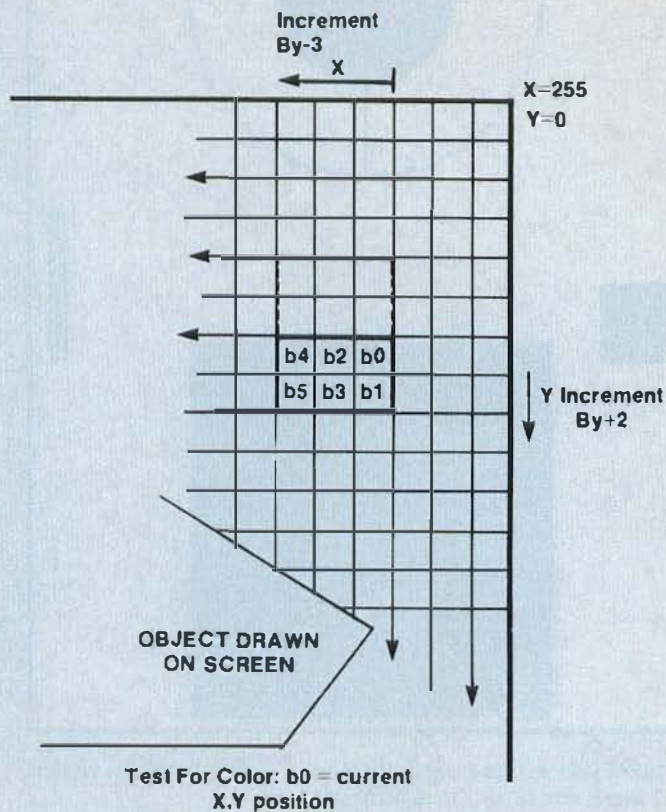
Printer Mode	Required Code
5 CHAR/INCH	CHR\$(30)+CHR\$(31)
8.3 CHAR/INCH	CHR\$(29)+CHR\$(31)
10 CHAR/INCH	CHR\$(30)
16.5 CHAR/INCH	CHR\$(29)
6 LINES/INCH	CHR\$(27)+CHR\$(54)
8 LINES/INCH	CHR\$(27)+CHR\$(56)
GRAPHICS MODE	CHR\$(14)
ALPHANUMERIC MODE	CHR\$(15)

The real use of these graphics blocks is to draw pictures. *Pixdump* is an Extended BASIC program (see the listing) which takes a picture or scene drawn on the video screen and reproduces it on the printer. There are several ways of doing this but one easy way is to use the *PPOINT* command in Extended BASIC to test whether a specific pixel on the screen is on or off, then convert this into the necessary graphics character. Figure 2 shows the method used to scan the screen. The 2 x 3 block matrix is scanned vertically down the screen starting at the right side progressing to the left. This scanning method results in output from the printer having the horizontal axis of the screen transposed to the paper feed direction. Note that Figure 2 shows a uniform step rate of -3 in the horizontal direction and 2 in the vertical direction. This results in a considerable amount of distortion because the ratio of pixel sizes is 33/24 or 1.35. The picture is longer than it should be. This can be corrected by skipping every fourth scan line. In order that information which exists in the fourth line is not lost, the line is scanned but is printed in the third line. This is done to prevent, in particular, circles and arcs from being broken. This results in an artificial but very accurate scaling of the pixel ratio to 1.03. Not bad, particularly when you consider that there is much more distortion present on the video screen. Measure it. A 'circle' is about 10 percent taller than it is wide. The program listing has built into it a test pattern which can be used to observe the effect of this "scaling" correction. The program allows you to print in both the corrected and uncorrected mode. You will want to run both for comparison. I am sure you will agree that the scale correction is well worth the very minor impact that it has on accuracy.

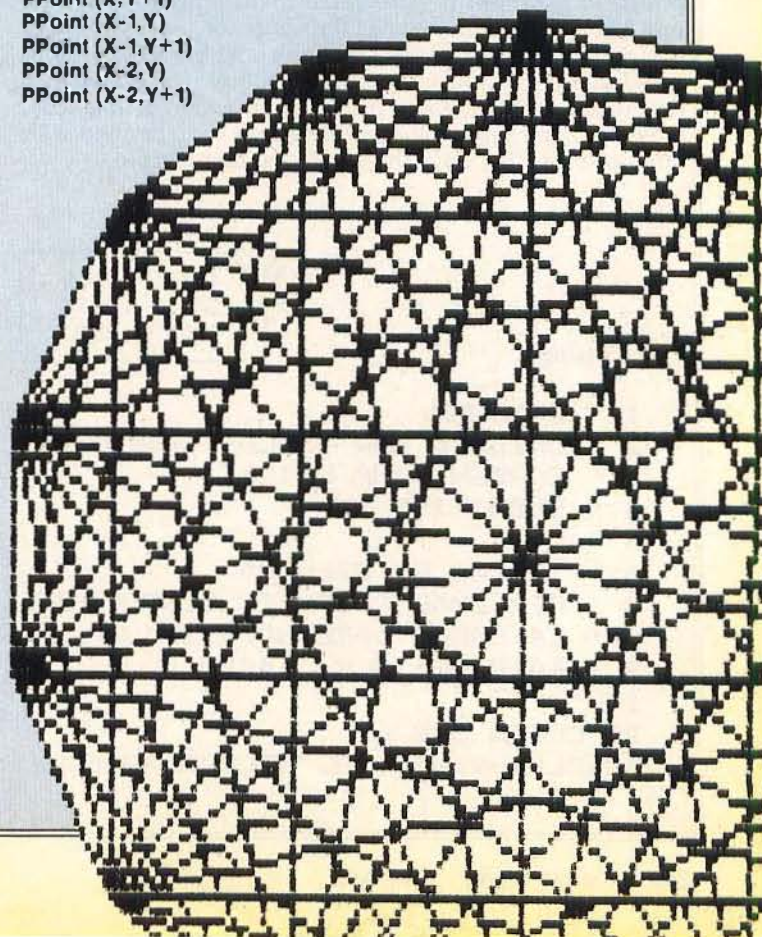
The *Pixdump* program is liberally embellished with remarks which should be removed to speed execution. You may also want to modify the program to eliminate the correction decision and eliminate unnecessary spaces. Also, the speed up poke (line 170) should be removed if it doesn't work with your system. It should be noted that this screen dump works with all pmodes, the only requirement is that *ppoint* (according to R.S.) can be used only with the *pmode*

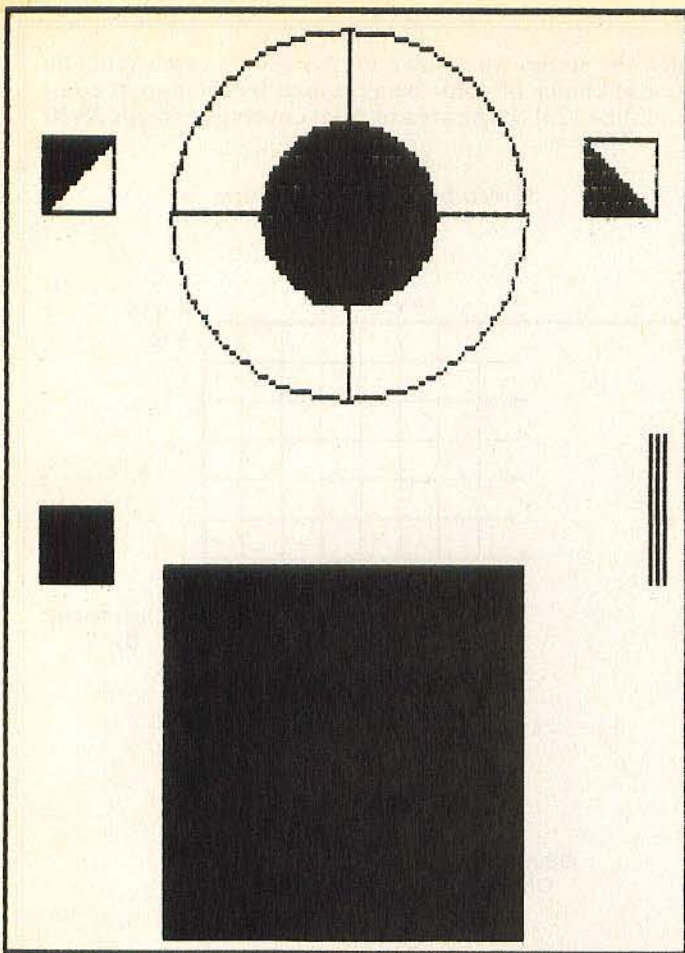
which the screen was drawn in. Also some care should be taken in choice of color being sensed by the *ppoint* command (line 120). If the area of print coverage exceeds 20-30

**Figure 2.
Screen Scanning Procedure**



- PPoint (X,Y)
- PPoint (X,Y+1)
- PPoint (X-1,Y)
- PPoint (X-1,Y+1)
- PPoint (X-2,Y)
- PPoint (X-2,Y+1)





percent you will prematurely wear out the ribbon as well as put undo stress on the printhead.

As you can see, this technique is useful and quite accurate. It is interesting to note that the pixel size generated by the printer in this mode is very similar to the pmode 4 pixel size on a 13 inch T.V. monitor. On the screen the pixels are about .033 x .037 inch whereas the printer has a pixel which is .030 x .041 inch. Not a bad comparison and this is available with the standard Okidata 82a printer. I suspect that this technique with perhaps some modifications may be used with other printers that have the block graphics feature.

✓
140... 02EE
300... 0576
END... 086D

The listing:

```

1 * PIXDUMP
2 * OKIDATA 82A /COLOR COMPUTER
3 * SCREEN DUMP UTILITY
4 * SUBMITTED BY
5 *
6 * THOMAS F. SZLUCHA
7 * PERSONAL COMPUTER CONSULTING
8 * 14 GREAT GARLAND RISE
9 * FAIRPORT N.Y. 14450
10 *
20 CLEAR 500
30 CLS:PRINT@128,"SELECT MODE:

```

```

40 PRINT@161,"1 - DRAW TEST PATT
ERN ON SCREEN
50 PRINT@193,"2 - DUMP UNCORRECT
ED TO PRINTER
60 PRINT@225,"3 - DUMP CORRECTED
TO PRINTER"
70 INPUT R
80 ON R GOTO 420,90,90
90 POKE 150,41 : ' SETS BAUD RAT
E TO 1200
100 SCREEN 1,1
110 PRINT#-2,CHR$(29)CHR$(27)CHR
$(56):' THIS SETS THE PRINTER TO
16.5 CPI AND 8 LINE/IN
120 C=5 : 'THIS IS THE COLOR LOO
KED FOR WITH THE PPOINT COMMAND
130 IF R=3 THEN SC=-4 ELSE SC=-3
: 'SC IS THE NUMBER OF SCANNING S
TEPS
140 FOR X=255 TO 0 STEP SC : ' TH
E SCAN STARTS ON THE LEFT OF THE
SCREEN
150 PRINT#-2,CHR$(14); : ' SET PR
INTER FOR GRAPHICS
160 G#=STRING$(18,64) : ' ADDS 18
BLANKS TO THE BEGINNING OF EACH
LINE PRINTED SO THAT THE PICTUR
E WILL BE CENTERED HORIZONTALLY
170 POKE65495,0 : 'SPEED-UP CPU
180 FOR Y=0 TO 190 STEP 2 : ' VER
TICAL SCANNING OF THE SCREEN
190 G=0
200 ' THE FOLLOWING LINES TESTS
FOR THE PRESENCE OF A CERTAIN CO
LOR AND CREATES THE APPROPRIATE
GRAPHICS CODE
210 IF PPOINT(X,Y)=C THEN G=G+1
220 IF PPOINT(X,Y+1)=C THEN G=G+
2
230 IF PPOINT(X-1,Y)=C THEN G=G+
4
240 IF PPOINT(X-1,Y+1)=C THEN G=
G+8
250 IF R=2 THEN 290
260 IF PPOINT(X-2,Y)=C OR PPOINT
(X-3,Y)=C THEN G=G+16
270 IF PPOINT(X-2,Y+1)=C OR PPOI
NT(X-3,Y+1)=C THEN G=G+32
280 GOTO 310
290 IF PPOINT(X-2,Y)=C THEN G=G+
16
300 IF PPOINT(X-2,Y+1)=C THEN G=
G+32
310 ' THE FOLLOWING CONVERTS THE
VALUE OF G TO PRINTER CODE
320 G=G+64
330 IF G>95 THEN G=G-64

```

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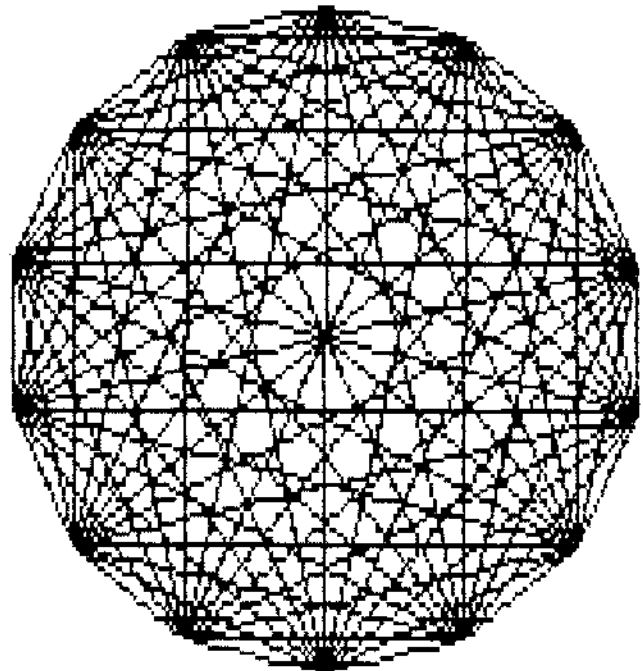
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```

340 G#=G#+CHR$(G)
350 NEXT Y
360 POKE65494,0 : ' SLOW DOWN CPU
    BEFORE I/O
370 PRINT#-2,G#;
380 PRINT#-2,CHR$(15)CHR$(10)
390 NEXT X
400 SCREEN 0,1:CLS:PRINT@234,"FI
NISHED":END
410 ' THE FOLLOWING GRAPHICS ARE
    USED TO DRAW A SIMPLE TEST PATT
    ERN ON THE SCREEN
420 PMODE 4,1:PCLS
430 SCREEN1,1
440 LINE(5,45)-(105,145),PSET,BF
450 LINE(0,191)-(256,0),PSET,B
460 LINE(100,10)-(120,30),PSET,B
    F
470 LINE(100,181)-(140,181),PSET
480 LINE(100,183)-(140,183),PSET
490 LINE(100,185)-(140,185),PSET
500 CIRCLE(200,96),50
510 CIRCLE(200,96),25
520 PAINT(200,96)
530 LINE(200,46)-(200,146),PSET
540 LINE(150,96)-(250,96),PSET
550 LINE(200,10)-(220,30),PSET,B
560 LINE(200,10)-(220,30),PSET
570 PAINT(205,11)
580 LINE(200,162)-(220,182),PSET
    ,B
590 LINE(220,162)-(200,182),PSET
600 PAINT(205,163)
610 GOTO 30 : 'BACK TO MENU
    
```



Answer The Question 'What Happens If . . .'

By Joseph Kolar
Rainbow Contributing Editor

What is a Color Computer? It is a one-eyed monster that challenges you to be creative. You power up, clear the logo and you are off and running. The possibilities are almost limitless.

You have your "*Getting Started with Color BASIC*" and by now have gotten to the part where you are shown a small routine and are challenged to make up a dice game. If you made up your own version of the crap game, you had fun and were proud to produce your own game. But, there was something lacking, wasn't there? It didn't tax your potential because a crap game is a crap game is a crap game.

Whenever you are sitting at the keyboard, communing with the computer, think to yourself, "what would happen if . . .?" "How can I develop this idea? How can I change or improve this program? How can I put my personal stamp on it?"

Answer one question at a time by working it out. Find out what happens if . . . Do not be afraid of ruining a program or routine you like. You never know what will trigger a train of thought or stimulate your mind to create new ideas. So you get an idea? It's wild! What do you do? Write it down! Try it out!

To give you an idea of what happens when you let your mind work its will upon the computer, I made up a crap game, *2CRAPSA*. "A" because it is a version of a taped *2CRAPS*. See Listing 1.

First, copy and *RUN* it. Then, dress it up. Say to yourself, "How would it look if I . . .? Suppose I changed the color? What if I added a sound? —Or, sounds? Where?" Try to improve it. I bet in 10 minutes you'll come up with something innovative and within an hour you will have so altered and improved it that you'll wonder what dope wrote the program in the first place.

Here are a few things wrong with the program:

- 1) The centering (horizontal and vertical) stinks. Did you realign it to make it more pleasing to look at?
- 2) The two dies are much too far apart. Did you move them closer together?
- 3) All the text, printed on the colored background, has green "trailers" (green line continues after the last line to the right margin). Did you correct this fault? If you didn't, type a ";" at the end of each line that has the trailer. Make a note of it in your notebook.

Now for a little logic! Boy, this computing sure exercises your mind!

Look at lines 637 to 690. Now, everybody knows that playing craps is a quick game averaging three or four throws. Isn't it foolish and tedious to ask a player to indicate if he wants to play or not to play? Wouldn't it be better to delete lines 637 to 690 and make *line 640 GOTO 10 . . .* and keep next player a chance at a new run or *NEW* and Kill the program playing? Doesn't it make sense to *BREAK* to give the nor simply turn off the computer? Why go through a mindless and time-consuming routine over and over? Try the change! Don't you agree?

When you have made a completed revision that suits you, insert a few *REMs* in the program listing your name and address. Well, what are you waiting for? Give it a name and *CSAVE* it. List it on the title card (start, name, end) and enter it into your tape register. Under "description" you can confidently print, "Revised *2CRAPA* game" by "your name."

Pay attention, now! Think boldly! Perhaps, even a bit wildly! What can be done to this dice game?

Let me throw this idea at you. How about a three-dice crap game? "Dopey!" you say. "Real dopey!" I reply.

Wait a cotton pickin' minute! So what, if there is no such animal as a three-dice crap game? Who says you can't make one? Who says it won't work? Let your imagination soar.

First, make up some rules. Make them to fit the situation as you determine it. You are in charge of creating a new game. You make the rules.

Think! A third die is needed. Room has to be made to display it alongside the other two. When the first roll is cast, you have to—well, you get the idea. Hop to it!

Remember to check out the modified version you made of the *2CRAPSA* listing and use it as a rough guide.

It is surprising to note that a three-craps game doesn't have too many more lines than a two-craps game. When you finish up your program, *RUN* and *LIST* it and figure any more nice touches you can add to it to make it more visually attractive or operate more efficiently. If you are satisfied, then a title should be added at this point. (We will get to creating titles in a future article.) Add the *REMs* such as your name and address, etc. Give it a name and *CSAVE* it to tape, list it on the tape title card and enter it into your tape register.

That was fun, wasn't it? You were both learning and reinforcing what you already knew. You learned that far out ideas (like the three-die game) are viable. That is where I want you to channel your thoughts: into uncharted regions.

Your computer has nearly unlimited capabilities to enable you to express yourself.

Creativity is not the sacred province of the gifted few. As long as you exercise *what ifs* or *suppose* *Is* you are being creative. It is a matter of getting into the habit of using your mind in an inquiring way.

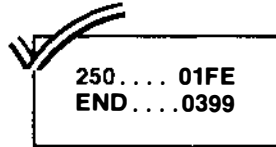
Always make an attempt to revise your own or an existing program. There is no program that can't stand improvement. Mainly, because there is more than one way to do anything.

Listing 2 is my version of *3CRAPS*. Don't key it in until you have made up your own *3CRAPS* game from the revised version of your *2CRAPS*. Your program should be better than the listing and that is as it should be!

Key in *3CRAPS* if you like, and touch it up. Give it your imprimatur (stamp of approval) and tape it for reference.

In the next article, we shall study this program in depth. If you are the proud creator of a nice, revised three-crap game and want to share it with me, I would be pleased to get a listing. Show me what you cooked up.

In the next article, we shall study this program in depth. If you are the proud creator of a nice, revised three crap game and want to share it with me, I would be pleased to get a listing. My address is 1709 Dickinson Street, Inverness, FL 32650. Show me what you cooked up.



Listing 1:

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```

20 B = RND(6)
30 A = RND(6)
40 R = A + B
50 PRINT @ 200, A
60 PRINT @ 214, B
70 PRINT @ 394, "YOU ROLLED A"!R
80 IF R = 2 THEN 600
90 IF R = 3 THEN 600
100 IF R = 12 THEN 600
110 IF R = 7 THEN 500
120 IF R = 11 THEN 500
130 FOR X = 1 TO 800
140 NEXT X
150 CLS(5)
160 PRINT@ 195, "ROLL ANOTHER"!R
"AND YOU WIN"
170 PRINT@262, "ROLL A 7 AND YOU
LOSE"
180 PRINT@ 420, "PRESS <ENTER> W
HEN READY."
185 PRINT@ 456, "FOR YOUR NEXT R
OLL."
190 INPUT A$
200 X = RND(6)
210 Y = RND(6)
220 Z = X + Y
225 CLS
230 PRINT@ 200, X
240 PRINT@ 214, Y
245 CLS(2)
250 PRINT@ 394, "YOU ROLLED A"!Z
255 PRINT@ 295, "YOU NEED TO ROL
L A"!R
260 IF Z = R THEN 500
270 IF Z = 7 THEN 600
280 GOTO 180
500 FOR X = 1 TO 1000
510 NEXT X
515 CLS(2)
520 PRINT @ 230, "YOU'RE THE WIN
NER"
530 PRINT@ 294, "CONGRATULATIONS
!"
540 GOTO 635
600 FOR X = 1 TO 1000
610 NEXT X
615 CLS
620 PRINT@ 264, "SORRY, YOU LOSE
"
635 FOR Z = 1 TO 1000
636 NEXT Z
637 CLS(8)
640 PRINT @ 453, " TO CONTINUE T
YPE Y, IF NOT N."
650 INPUT L$
660 IF L$ = "Y" THEN 670
665 END
670 PRINT
680 GOTO 10
690 IF L$ = "N" THEN 665

```

340.... 02EF
END....0525

Listing 2:

```
1 '***<3CRAPS> LISTING 2 FOR ART
ICLE 5.
10 CLS:PRINT
20 PRINT "          RULES"
30 PRINT:PRINT:PRINT
40 PRINT"          RULES FOR THREE D
ICE."
50 PRINT
60 PRINT" IF YOU ROLL A 10 OR 1
7 ON "
70 PRINT"YOUR FIRST THROW, YOU W
IN!"
80 PRINT:PRINT:PRINT
90 PRINT " IF YOU ROLL A 4, 5,
OR 10,"
100 PRINT "ON YOUR FIRST THROW,Y
OU CRAP OUT"
110 FOR Z = 1 TO 4500
120 NEXT Z
130 CLS
140 B = RND(6)
150 A = RND(6)
160 C = RND(6)
170 R = A + B + C
180 PRINT @ 200,A
190 PRINT @ 200, B
200 PRINT @ 216,C
210 PRINT @ 393, "YOU ROLLED A";
R;
220 IF R = 4 THEN 570
230 IF R = 5 THEN 570
240 IF R = 10 THEN 570
250 IF R = 10 THEN 510
260 IF R = 17 THEN 510
270 FOR X = 1 TO 800
280 NEXT X
290 CLS(5)
300 PRINT@ 195, "ROLL ANOTHER";R
"AND YOU WIN";
310 PRINT@261, "ROLL A 10 AND YO
U LOSE";
320 PRINT@ 420, "PRESS <ENTER> W
HEN READY ";
330 PRINT@ 454, "FOR YOUR NEXT R
OLL.";
340 INPUT A#
350 X = RND(6)
360 Y = RND(6)
370 T = RND(6)
380 Z = X + Y + T
390 CLS(5)
400 PRINT@ 198, X
410 PRINT@ 207,Y
420 PRINT 216,T
430 CLS(2)
```

```
440 PRINT@350, "***YOU ROLLED A";
Z;
450 PRINT@376, "***";
470 PRINT@ 262, "YOU NEED TO ROL
L A";R;
480 IF Z = R THEN 510
490 IF Z = 10 THEN 570
500 GOTO 320
510 FOR X = 1 TO 1000
520 NEXT X
530 CLS(6)
540 PRINT @ 232, "YOU'RE THE WIN
NER";
550 PRINT@ 296, "CONGRATULATIONS
!";
560 GOTO 610
570 FOR X = 1 TO 1000
580 NEXT X
590 CLS(7)
600 PRINT@ 264, "SORRY, YOU LOSE
!";
610 FOR Z = 1 TO 1000
620 NEXT Z
630 GOTO 130
640 '***NOTE 630 GOTO 130 RATHER
THAN 10 TO AVOID HAVING TO READ
THE INSTRUCTIONS OVER AND OVER.
```

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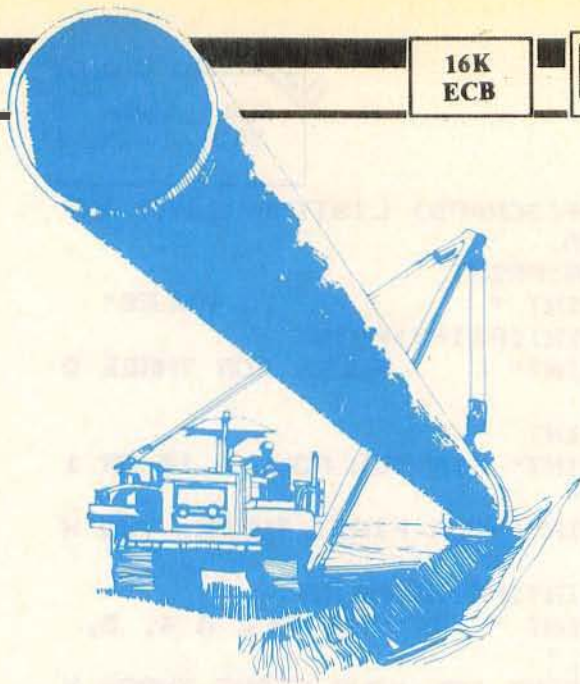
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Supply Water to Thirsty Urbanites With Pipeline

By Martin S. Montes



A game programmer's aspiration has always been to make a game which plays and sounds like its arcade counterpart. Many such attempts have been successful, creating pixel for pixel copies of the fast, colorful, well-developed arcade games. The programs themselves usually are manybytes of a programmer's hard work and though his work is there, his creativity did not surface in the program since he is merely using the previously given game format.

To avoid both the dilemma of too much work for nothing more than a previously created game, I spent almost a week developing not the program, but the game's format. The essential elements of the game were to be color, speed, noise and most importantly a simple set of rules which would bear no resemblance to any of the current arcade games. It really was a good feeling to get the creative juices flowing, and immediately following the design, I was ready to see my idea come to life in the easy to use language of BASIC.

The programming part was actually one of my first considerations when designing the following game named *Pipeline*. I wanted to make full use of the powerful paint command and once you see the results, you'll write your next game program using any single command to display the game's major effect. The "X" command for draw strings is also used extensively (lines 70-100) for "quicker than eye" graphics without making use of any Speed Up the Processor pokes.

The rules to *Pipeline* are simple yet provide a very creative medium for the player. At the start of a round, the screen will display several yellow squares; these are pumping stations. Two of the squares are larger and these are two "thirsty cities." The object of the game is to build a pipeline connecting all cities on the screen; the trick is that there are many earthquake epicenters which cut across the path of the pipe and disrupt flow.

Construction of the pipe takes place beginning at the city colored red in the center. A pipe connecting one station to another is built in the direction indicated by pressing one of the four arrow keys on the keyboard. Once you are confident that a sound pipe has been built connecting all cities on the screen, press the space bar to begin the flow

through the pipe. If the flow cannot move through a section of pipe, possibly because an earthquake has cut across the line, the flow will look for an alternate route to the cities. If the flow is unsuccessful in getting to all cities on the screen, the game is over and your final score displayed.

Successfully getting the flow to all cities on the screen adds to your score the time left indicated by the time remaining line at the bottom of the display. This line gets shorter as you are in the process of building your pipeline and if the line diminishes to zero, the game ends. When the player scores, he begins the next round with an additional city and must begin again building a good pipeline between these cities. Total score for all previous rounds is displayed in the lower right corner.

If a player presses the space bar so that flow begins, but the flow does not reach one or more cities due to earthquake destruction or a connection between the cities not having been made, an alarm sounds as the thirsty city blinks and the game ends.

The following is a brief description of the function of the program's statements:

- 10 — remove this statement if you wish to type in a set of instructions.
- 20 — asks the player if he/she desires instructions. The response is stored in variable A\$ and a response of "yes" could display any instructions you wish to put.
- 30 — randomizer, using the TIMER to get a different number at the start of the game.
- 40 — functions used to get random pixel coordinates.
- 50 — data on how to draw numerals.
- 60 — data on how to draw section of pipe in four directions
- data on drawing pumping stations and earthquake epicenters.
- 70 — 100 draw strings for drawing rows and columns of pumping stations.
- 110 — locate starting city, max time per round, number and placement of earthquakes.
- 120 — code direction keys, placement of cities.
- 130 — paint starting city.

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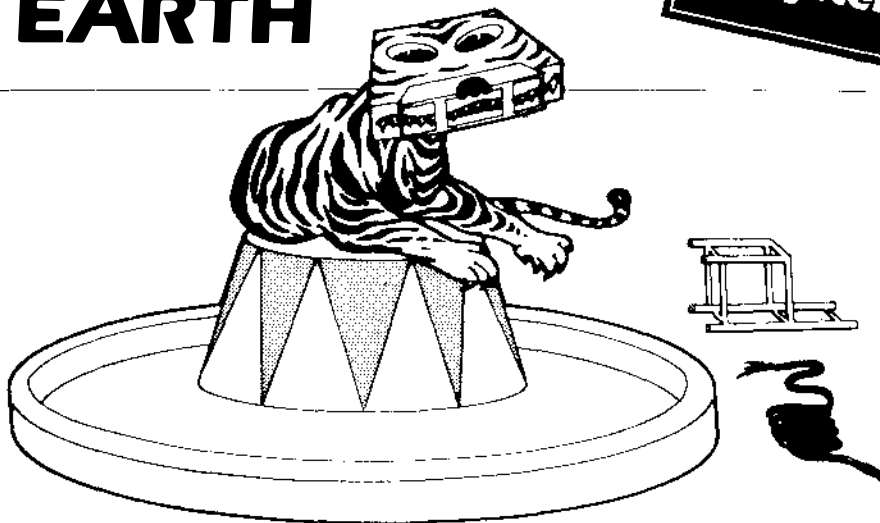
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```
"C4BM5,187R"+I$: PLAY"02;3;8;8;3
;11;12;12"
170 I$=INKEY$: IF I$="" THEN 230
180 DX=0:DY=0:IF I$=L$ THEN DX=-
1 ELSE IF I$=R$ THEN DX=+1 ELSE
IF I$=U$ THEN DY=-1 ELSE IF I$=D
$ THEN DY=+1 ELSE IF I$=" " THEN
280190 X=X+DX*16: Y=Y+DY*8
200 IF X<15 THEN X=15:SOUND 10,1
:GOTO 230 ELSE IF X>239 THEN X=2
39:SOUND 20,1:GOTO 230
210 IF Y<9 THEN Y=9:SOUND 10,1:G
OTO 230 ELSE IF Y>177 THEN Y=177
:SOUND 20,1:GOTO 230
220 PLAY"04L250;5":DRAW"BM"+STR$
(X-DX*16)+", "+STR$(Y-DY*8)+E$(DX
*2+DY+2)
230 IF RND(5)<>1 THEN 270 ELSE I
=RND(EP):L=X0(I):M=Y0(I): I$="BM
"+STR$(L)+", "+STR$(M): DRAW"C3XI
$;XEN$;"
240 IF RND(2)=1 THEN J=SGN(X-L):
K=0 ELSE J=0:K=SGN(Y-M)
250 DRAW"XI$;C2M"+STR$(L+J*16)+
", "+STR$(M+K*8)+"XEN$;"
260 X0(I)=L+J*16: Y0(I)=M+K*8
270 IF TIME<0 THEN 320 ELSE TIME
=TIME-0.3:DRAW"C3BM"+STR$(INT(TI
ME*2+5))+", 185D2":GOTO 170
280 PLAY"02L255T255;1;3;8;7;2;2;
2;3":PAINT(HX(0),HY(0)+1),4,2:FO
RI=1TO LEVEL:IF PPOINT(HX(I),HY(
I)+1)<>4THENDRAW"BM"+STR$(HX(I)
)+", "+STR$(HY(I)):FORJ=1TO27+2*LE
:PLAY"05V31;1;3;8;8;12":DRAW"C4X
S$":PLAY"04;12;10;6;6;3;1":DRAW
"C1XS$":NEXTJ:GOTO320
290 NEXT I:FOR I=3 TO 5:PLAY"L24
00"+STR$(I)+";3;6;8;9":PAINT(HX(
0),HY(0)+1),1,2:PLAY"9;4;6;2;1":
PAINT(HX(0),HY(0)+1),4,2:NEXT I:
PLAY"T4L802;1;P32;1L4P32;1;4L8;8
P32;8;10P32;10L4;8;L2;3":PTS=PT
S+INT(TIME):LEVEL=LEVEL+1:GOTO11
0
300 R$=S$+"BR16":L$=S$+"BL16":U$
=S$+"BUS":D$=S$+"BD8": I=14:DRAW
"C2BM15,9"+MID$(R0$,5)+"XS$":PL
AY"L255V2503;5;8;6;4;4;1"
310 PLAY"1;1;2;8;2":DRAW LEFT$(D
0$, (I+7)*4+1)+"XS$":PLAY"3;10;4
":IF I=0 THEN RETURN ELSE DRAW L
EFT$(L0$, I*4+1)+"XS$":PLAY"5;12
;6":DRAW LEFT$(U0$, (I+6)*4+1)+"X
S$":PLAY"7;04;4;03;9":DRAWLEFT$
(R0$, (I-1)*4+1)+"XS$": I=I-2:GOT
O 310
320 CLS:PRINT@230,"TOTAL POINTS
="PTS:PRINT@416:END
```

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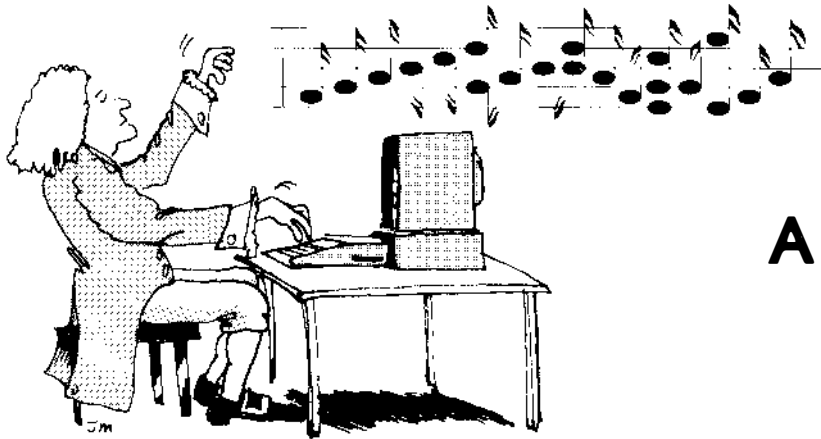
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A Musical Scale Generator

By Bob Delbourgo

The books and manuals on Color BASIC give instructions on how to produce a tone T of given length L through the command

SOUND T,L.

For instance, middle C (octave 03) has tone value T=89; the octave above (04) has a C note with T=176 and a further octave up (05) the T value is 218. Similarly for other notes and other octaves. One recognizes a steady upward progression in T as the notes get higher but to find out what T-value corresponds to a particular note one is forced to consult the manual. In fact the T-values associated with the various notes have an element of mystery about them. I shall try to dispel it.

Musicians with even a rudimentary scientific training will tell you that a note has a precise pitch, or frequency N (in cycles per second). For example, middle C has N=256. Each time that you go up an octave you double the frequency, N to 2*N, and conversely each time that you go down an octave you halve the frequency. There is obviously some relation between the frequency N and the tone T. You can get a fair idea of that by plotting N against T—the graph shows a steady and ever-steeper climb as T approaches the magic value of 256. If the N - T relation can be quantified, then a whole new range of musical possibilities is open to you.

I have found that a reasonably accurate formula is provided by

$$T = \text{INT}(259.4 - 41516 / (N - 11))$$

as you may perhaps agree by glancing at the following table. (A more accurate formula, especially nearer the low frequency end, is no doubt possible, but it would involve more complicated algebraic expressions. You are welcome to try improving mine.)

OCTAVE	NOTE	FREQUENCY N	T (by formula)	T (in manual)
02	G	192	30	32
03	C	256	89	89
03	G	384	148	147
04	C	512	176	176
04	G	767	204	204
05	C	1024	218	218
05	G	1534	232	232
06	C	2048	239	239

Since T must lie between one and 255, you must restrict the N to the range 172 to 12200, otherwise the formula will cause ncy an ?FC ERROR.

Why bother with any of this? *Because musical scales are based upon exact frequency ratios.* The major scale uses notes in the following proportion:

1 : 9/8 : 5/4 : 4/3 : 3/2 : 5/3 : 15/8 : 2
Do Re Mi Fa So La Ti Do

whereas the minor scale has instead the ratios:

1 : 9/8 : 6/5 : 27/20 : 3/2 : 8/5 : 15/8 : 2

The beauty of the formula is that you can generate a scale starting from any pitch (even from an unconventional note) without needing to consult the manual all the time and having to smarten up on musical theory into the bargain! Apart from the Color BASIC limitation on the length L of the note and the restriction to N>171, I think that the formula competes favorably with the *PLAY* command of Extended Color BASIC.

The twelve chromatic semitones are easily obtained by multiplying successive notes by the (equal temperament) factor 1.0595. See how simple is the Listing which produces

the chromatic scale:

```
1 N=256:GOSUB2:FOR K=1TO11:N=1.0595*N:GOSUB2
:NEXTK:GOTO1
2 T=INT(259.4-41516/(N-11)):SOUND T,2:RETURN
```

It is surely easier and more economical than writing a host of *SOUND* statements. Maybe you will be more impressed if you let K run from 1 to 35 in Line 1, when you go through three octaves chromatically!

More interesting musical phrases are now within your grasp. For instance, a sequence of arpeggios is generated in the next Listing:

```
1 M=192
2 N=2*M:GOSUB5:N=3*M/2:GOSUB5:N=5*M/4:
GOSUB5:N=M:GOSUB5
3 FORU=1TO100:NEXTU:M=1.0595*M:IFM>1024
THENM=192
4 GOTO2
5 T=INT(259.4-41516/(N-11)):SOUND T,1:RETURN
```

You simply cannot achieve the same effect *directly* in the sound statement, either by incrementing with a fixed number or by multiplying with some number—indeed, those sound procedures are decidedly harsh on the ear though they are often used for want of anything better. Now, I hope I have offered you something better.

Musically knowledgeable readers ought to be able to adapt my formula to serve up richer musical fare than I have done. And why not also build up other sets of scales (oriental, arabic,...) where the frequency ratios are different from the Western major and minor scales?



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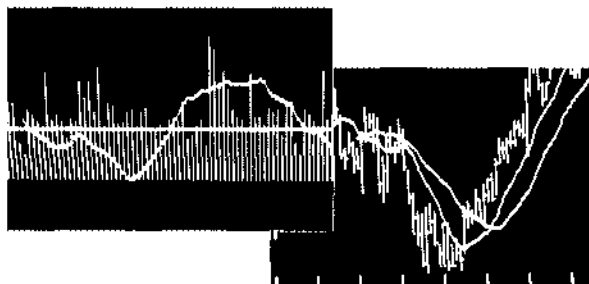
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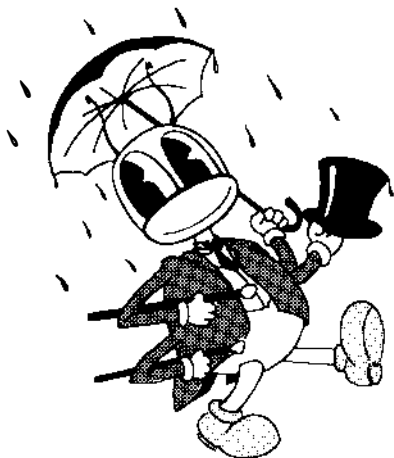
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Rainbug Redux

Part two of a four-part series on our new machine language monitor being developed by the author, *Rainbow* Technical Editor, Dan Downard. Our apologies to John Updike for this month's title

I hope by this time most of you have experimented with the memory examine function described in the first part of this series. This month we will add a command handler and a utility to calculate relative offsets to the *Rainbug* monitor. First, we will cover two of the fundamental ideas of machine language programming, registers and addressing. Next month we will cover the different types of machine instructions, or op-codes, that are available, as well as add more commands to our monitor. As we mentioned before some supplementary material will be necessary as we are only providing an overview of machine language programming. The best way I have found to become familiar with op-codes, etc., is by experimentation.

Registers

The 6809 contains internal memory locations called registers. There are nine registers for the programmer's use. They can be categorized into six areas; Index Registers, Stack Pointers, Program Counter, Accumulators, Condition Code and the Direct Page Register.

Index Registers (X,Y)

These two 16 bit registers normally contain address information for use during indexed addressing mentioned later in this article. They can also be used for counting or any time a 16-bit value is necessary during arithmetic operations.

Stack Pointers (S,U)

These two 16 bit registers contain information that is necessary to be temporarily stored during program execution, such as the return address during execution of a subroutine. The S Register is called the Hardware Stack Pointer as it is automatically used by the processor to store this information and, by the way, set to a specific location by BASIC. The U Register can be programmed by the user and can also be used as an Index Register.

Program Counter (PC)

The program counter is a 16 bit register that stores the address of the next instruction to be executed.

Accumulators (A,B,D)

The accumulators A and B are general purpose 8 bit registers for arithmetic and general purpose use. A and B can be combined to form a 16 bit D register.

Direct Page (DP)

This 8 bit register is used for direct addressing mentioned later. It is used as the 8 most significant bits of a 16 bit address.

Condition Code (CC)

Each of the 8 bits in this register is used to indicate the result of a previous operation, enable operations or indicate status.

Addressing

There are usually two types of information essential to the operation of a microprocessor, addresses and data. An address consists of 16 bits of binary information generated by the processor. Some elementary math will produce the fact that with 16 bits of binary information we can address 2 raised to the 16th power or 65,536 bytes of memory. Hence, we refer to the maximum addressable memory as 64K. Data consists of the 8 bits, or byte, of information contained in memory at any discrete address. The 16 bits of address and 8 bits of data are most commonly called the "Address Bus" and "Data Bus." Previously we mentioned that the microprocessor starts at a certain address and examines the data at that location. This data is interpreted by the microprocessor and this particular instruction is executed. Op-codes can be divided into several different categories, one important distinction being the type of addressing mode specified. Following are the different types of addressing modes available on the 6809 processor used in the TRS-80C.

Inherent Addressing

The instruction is self-contained. Only one byte of information is necessary to specify the operation to be performed. An example would be ABX or add Register B to Register X. The corresponding op-code for this mnemonic is 3A.

Immediate Addressing

The instruction consists of an op-code followed by an 8 or 16 bit data byte called the operand. The operand is a constant value. An example would be LDA #\$41 or load the immediate value \$41 into Register A. In the mnemonic language "#" is used to signify immediate addressing. Since we now have an op-code and an operand this particular instruction would appear in two consecutive memory locations as 86 41.

Extended Addressing

The operand contains an address, or two bytes, pointing to the data for the operation. LDA \$7000 would put the data at memory location \$7000 into the A-Register. Now, three consecutive memory locations should contain the op-codes B6 70 00.

Direct Addressing

Direct addressing is similar to extended addressing except the first byte, or the first two hexadecimal digits, of the operand are specified by the direct page register. Assuming the direct page register (DP) contains \$0, or zero, the instruction LDA < \$FF would load Register A with the data at memory location \$00FF. Note that the mnemonic symbol for direct addressing is "<."

Indexed Addressing—Constant Offset

In this mode of addressing, one of the 16 bit registers is used as a reference operand for the operation. The value of the X, Y, U or S Register is the effective memory location of the data. A 5-bit, 8-bit, or 16-bit offset may be specified in addition. An example would be LDA 2,X. Assuming the value of the X-Register was \$2000, this instruction would load the data at memory location \$2000 plus 2, or \$2002, into Register A. This type of operation requires an op-code and a postbyte. Since one of the functions of *Rainbug* will be the calculation of the postbyte we will not elaborate at this time, but be patient. For the particular example given, the machine code would appear as A6 02.

Indexed Addressing—Accumulator Offset

The contents of the specified register are added to the value of the specified accumulator (A, B or D) using a twos complement to form the effective address of the data. Assuming Register A contained \$02 and Register X contained \$2000, the execution of a LDA A,X instruction would load Register A with the data in memory location \$2002. The op-code and postbyte for this particular instruction would be A6 86.

Autoincrement/Decrement

This form of indexed addressing is essentially the same as constant offset except the specified register is either incremented or decremented depending on the operation. In the autoincrement mode the value of the effective address is incremented after the operation is performed. In the autodecrement mode the value of the effective address is decremented before the operation. Here, the effective address refers to a 16 bit register such as X or Y without an offset. The register can be incremented/decremented by one or two and is noted as LDA ,X+ or LDA ,X++ respectively. The mnemonic LDA ,X+ would have a corresponding op-code and postbyte of A6 80. The "+" or "-" specify the mode of operation.

Program Counter Relative

The Program Counter Register (PC) can also be used for indexed addressing. An offset of 8 or 16 bits can be added to form an effective address relative to the value of the current program counter. It is exactly the same as extended addressing and the mnemonic would appear as LDA \$2000,PCR. This instruction would load the data at memory location \$2000 into the A Register. Why not use extended addressing? Well, in this particular example it doesn't matter but one of the strong points of the 6809 is the ability to use position independent code or PIC. Program counter relative addressing allows us to specify an address relative to the

location of the instruction, thus allowing us to write programs that will execute no matter where they are located in memory.

Indirect Addressing

In this mode of addressing the operand contains the address of the data. For example, the operation LDA [\$A000] would instruct the processor to load Register A with the data at the address located at \$A000. Confused?. If \$A000 contained the two bytes \$1234, Register A would be loaded with the data at address \$1234.

Branch Relative

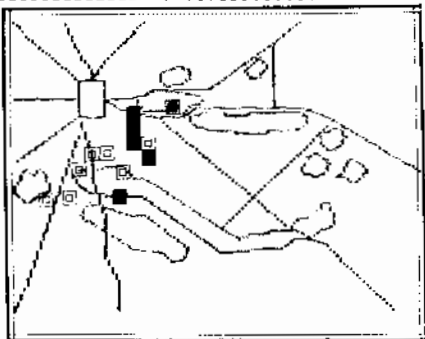
This type of addressing is used when conditional tests are made throughout the program to determine further operations. If the condition is satisfied, the program counter value will be incremented by a value called an offset. Usually tests are performed on the Condition Codes Register (CC) and a decision is made as to the next step in the program.

Since at the time the instruction is executed the program counter is pointing to the next instruction, the value of the postbyte is calculated using the address of the next instruction as the beginning address and the destination as the end address. Again, don't worry about calculating the offset value since *Rainbug* will calculate it for you. An example of relative addressing in mnemonic form would be BCC \$2000 where if the carry bit of CC was zero, the program counter would move to address \$2000. Relative addressing has two forms of op-codes and mnemonics depending on whether an 8 or 16 bit offset is necessary. With an 8 bit offset using twos complement arithmetic, the program counter can only be incremented by 128 or decremented by 127. If a longer

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branch is necessary a "Long Branch" is necessary and in the previous example would be noted as LBCC \$2000.

Rainbug

This month the listing for *Rainbug* contains all of the necessary housekeeping software to initialize the monitor and give you a "#" on the screen to indicate that it's ready for a command. After displaying the prompt, it compares the command you type in the form of a single letter to the list of available commands and moves the program counter to that location for execution. Two new commands are implemented, W-Window and O-Relative offset calculation.

W-WINDOW W XXXX

This command sets the value of W to the value XXXX. This value may be used when entering expressions by simply entering W instead of the value.

O-OFFSET O XXXX YYYY

This command calculates the postbyte offset value for branch relative instructions where XXXX is the address of the current branch instruction and YYYY is the destination address. The resultant offset is printed on the next line and control is restored to the command mode.

Summary

Addressing is probably the most difficult feature of micro-processors to understand, but probably the most important from a programmer's view. By recognizing all of the available methods at your disposal, code can be minimized in length for a corresponding maximum efficiency. As we men-

tioned several times before, this article only presents an overview of machine language programming, but with the information in this month's installment, see if you can follow a little bit of the machine code in *Rainbug* and figure out how it works.



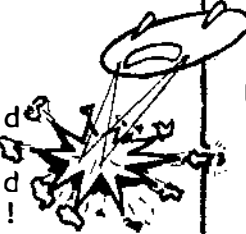
See you next month!

The listing:

```

00100 #RAINBUG
00110 #DAN DOWNARD    REV 1
00111 #LINES 100-2100 APPEARED
00112 #IN PART 1 OF THIS SERIES
3000    00120            ORG    $3000
         3006    00130 CHDBAD EQU    CMEM2
         000C    00140 SKIP2 EQU    $8C
         A000    00150 POLCAT EQU    $A000
         A002    00160 CHROUT EQU    $A002
                 02105 #COLD START
319E 30    8D 0015    02150 RESET    LEAX    MONTR,PCR
31A2 9F    9D            02160            STX    $9D
31A4 20    11            02170            BRA    MONTR
                 02175 #ERROR MESSAGE
31A6        3F04    02180 ERRMSG    FDB    $3F04
31A8 30    8C FB    02190 ERROR    LEAX    ERRMSG,PCR
31AB 8D    D9            02200            BSR    PDATA
31AD 20    1C            02210            BRA    CMD
                 02215 #MONITOR PROMPT
31AF        52            02220 SIGNON    FCC    /RAINBUG/

```

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	41				
	49				
	4E				
	42				
	55				
	47				
31B6	04	02230	FCB	004	
		02235	*WARM START		
31B7	1A	02240	MONTR	ORCC	0080
31B9	34	02250	PSHS	U,Y,X,DP,B,A,CC	
31BB	86	02260	LDA	0020	
31BD	87	02270	STA	DELIM	
31C0	30	02280	LEAX	SIGNON,PCR	
31C3	8D	02290	BSR	PDATA	
31C5	8D	02295	BSR	PCRLF	
31C7	10FF	02300	STS	PSTACK	
		02305	*COMMAND LOOP		
31CB	10FE	02310	CMD	LDS	PSTACK
31CF	4F	02320		CLRA	
31D0	5F	02330		CLRB	
31D1	FD	02340		STD	NUMBER
31D4	86	02350	LDA	0023	
31D6	8D	02360	BSR	OUTCH	
31D8	17	02370	LBSR	READ	
31DB	30	02380	LEAX	CMPADP,PCR	
31DF	81	02390	CMPA	002F	
31E1	27	02400	BEQ	CMDXQT	
31E3	1F	02410	TFR	A,B	
31E5	8D	02420	BSR	SPACE	
31E7	30	02430	LEAX	CMDTBL,PCR	
31EB	86	02440	LDA	0010	
		02445	*LOOK FOR COMMAND		
31ED	E1	02450	CMD1	CMPB	,X
31EF	27	02460		BEQ	CMD2
31F1	30	02470		LEAX	3,X
31F3	4A	02480		DECA	
31F4	26	02490		BNE	CMD1
31F6	20	02500		BRA	ERROR
		02505	*GO TO COMMAND		
31FB	30	02510	CMD2	LEAX	1,X
31FA	EC	02520		LDD	,X
31FC	AD	02530		JSR	D,X
31FE	20	02535		BRA	CMD
		02537	*QUICK MEM COMMAND		
3200	AD	02540	CMDXQT	JSR	0,X
3202	16	02550		LBRA	MONTR
		02555	*TABLE OF COMMANDS		
	3205	02560	CMDTBL	EQU	*
3205	42	02570		FCC	/B/
3206	005D	02580		FDB	BKPT-*
3208	43	02590		FCC	/C/
3209	005B	02600		FDB	CALL-*
320B	44	02610		FCC	/D/
320C	0059	02620		FDB	DISK-*
320E	45	02630		FCC	/E/
320F	0057	02640		FDB	ENCDE-*
3211	47	02650		FCC	/G/
3212	0055	02660		FDB	GO-*
3214	4C	02670		FCC	/L/
3215	0053	02680		FDB	LOAD-*

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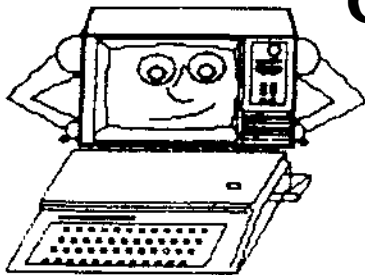
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321A	40	02710	FCC	/e/
321B	004E	02720	FDB	PRINT-*
321D	4F	02730	FCC	/O/
321E	0017	02740	FDB	OFFS-*
3220	50	02750	FCC	/P/
3221	0049	02760	FDB	PUNCH-*
3223	52	02770	FCC	/R/
3224	0047	02780	FDB	REG-*
3226	53	02790	FCC	/S/
3227	0045	02800	FDB	STLEV-*
3229	54	02810	FCC	/T/
322A	0043	02820	FDB	TRACE-*
322C	56	02830	FCC	/V/
322D	0041	02840	FDB	VER-*
322F	57	02850	FCC	/W/
3230	FESC	02860	FDB	CWINDO-*
3232	58	02870	FCC	/X/
3233	002A	02880	FDB	EXIT-*
		02885	*OFFSET	CALCULATION
3235	17	FF07	02890	OFFS LBSR CDNUM
3238	1F	01	02900	TFR D, X
323A	17	FF02	02910	LBSR CDNUM
323D	30	01	02920	LEAX 1, X
323F	34	30	02930	PSHS Y, X
3241	A3	E4	02940	SUBD , S
3243	ED	E4	02950	STD , S
3245	30	01	02960	LEAX 1, X
3247	1D		02970	SEX
3248	A1	E4	02980	CMPA , S
324A	26	03	02990	BNE COFN01
324C	17	FF19	03000	LBSR OUT2HS
324F	EE	E4	03010	COFN01 LDU , S
3251	33	5F	03020	LEAU -1, U
3253	EF	84	03030	STU , X
3255	17	FF0E	03040	LBSR OUT4HS
3258	17	FF28	03050	LBSR PCRLF
325B	35	96	03060	PULS PC, X, D
		03065	*RETURN TO BASIC	
325D	6E	9F FFFE	03070	EXIT JMP [\$FFFE]
		03075	*VARIABLES	
3261		03080	PSTACK RMB	2
		03085	*RTS FOR FUTURE	
		03086	*COMMANDS	
3263	39	03090	BKPT	RTS
3264	39	03100	CALL	RTS
3265	39	03110	DISK	RTS
3266	39	03120	ENCDE	RTS
3267	39	03130	GO	RTS
3268	39	03140	LOAD	RTS
3269	39	03150	PRINT	RTS
326A	39	03160	PUNCH	RTS
326B	39	03170	REG	RTS
326C	39	03180	STLEV	RTS
326D	39	03190	TRACE	RTS
326E	39	03200	VER	RTS
		0000	03210	END
		00000	TOTAL ERRORS	

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- 10). **FIND FRIENDS** As a new member, you will receive a list of the members in your area whom you may contact for CoCo talk.

HOW TO BECOME A MEMBER:

Write to the club for an application, there are no conditions for membership other than agreeing to obey the rules, being interested and paying the dues. The membership dues are \$30.00 per year and we believe you get more than your moneys worth. You can save more than the \$30.00 in discounts the club offers you. Example: Subscription to the RAINBOW, 25% off of regular subscription rates. Some members have told me that the new member tape alone is worth the \$ 30. it contains 10, very good programs. Some of the programs contained in the library are, Accounts Receivable, General ledger, Inventory, Sales file and ticket program with automatic Inventory update (for 32 K with 2 disc.)



CORRECTIONS

A short listing was omitted from Melvin Hefter's article, "Learning To Live With A One Disk System" (April 1983). Mr. Hefter says, "I generally use the *VERIFY* command so that I know when I have a problem as soon as possible. The program I use for duplicating and restoring the needed directory information is a simple one that I run in a few seconds whenever I add a file to my disk or make any significant changes. A *RUN* command duplicates the information. When I have a problem and the *DIR* command results in an I/O error, a *RUN 100* command will restore the directory to its configuration during the last run of this program. If the *DIR* works OK, do not use this recovery procedure. Just accept the loss of one file. I keep a copy of this program on each of my disks so that it is easily available for running and always conveniently available when I have a problem."

The listing:

```
10 DIR 'RUN TO BACKUP DIRECTORY
20 CLEAR400
30 DSKI$ 0,17,2,A$,B$
40 DSKO$ 0,17,1,A$,B$
50 FOR I= 3 TO 9
60 DSKI$ 0,17,I,A$,B$
70 DSKO$ 0,17,I+9,A$,B$
```

```
60 NEXT I
90 END
100 CLEAR400 'RUN 100 TO RECOVER
110 DSKI$ 0,17,1,A$,B$
120 DSKO$ 0,17,2,A$,B$
130 FOR I=3 TO 9
140 DSKI$ 0,17,I+9,A$,B$
150 DSKO$ 0,17,I,A$,B$
160 NEXT I
```

Gremlins were hard at work on our March program, *Power of Attorney*. You can exorcise the little devils with the following line changes. **First you need to eliminate lines 33448, 627 and 2010** by typing in the line numbers and entering the vacant lines. Do not use the *EDIT* mode for making any corrections in this program. **Next, ENTER** the correct lines as follows:

```
60 PRINT "FOR GENERAL APPLICATION"
115 PRINT "ALIGN PAPER"
645 PRINT "STATE OF COMMISSION"
680 CLS: PRINT "PRINTING, PLEASE STAND BY."
755 PRINT #-2, ""
925 INPUT RG$
1360 PRINT #-2, "in his judgement deems advisable, but
not less than $";P;":"
2010 PRINT "HAS BEEN PRINTED. YOU MUST"
```

the RAINBOW's

SIMULATION CONTEST

Write a simulation program in the Rainbow's Simulation Contest. You will have the chance to win valuable prizes and to share your simulation with thousands of Color Computer, TDP-100 and Dragon-32 owners worldwide.

Your simulation can be about any subject—and can be either graphic or non-graphic. See examples of simulation programs printed in the Rainbow.

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RULES: All programs must be original works, no "conversions." Entries must be postmarked by July 30 and become the property of Falsoft, Inc. publisher of the *Rainbow*. Decision of the judges is final. Duplicate prizes will be awarded in the case of ties. Winning programs to be featured in a special *Rainbow* Simulation issue. Mark entries "Simulation Contest Editor" and send to the *Rainbow*, P.O. Box 209, Prospect, KY 40059.

If you follow these instructions in the exact order they are given here, you should be rewarded with a working copy of the program.

To operate the *Fallout* program from our March issue, 16K systems will need a PCLEAR 2 before loading. Also, in order to merge the two parts of the program, you must change the following lines to the way they are listed here:

```
1000 PCLS;CLEAR100;GOSUB1110;SCREEN1,1
1750 PMODE0;PCLEAR4;PMODE4
1800 (delete this line entirely)
```

OOPS

Due to an error by *Rainbow*, the S & S Arcade Supplies ad in our April issue incorrectly listed the price of *ZAXXON* as \$32.95. The correct price is \$39.95. We regret any inconvenience this may have brought about.

Last month in our Pipeline column, we told you about a new bulletin board service called *CoCo's Nest*, run by Strictly Communications, Inc. If their I/O traffic hasn't picked up any, it could be because we forgot to include their phone numbers. Here they are: (212) 423-4623 — Data Line, and (212) 423-4626 - Voice Line.

IMPORTANT NOTICE ABOUT SUBSCRIPTIONS

This month's issue of *the Rainbow* carries a cover date of "June, 1983" although it is actually appearing at the time when you would normally receive your May issue. In addition, you **were not supposed** to have received an issue with the date of May on it.

The reason for this is simply a cosmetic one. We would prefer, and believe you would prefer, to have the June issue arrive in advance of June. By appearing to "skip" the May issue, you will get this, the June issue, before the month of June actually begins.

Your monthly issue of *the Rainbow* will arrive on or about the same time of the month as it always has. There will be no actual "break" in receipt of the issues themselves. The only effect of this change is that this issue has a cover date of "June" instead of "May."

If you are a subscriber, we have advanced the expiration date of your subscription by one month. Although we announced last month that this change would be evident on your mailing label this month, it actually was made last month. You will see by comparing your label on the March and April issues that the change was made.

So, you will not be "missing" an issue. There is no "May" issue of *the Rainbow* and, if you are a subscriber, your subscription expiration date has been advanced one month to reflect the new situation with our cover dates.

Rainbow On Tape subscribers have also had their subscription expiration dates advanced one month so that theirs will coincide with magazine expiration dates.



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RAINBOW Info

What's A CoCo

CoCo is an affectionate name which was first given to the TRS-80 Color Computer by its many fans, users and owners. As such, it is almost a generic term for three computers, all of which are very much alike.

When we use the term CoCo, we refer to the TRS-80 Color Computer, the TDP System-100 Computer and the Dragon-32 Computer. It is easier than using the three "given" names throughout *the Rainbow*.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and TRS-80 Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.



The Rainbow Seal

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product which carries the Seal has been physically seen by us and that it does, indeed, exist.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to *the Rainbow* for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal. This lets you know that we have seen the product and that it does, indeed, exist.

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

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

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

Using Machine Language

Machine Language programs are one of the features of *the Rainbow*. There are a number of ways to "get" these programs into memory so that you can operate them.

The easiest way is by using an Editor-Assembler, a program you can purchase from a number of sources.

An editor-assembler allows you to enter mnemonics into your CoCo and then have the editor-assembler assemble them into specific instructions that are understood by the 6809 chip that controls your computer.

When you use an editor-assembler, all you have to do, essentially, is copy the relevant instructions from *the Rainbow's* listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand assemble some programs.

Use the following program if you wish to hand assemble machine language listings:

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

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

Changing Issue Dates

We are "skipping" a cover issue date — but **not** an issue of *the Rainbow* — with this month's issue.

You may have noticed that this month's issue carries the cover date of "June, 1983" although the last *Rainbow* you received had a cover date of "April." No, you did not miss an issue — we just jumped a month in the cover dates so that your June *Rainbow* would arrive before June started, rather than in the middle or end of the month shown on the cover.

If you have a subscription, your subscription expiration date was advanced one month last month. (We said it would be this month, but we did it last month instead). You will still get a full 12 issues in your subscription.

The Rainbow Check

The small boxes which you see with programs in *the Rainbow* are our *RAINBOW CHECK* program, which is designed to help you type in programs accurately.

The check program will count the number of characters you type in. You can then compare the number the *RAINBOW CHECK* gives you to those printed in *the Rainbow*. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use the *RAINBOW CHECK*, type in the program, *CSAVE* it for future use, then type in the command *RUN* and press *ENTER*. Once the program has run, type *NEW* to remove it from that area into which you will be keying programs.

Now, whenever you press the down arrow, CoCo will give you the hexadecimal number of bytes in memory. This is to check against the numbers printed in *the Rainbow*. If your number is different, check the listing carefully to be sure you typed in the proper BASIC program code.

As the hexadecimal number appears in the upper-left corner of the monitor screen, you may want to clear the screen and press the spacebar five or six times to move the cursor out of the way for easy reading. The *RAINBOW CHECK* counts spaces, too, follow the spacing just as it appears in the magazine.

Here's the program:

```
10 CLS:IF PEEK(116)=127 THEN
X=32688 ELSE X=16304
20 CLEAR 25,X-1
30 IF PEEK(116)=127 THEN X=32688
ELSE X=16304
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IF W=5718 THEN 80 ELSE PRINT
"DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 141, 0, 68
100 DATA 134, 126, 183, 1, 106, 190
110 DATA 1, 107, 175, 141, 0, 57, 48
120 DATA 141, 0, 4, 191, 1, 107, 57
130 DATA 129, 10, 38, 44, 52, 22, 220
140 DATA 27, 147, 25, 142, 4, 0, 141
150 DATA 6, 31, 152, 141, 2, 32, 25
160 DATA 52, 2, 68, 68, 68, 68
170 DATA 141, 4, 53, 2, 132
180 DATA 15, 129, 9, 46, 4, 139, 112
190 DATA 32, 2, 139, 55, 167, 128, 57
200 DATA 53,22,126,0,0
```

THESE FINE STORES CARRY THE RAINBOW

The retail stores listed below carry **the RAINBOW** on a regular basis and may have other products of interest to Color Computer users. We suggest you patronize those in your area.

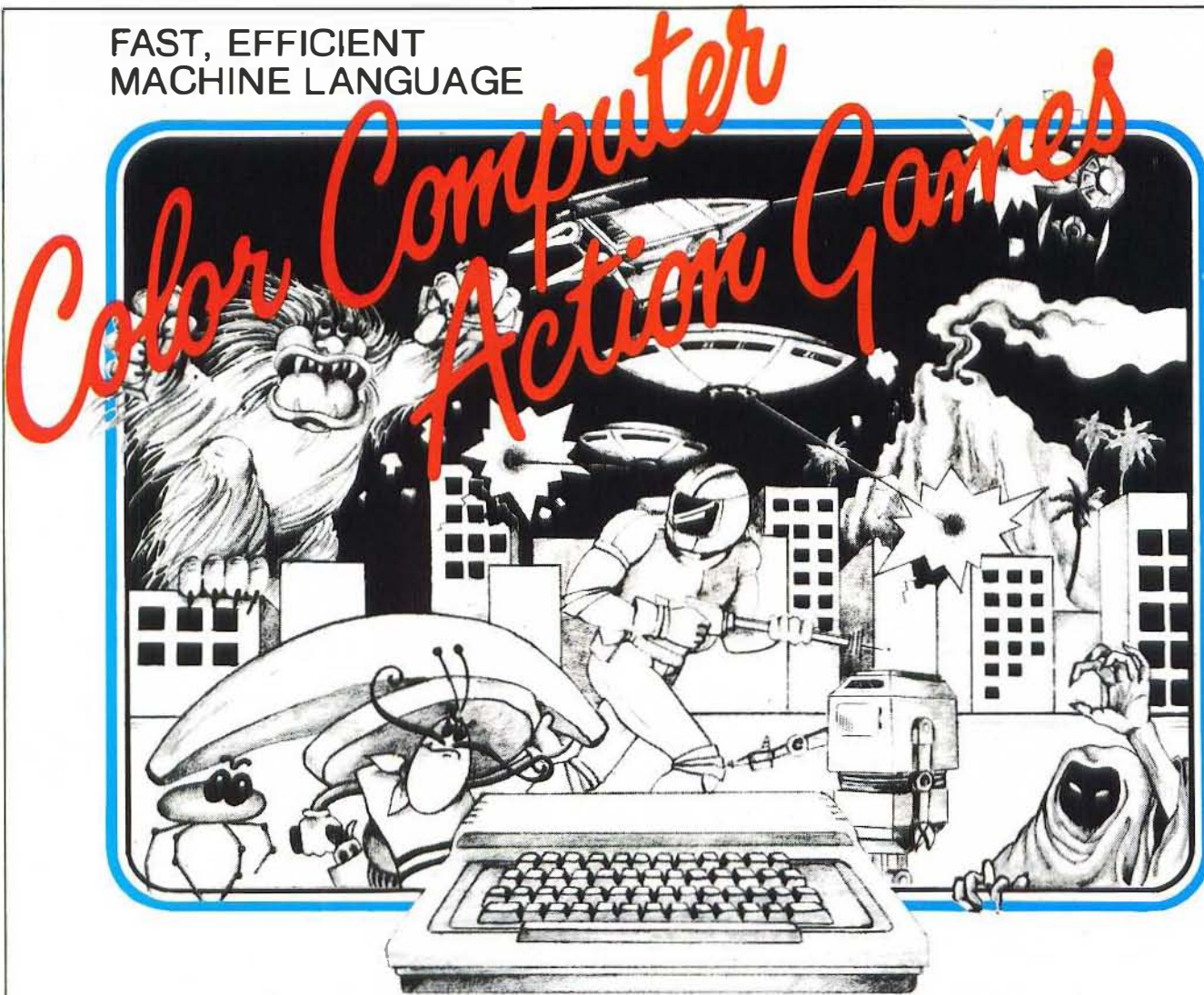
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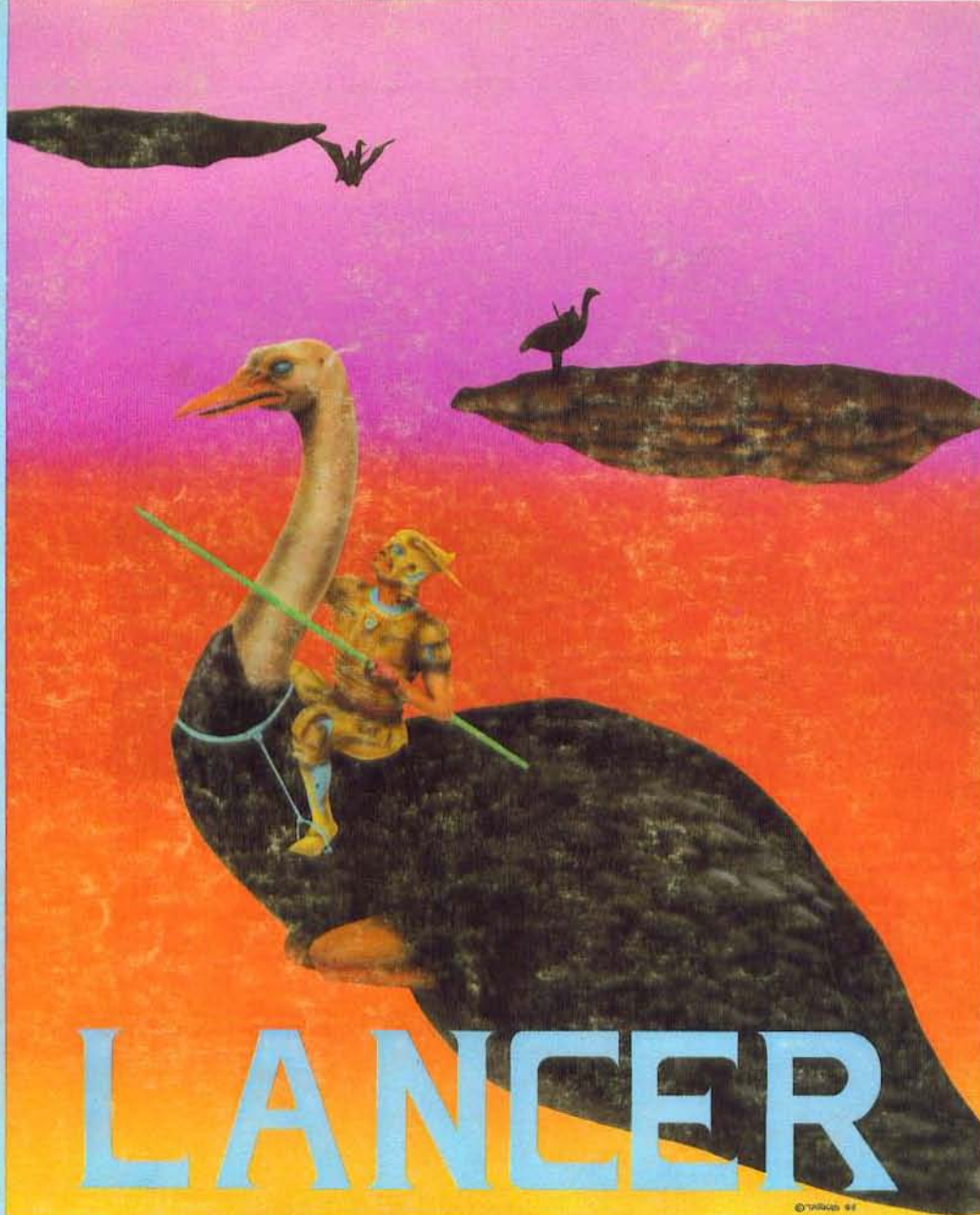
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