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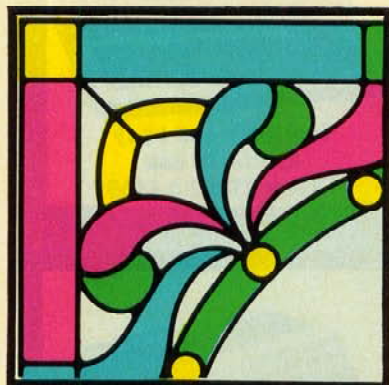
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Under the Rainbow

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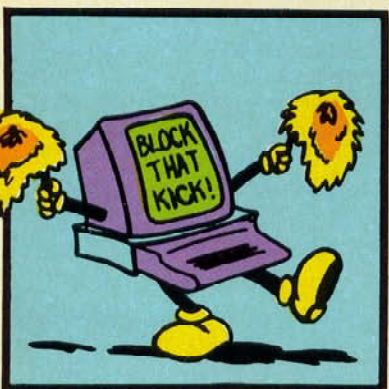
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COVER art © by Fred Crawford

Due to family illness, Dennis Lewandowski's *Assembly Corner* column does not appear again this month. It will return in September.

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NEXT MONTH: September means back to school (already?) and that means *the Rainbow* will have a special emphasis on education. Plus, Steve Blyn's *Education Notes*, Dr. Michael Plog's *Education Overview* and Dale Peterson's *Greetings From Uncle Bert*, our own LOGO column.

Our memory map will feature disk BASIC, we'll offer a *Superpatch* for EDTASM, an appointment book and a new video worksheet.

Plus... more games, more utilities and just more of everything — programs, reviews, and information on CoCo than you can possibly find *anywhere* else. Don't miss the September *Rainbow*!

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RAINBOW

RAINBOW ON 'RECORD'?

Editor:

It is a splendid effort, the 2nd Anniversary issue, and the tipped-in record a brilliant thought. My boys would not object to a rise in the subscription rate, equivalent to a monthly *Rainbow on Tape*, if that helps to guide your decision—so long as the Sound-sheet could be made to contain an equivalent amount.

As for the CGP-115 and Katakana, I have never touched Switch Four at all, but I have found that that syllabary can be entered directly from BASIC, with PRINT#-2, CHR\$(X) where X is above 128. I am not going to stop everything now to refresh my memory of the exact numbers. Why, by the way, do you suppose the Japanese never include the Hiragana on these chips? There's a set of characters which could be put to some real use in the world. There was room enough on the CGP-115 for all the variant forms, I think.

R.W. Odlin
Sedro-Woolley, WA

TRY THE TRS TRIPTIK

Editor:

I find from various articles and advertisements that *Rainbow* has a wealth of information on different aspects of programming. For instance, I gather from the article *Write an ML Program to Handle BASIC Chores* that you have the information on addresses of various ML routines. I also find that you have complete information on *POKEs* and *PEEKs* that we seldom find in one place.

One of the problems I have not been able to get a solution to, except to go in for some kind of toolkit is to protect my BASIC programs from being listed after initial loading from the tape or after *BREAKing*. Maybe this piece of information was published in one of the earlier issues of *Rainbow* but I am so far in the dark.

Monohar Santwani
Fairport, NY

Editor's Note: See Bob Russell's Memory Map in this and other issues.

INFORMATION PLEASE

Editor:

I am a stamp collector and I'm looking for a program that will work on the CoCo. Can someone help? I know that there is one available for the Sinclair, but, I haven't heard of any others. Please send a reply to: C-M Enterprises, P.O. Box 187, 61071.

Connie
Rock Falls, IL

Editor:

I have had an adventure game called *Pirates Ahoy* by Spectral Associates for some time now and I am approaching the brink of insanity!

Can anyone give some hints to a poor, frustrated, adventure novice that can't get out of the first five rooms?

If anyone can give me some clues (or even the solution) to this tough adventure, please send them to: Matt McMann, 22550 Dickinson Rd., 48164. Your help will be greatly appreciated.

Matt McMann
New Boston, MI

Editor:

Is there any way that human-like figures can be drawn using the CoCo's graphic routines? Everytime I try to do it they end up looking like stick figures. I would like to have them look more like people.

I have two books on Color Computer Graphics but I am having a hard time understanding how the graphics are supposed to work.

Bob Chase
Concord, NH

Editor:

I wonder if any of your readers could help me out. I am a graduate student at Penn State University and am in need of any programs for the CoCo that could help me with statistical analysis. For example, anything for determining confidence intervals, standard errors, slope formula, correlation coefficient, z score or anything else that might be useful. I will appreciate any help anyone might offer. My address is: 268 Toftress Ave., Apt. 321, 16801.

James E. Pendorf
State College, PA

Editor's Note: You might find interesting reading in "A 'Nova' For CoCo," an article and program on the statistical analysis of variance by Sam Sherrill. It was published in the March 1983 issue of the *Rainbow*. You'll find it on page 94.

SHED SOME LIGHT?

Editor:

Your April issue contained an excellent article by William C. Clements, Jr., on the addition of a "Power On" light to the CoCo. I was wondering whether any of you electronic experts have a suggestion on how to add a power on light to Radio Shack's disk drive. The present light only comes on when the disk is in actual operation and I find myself forgetting to turn it off more often than CoCo itself.

Chris L. Shelby
Lebanon, IN

Editor:

In your June 1983 edition of *Rainbow*, Letters to the Editor section, there was a letter asking for any information concerning an adapter to convert from TRS-80 to Atari.

I am very interested in any response you receive concerning this letter. Where I work we have two large TRS-80C and Atari groups and are trying to communicate between both systems.

James Downey
Framingham, MA

WHEN THE CHIPS ARE UP

Editor:

I have recently read in the March issue of *Rainbow Pipeline* that there is a VDG chip being developed that could enable the CoCo to have a numerous 4,000 colors, 700 x 500 pixel high-res graphics screen, and a 64 character screen display on the horizon. I want to know if this is true and where this chip will be sold?

I'm very happy with my CoCo, but when I found out how many colors the Atari 400 and 800 computers had, I found my CoCo was missing something!

I feel this VDG chip (if there is one) will help out the CoCo and its owners a great deal.

Also, I enjoy your magazine a lot and look forward to it each month, so please keep up the good work.

Dan Dipierro
Jamesburg, NJ

Editor's Note: We hear rumors to that effect and will report our findings as soon as something is finalized.

Editor:

As the addresses of the ROM subroutines of the Tandy CoCo and the Dragon 32 differ, I would ask if it is possible to publish a list of the addresses of the ROM subroutines of the Tandy CoCo versus the appropriate addresses of the Dragon 32.

T. Arnold Bik
Uilenstede 12 Netherlands

Editor's Note: Though we don't have such a list at this time, CompuSense of England has a new utility which should interest you. Look in this month's Pipeline column.

GROWING PAINS

Editor:

I have owned my CoCo since it was a 4K machine. I have watched it slowly evolve into its present 32K with disk configuration over the last two years.

I have reached the point where what was once a minor inconvenience is now an impediment to its future growth. I refer to the garbage collection habit with which my machine is afflicted.

I read *the Rainbow* very nearly from cover to cover and I have, to my bewilderment, not seen my particular problem addressed.

The specifics of my case: a) I have Radio Shack's line filter and only Radio Shack's computer center has ever worked on any computer upgrading and b) I have established through two years of use that I get trash in the machine during power drops, but not power spikes (ie, memory is altered when the electric furnace comes on, but not when it shuts off, etc.).

Where have I gone wrong? Why is my CoCo growing up with no more ambition than to be a garbage collector?

Charles F. Kerner
Kernersville, NC

Editor's Note: Any electronic device is susceptible to voltage fluctuations at the input, whether spikes (overvoltage) or dropouts (undervoltage). The line filter you mentioned will eliminate spikes but there is no economical way to eliminate dropouts. We may suggest a circuit directly connected to your electrical service panel, via a circuit breaker of course, as a pseudo solution. This circuit would not have the voltage drop present on a normal residential circuit.

I AM THE SYSOP

Editor:

I am the *Sysop* of the BULLET-80 system located in Rochester, NY. I have recently expanded my download section greatly and I was wondering if I could ask you a few questions.

First of all, for my new download section, I would like to have your magazine's programs in it!

Second, since I do not have a Color Computer to load the tapes in with, would there be a "middle-man" who has a Color Computer and could load these in and later upload them to me?

Harold Land
Rochester, NY

Editor's Note: Sorry, these programs are copyrighted and available on *Rainbow on Tape*.

KUDOS

Editor:

I am a relatively new subscriber to your magazine. In the past four months you continue to amaze me with the quality of your magazine. I find the hardware tips and hardware reviews of particular interest. The large number of advertisers is a definite asset to your magazine.

I am a high school science teacher and have access to several different computer systems and many periodicals. Your magazine is the best there is on the CoCo, which

says your product is the best of all the micro-computer journals.

If you change any part of the magazine it should be to add more on the hardware, but the present mix is quite good. I have found your reviews to be excellent and use them as a guideline in my software purchases.

Thanks again for an excellent magazine.
David Loveless
Trenton, NJ

Editor:

Congratulations on your recent upgrade of the cover design. Each issue seems to be an improvement over the last. Keep up the good work.

Charlene Merrill
Ft. Lauderdale, FL

WANTS SOME POINTERS

Editor:

I have had my CoCo a year since April and have enjoyed it greatly. Since I got my computer I have spent very little time with my amateur hobby, but do enjoy the articles for the amateur hobbyist and have copied them.

I would like to get into machine language and was wondering if it would be possible to run articles that tell a person what they need or how to get into machine language? Would it also be possible to make this article start out simply, if possible?

I do enjoy *the Rainbow* and was glad that I found your magazine, although it makes a wife a widow when it shows up in the mail. Keep up the good work and I like to see those Canadian articles in there.

W.S. Goheen
Timmins, Ontario

Editor's Note: For a start, read Dan Downard's and Dennis Lewandowski's columns in *Rainbow*.

PEN PAL FOR A WRITER

Editor:

I am interested in pen pals. I own a TRS-80 CoCo and a TRS-80 Model II Computer/Word Processor.

I'm a bored to tears freelance writer. Can any pen pals out there tell me how to make money at home with my computers? Over 40, M.A. in creative writing and seeking new career in computers. I've authored 29 books. My address is: P.O. Box 4333, 92104.

Anne Jorgensen
San Diego, CA

OLD TV CALLED A HAZARD

Editor:

In your April issue, reader Charlie Muncy inquired about harmful radiation for old TVs. There is indeed such a hazard, and I refer you to a letter to the editor in the September 1982 issue of *The New England Journal of Medicine*.

It has been found that pre-1970 TVs can cause X-ray exposure higher than the recommended maximum dose. The recommended dose limit is 500 millirem per year

for organs especially sensitive to radiation, such as the thyroid. Old TVs used two hours per day at short distances, as with a micro-computer, could result in exposure as high as 890 millirem per year to the eyes and 779 to the thyroid. See also the February 1983 issue of *FDA Consumer*.

Since 1970, the FDA's performance standards for TV receivers have been in effect, so emissions have been sharply reduced by manufacturers so as to be in compliance.

Richard Riffer
Berkley, CA

Editor:

This is in regard to the letter from Charlie Muncy concerning radiation from older color TVs. I heard the same thing reported on the TV news. I believe it was from a government agency, maybe the Surgeon General's Office. The report stated that older TV sets give out more radiation than the newer sets. The problem with video games and home computers is that the user is usually sitting close to the TV and so exposing himself to possible higher than recommended levels of radiation. It would be better for all who own older TVs to sit at least eight feet from the set.

Joseph S. Paravati
Yorktown Heights, NY

CALL ANYTIME

Editor:

Please announce that the Sangarnet Bulletin Board is now on-line 24 hours a day, 7 days a week. Sangarnet is a free bulletin board which features uploading, downloading, electronic mail, bulletins, and much more. This 300 Baud Bulletin Board also features System Chess, a new concept in electronic computer bulletin boards. Sangarnet can be accessed at (919) 758-5261.

Gary L. David
Greenville, NC

WHICH WAY TO 64K?

Editor:

I own a Color Computer, 32K Extended Color BASIC with 64K RAM chips; it has an "E" board. My question is how can I make my machine into a 64K system, or is it already? Would it require further hardware modifications or only software to access the full 64K of memory?

I have read most of this issue's (April 1983) articles and ads. I found one article of particular interest to me, which prompted me to write this letter. The article is about a program called *The 64K Screen Expander*, a software review by Dan Downard, on page 100. My main concern is, if I bought this program, could it run on my CoCo in its present state, or would the CoCo need some modifications?

I would highly appreciate any help I can get on this matter.

Gennaro D'Ambrosio
Revere, MA

Editor's Note: Gennaro, read on.

Editor:

I have had my CoCo for about a year after purchasing it second-hand from a friend. I

am not sure of its age but it is a 1.0 version and has a D board. I am considering a do-it-yourself upgrade and would like to know if my board can be upgraded to 64K or am I stuck with 32K? Also, the *POKE 65495,0* plays havoc with any *SOUND* statements which are included in some games. I understand this is common with some older CoCos, but I was wondering if there is any kind of fix.

John E. Duling
Las Cruces, NM

Editor's Note: Your board can be upgraded but you must have the 1.1 ROM to use 64K. See March *Rainbow*, page 100, "D-Board 64K Upgrade" by B. H. Alsop. The processor clock runs at twice its normal speed with the *POKE* you mentioned. Sound is a function of the clock speed as is the cassette and disk I/O.

LOOK FOR THE SEAL

Editor:

I have a TRS-80 Color Computer 16K BASIC (26-3004A) and wish to upgrade to 32K Extended BASIC. The cost of doing this in the U.K. is prohibitive, and in reading your *Rainbow* magazine I have seen various adverts for upgrade lists. These include Selected Software, Spectral Associates, Computerware, Jarb, Inc. Since they all vary and I have no knowledge of any of these companies I would be most grateful if you could recommend a reputable and reliable system. I would like a kit that is obviously simple to install and one that gives continuously reliable results.

D.A. Berle
London, England

Editor's Note: All of the companies you mentioned, plus several others, offer memory upgrade kits. Look for the *Rainbow Seal of Approval* to verify that these products indeed exist.

MORE THORNS, LESS ROSES

Editor:

I have become weary of most of the reviews in your magazine because, generally, they seem to paint too rosy a picture of the program under review. If the programs available now were available a year and a half ago, then I would agree with the reviews. But CoCo owners have become accustomed to a variety of good, enjoyable programs and expect quality. There are few exceptional programs.

Please try to impress upon all of your reviewers the need for an honest evaluation—good, so-so, and poor points—that is separate from an expression of enthusiasm or rejection (I know that can be difficult, and I know it is easy to criticize, and I know opinions vary). A review is for the benefit of the buying public, not the manufacturers; a review is an assessment, not an advertisement.

John Plaxton
Medley, Alberta, Canada

PATCHING PROBLEMS

Editor:

I agree with Mr. Kennedy's letter on Telewriter (it's great!), but the problem is I can't use it. I have a Silent-700 printer and can't patch my CoCo to print with it while using Telewriter. I have the original version of Telewriter, and can patch my CoCo to print while in BASIC, but not while in any machine language programs. I also have a problem with the spacing, upper- and bottom-margins (I can't get them to work with a Okidata Microline 82A). Can someone please help me?

I have seen samples from the new Okidata Microline 92, and it seems absolutely fabulous!

Mitch Cohen
Framingham, MA

Editor's Note: A letter to Cognitex would probably bring results. If you have a monitor with a "find" command search for all locations containing SA2BF in Telewriter and change this address to the location of your printer driver.

A DIFFERENT OPINION

Editor:

Your review of our program *Graphics Program Generator II* in the June issue gives heavy-handed criticism to our documentation, "... I wish I could say something good about the documentation. ..."

While we appreciate the praise the reviewer gives a number of features of the program itself, we believe a software product without adequate documentation is half a product! We flatly disagree with the reviewer's comments. The manual to *GPG-II* is indexed, clearly written, logically organized, contains listing examples and is nicely printed.

I have enclosed a copy of the manual in question and ask that one of your staff members offer your readers a second opinion.

Tom Mardis
Principal, CoCoDATA Enterprises
Orlando, FL

Editor's Note: In this case, our opinion does seem to differ with the reviewer. We judge the manual to *GPG-II* to be quite adequate and, in fact, much better than average documentation.

HINTS 'N' TIPS

Editor:

Maybe this will help Chris Woods to solve a problem with his 64K upgrade. Connect Pin 12 of U4 to Pin 16 of U8; this is what I did to get my 64K operating. The article uses the old and incorrect method of jumping Pin 12 of U4 to Pin 17 of U8—this has been reported to give just 4K. Otherwise, the procedure does work.

Also, I have come up with a disk conversion for "NO ESCAPE" July 1982 *Rainbow*: Change line 26 to read DATA 142,14,63,166,128,167,136,191,140,37,236,45,246,57,36

and change line 28 to read
NEXT:LINE(0,191)-(255,178),PRESET,
BF:PLAY"V26L26T9":DRAW"BM50,
191C4S4":RS="BY JIM EBBERT":
GOSUB20:FORDU=1TO999:NEXT:
PCLS:PCLS

These two changes should make a disk executable copy of the program. Thanks to Jim for writing in P.I.C. In addition, I have found that adding 2084 (decimal) to most well-written programs like Jim's will convert them over to disk. If any readers out there don't want to wait for my conversion of *Rainbow Roach* they could use this idea.

Jim O'Connor
Cambridge, MA

Editor:

I have just received my first issue of the *Rainbow* and I think it's a great magazine. I learned a lot from it and thought that your readers might appreciate this bit of information: If you have a Radio Shack ROM pak and you want the game to move faster, this is all you have to do:

1. Turn computer on
2. *POKE* 65315,54
3. Insert cartridge
4. *POKE* 65495,0
5. *EXEC* 49152

Ruben Lipszyc
Sarnia, Ontario, Canada

Editor:

To get more men on *Pit Fall*, type: *POKE*&H2CBC,(1-255), after loading.

John Brissie
Greenville, SC

Editor:

I was very interested in the Text Editor Program "Mr. Ed" from the July issue. I found that the change command "C" was somewhat slow. I have rewritten the change logic to run faster. To add my changes, delete lines 880-1030 and insert the following four lines:

```
870 A=INSTR(X$,"/");IF A=0 THEN  
RETURN  
880 B=INSTR(TX$(CL),LEFT$(X$,  
A-1));IF B= THEN RETURN  
890 TX$(CL)=LEFT$(TX$(CL),B-1)+  
MID$(X$,A+1)+MID$(TX$(CL),B+  
A-1)  
900 RETURN
```

I hope you will have more articles on text processing in the future.

Kevin Davidson
Easley, SC

Editor:

I was pleased to read Judd C. Posner's fine article on the *Spectaculator* ROM Pack. I would like to pass along a few other *tricks* that I have found work well and help when preparing reports and printouts.

1. When it is desirable to repeat a column, multiplying by one will transfer it to the new column.

2. If a group of work sheets is necessary for a report, the sheets can be spread in steps over the available cells. As an example, the first work area could occupy columns 1 to 8 and rows 1 to 8 then the next area could be from columns 9-20 and rows 9 to 25 and so on. This allows for specific formulas for each area and can be saved to tape at one time. On

(continued on page 13)

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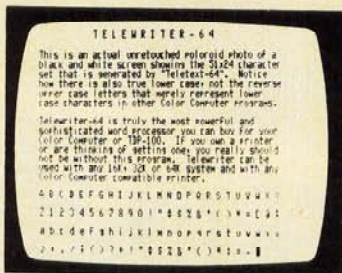
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TELEWRITER-64

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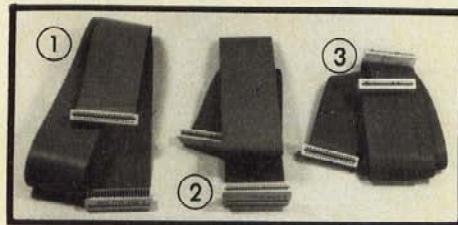
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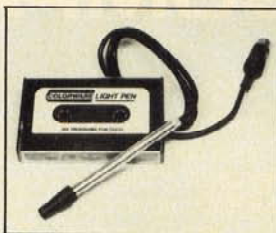
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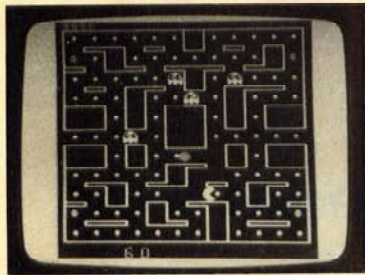
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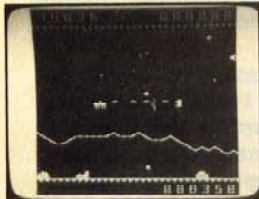
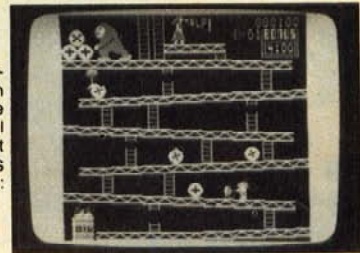
From Spectral Associates, this "Pac" theme game is the best of its type. Brilliant color, action and sound, just like an arcade gobble your way to glory, but watch for those ghosts! Get in on the wild fun of this game craze now. Tape: \$21.95, Disk: \$25.95

GHOST GOBBLER

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



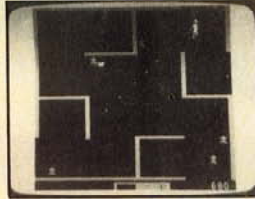
PROTECTORS

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



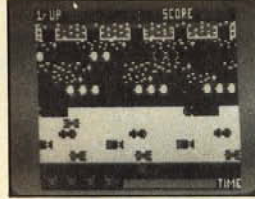
CREATURE FEATURE

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



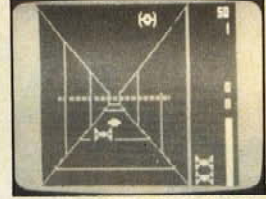
ANDROID ATTACK

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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a printout each area can be listed in a desired order to make a meaningful report.

3. When you do not want a calculated cell to print, by entering a text period (.) or dash (-), numbers will not be printed. This happens sometimes when the sum of a column or row is not a meaningful figure.

4. To consecutively number the rows in a column, you can generate a column of ones in the way Judd Posner suggested for zeros, then in the next column enter an integer SMT column formula.

I'm sure there are many more ways that this powerful program can be used. I for one would sure like to hear about them. *The Rainbow* is great.

G. Donald Jenkins
Camp Hill, PA

Editor:

A fast way to find all the unlisted lines—let the computer do it. Use RENUM.

Gerald Garhart
Sharon, PA

RANDOM?

Editor:

I have a 16K ECB CoCo and am writing regarding random number generation. First, turn on your CoCo and run this short program:

```
10 FOR X=1 TO 10
20 PRINT RND(10)
30 NEXT X
```

After you run this program, record all ten numbers. Then, turn off the CoCo and turn it on again, and run the same program. All the numbers are the same as the first time! (I got 50, 32, 14, 66, 45, 34, 56, 30, 11, 83.) My friend pointed this out to me and got the same numbers as I did. (He has 32K ECB.) This means that CoCo can't pick truly random numbers.

Kenny Miller
Yardley, PA

Editor's Note: Right, that is why they are called pseudo random numbers. But, through a process which has been explained on these pages before, you randomly select the pseudo random number with which you start—thus getting true random numbers anyway. See the letter below.

NOW HERE'S RANDOM

Editor:

Here are a couple of programming hints for those without Extended Basic. The RND(N) function is not random. The solution is easy with Extended Basic. Start each program with:

```
10 X=RND(-TIMER)
```

Note that it must be "-TIMER." Without Extended Basic, you can start with the following routine:

```
10 PRINT "TYPE X"
```

```
20 IF INKEY$ () "X" THEN CT=CT +
1:GOTO 20
30 X= RND(-CT)
```

This can be disguised in your program in many ways. If there is a simpler way, I would appreciate knowing about it.

Another major lack in Standard Basic is the SQR(N) function. There is, however, a simple algorithm which will accomplish the same result.

```
10 ANSWER=NUMBER/10
20 ERROR=(NUMBER/ANSWER +
ANSWER)*.5
30 ANSWER=ANSWER + ERROR
40 IF ABS(ERROR) > NUMBER*.001
THEN 20
```

What falls out for ANSWER after 4 to 8 iterations is a very close approximation to the SQR(NUMBER). Try these, you'll like them.

David W. Cochran
Norristown, PA

BREAK, BREAK, BREAK

Editor:

Thank you for an excellent magazine! I am a paraplegic, an electronics technician and an amateur radio operator. My amateur call is WDOHNF. I hear quite a bit of talk about CoCo on the ham bands. There is even supposed to be a net on 20 meters devoted to it, but I haven't been able to check in because the net is mostly an east coast function.

I would very much like to hear from other amateur radio ops with an eye to establishing some kind of net, perhaps on 75 meters. I also have info on how to go about using CoCo on RTTY, slow scan, and CW. I have appreciated the articles on amateur radio; but I would like to see more.

Randall Brink
Everett, WA

LONG LIVE THE KING

Editor:

This is to let readers know I have found a way to save high scores on *Donkey King*.

To accomplish this feat you need to load *Donkey King*, then *POKE* 12850,127, *POKE* 12851,0, *POKE* 12852,114. Then resave the game. To do this, type 'SAVEM "Donkey!",12803,&H7F00,12803' ENTER key for disk users. For tape users put a 'C' in front of *SAVEM* (*CSAVEM*). The rest is the same.

Now, when you get a high score in the high score table and you're through playing, hit 'reset' and you will be back in BASIC command mode.

Now for disk type 'SAVEM "score",31670,31790,12803' enter, for cassette put a 'c' in front of *SAVEM*.

When you play again and want your high score back, first load *Donkey King*, then load score and *EXEC*. Your scores will now be reset. You must do this every time you want to save a high score.

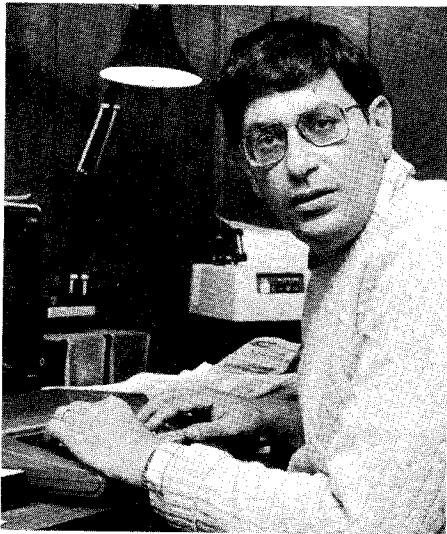
Chris Latham
Grants Pass, OR



Radio Shack's New Multi-Pak Interface

Here is a first look at the new Multi-Pak Interface just announced for the Color Computer. It allows four Program Paks to be on line at a single time, including the disk drive controller and the X-Pad. The left-hand side of the Interface has an extension which plugs into CoCo's expansion slot. Any one of the four Program Pak slots can be selected by either hardware or software. Cost of the unit is \$179.95.

An in-depth review of the Multi-Pak Interface will appear in next month's *Rainbow*.



We're moving into *the Rainbow's* third year with this issue and, first of all, I really do want to thank all of you who were so kind to call and write us with good words about our second anniversary issue. The mailman was overburdened for a number of days with the letters and cards, and I certainly thank all of you for letting us know what you thought about the issue.

The jury is still out on the record. All of you, without exception, said that you liked it, but the feeling was mixed as to whether you would like to have a record every month or, at least, several times a year. We'll let you know what's happening as soon as we can decide.

While we were nursing *the Rainbow* into its third year, we were giving birth as well. The first issue of our new magazine for the TRS-80 Portable Computer — known now as *PCM* — *The Portable Computing Magazine* — went to the printer's and, by the time you see this, should be in the middle of its first

month of life. I do hope you will check it out, because, more and more, I see the Portable Computer as a very excellent machine that has a great deal of potential.

Doing the first issue of *PCM* was an interesting and fun experience. One of the most interesting was the use of color in the magazine. Since issue Number One was only 32 pages, we were able to have color available on every single page. And, while the use of color for editorial purposes was so much less than is available in *the Rainbow* each month, the size of *PCM* makes it look simply loaded with color.

We actually have more pages of color available in *the Rainbow* each month than any other CoCo magazine has total pages! But, then, with more than 300 pages, it gets a bit spread out. In *the Rainbow* we try to space the color so that it gets used where it will look the nicest. Sometimes it isn't easy and it really is upsetting, sometimes, to have to go with black and white artwork on a really interesting program. We run so much color that it seems we could do almost anything we want, but we can't. We do hope, though, that you find *the Rainbow* to be an attractive publication, as well as an interesting and informative one.

It now appears that we will be sponsoring three — and possibly four — *RAINBOWfest* shows in the next year. One of them is set for the east coast — in the New York/Philadelphia/Boston general area. A second will probably be in Southern California, most likely somewhere in the San Diego/Los Angeles area, although we are not counting San Jose out. The other "probably for sure" site is Chicago again. It was so successful this year, we do want to go back.

As to general times, it looks like September/October for the east coast, January/February for the west coast (that's why Southern California is high on the list) and very late spring for Chicago.

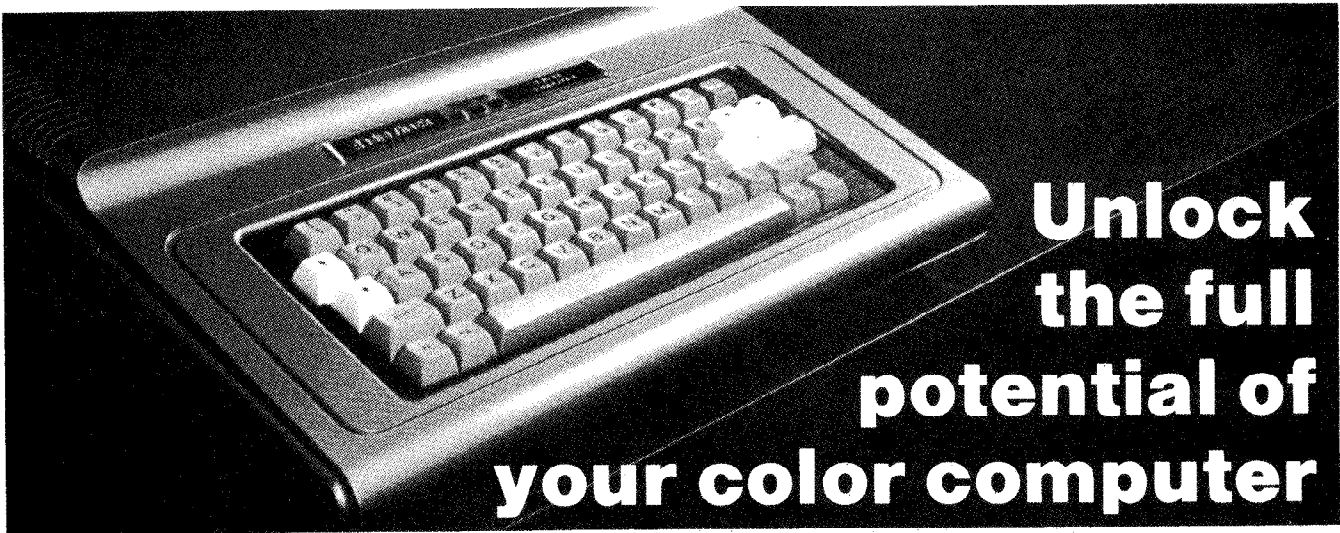
The possible fourth site? We'll just have to wait and see how negotiations go. But, plan to attend at least one of the *RAINBOWfests* next year. You'll be glad you did!

You have not seen much mention of the *Rainbow Seal of Certification* lately, but we are pleased with the program and, judging from the mail we receive, you are, too.

We began the program after hearing "horror" stories associated with several other computer markets about people who advertised products which never saw the light of day—and which quietly died only after some people ended up with a lot of other people's money. We devised the *Seal* program simply because we believed such a repetition would harm the CoCo market, and we didn't want that to happen. Remember, though, the *Seal* is not a guarantee of satisfaction, it is merely a certification that a product does, in fact, exist.

Because the *Seal* was a *Rainbow* certification, we never asked anyone else to use it or accept it. Still, I am very pleased at the spirit of cooperation which has been a part of the CoCo market so far as the *Seal* has been concerned. To my knowledge, only one publication in the Color Computer field has refused to use

(continued on page 296)



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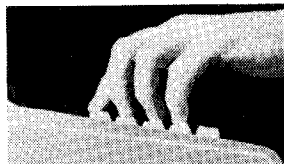
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I have just noticed that there are three TV sets on in my house. And, since there're only the two of us, this bears investigation. It turns out that my wife is in the back room watching *Outland* while, in the living room, two of our dogs are watching something called *Black Sunday*. In the "computer room," formerly the den, my word processing screen is watching me. Mostly, anyway.

Occasionally, I hit CLEAR "A" to clean up the copy and a CLEAR down-arrow to recenter the last line. Somehow, this sets me to thinking that we are not in so unique a situation. How many other families in America, and beyond, are gathered around the household TV sets and computer monitors?

Every month, more than 100 computers are used to produce *the Rainbow*. Really. Only a dozen of these are in the editorial offices here at Prospect; the rest are in homes scattered across the U.S., Canada and Australia. Think about it. The articles, programs—even letters to the editor—are generated on, and "written up" on, computers. Perhaps 95 percent of submissions arriving at *the Rainbow* are in machine-readable, magnetic media form.

What all this means is that the day of the electronic word has arrived at *the Rainbow*. While we haven't yet devised a way to hook electrodes to Don Inman's brain and patch a circuit directly to you, we can connect his innermost computer sanctum to our typesetting machine.

For the first time last month, this column you are now reading appeared in its final typeset, magazine format before ever touching paper! We hope that this will mean less slips "twixt the cup and the lip." Toward that end, we are asking regular contributors (and prospective ones) to submit not only their programs, but their articles as well, in ASCII format to be compatible with our typesetting system. While we still need a "hard copy" (as in double-spaced, typewritten, on paper), we're trading our green visors and blue pencils for green-screen CoCos and push-button editing.

Our focus this month is on games, and do we have a bagful—everything from brainbusting toughies to borderline mindless! We'll leave it to you to categorize them, but their style ranges from CoCo traditional (the *Enrak Adventure*) to MC-10 mod (Tom Szlucha's mini-duet written especially for the Micro CoCo). A personal favorite is *Auto Designer* by Joel Robbins.

As always, we have a full mix of CoCo offerings and a summertime special is Dennis Weide's *Cash Register* program, which he has tried and proven at many arts and crafts fairs. Also in this August edition, electrical engineer Dan Downard takes a look inside the new MC-10 Micro Color Computer. And cathode-ray tube test engineer Mike Dubuc wins this month's Roy G. Biv Award for his *Test Patterns*.

While September is our education issue, Dr. Michael Plog joins us this month as an education editor. His credentials are excellent. He is a program evaluator for the Illinois State Board of Education. In addition to reviewing interactive instructional use of the Color Computer, he intends to set up a system to evaluate software and to discuss development of materials, management of instruction, data exchange and administrative management of information.

Our CoCo Clubs section is new this month. While it may not be an every month feature, this section will be updated frequently—probably quarterly. If your club isn't on our master list or your club information needs updating, write.

Installments of several series continue in this issue, including our *QSORT* sorting utility and Bob Russell's CoCo memory map. And, if you haven't discovered our *Rainbow* installment plan, here's a money-saving idea: subscribe now to *the Rainbow* for just \$22, and you'll receive 12 monthly installments of the CoCo's most versatile peripheral.

—Jim Reed

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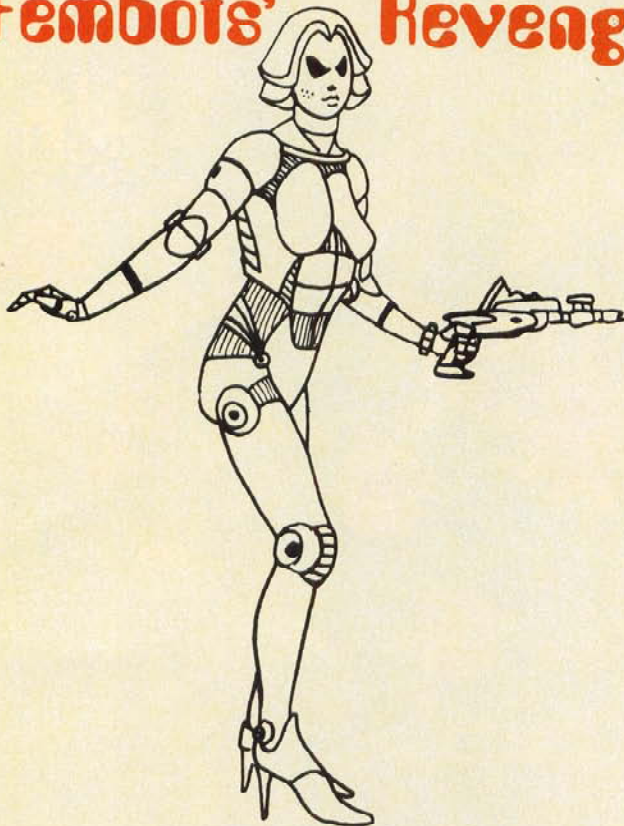
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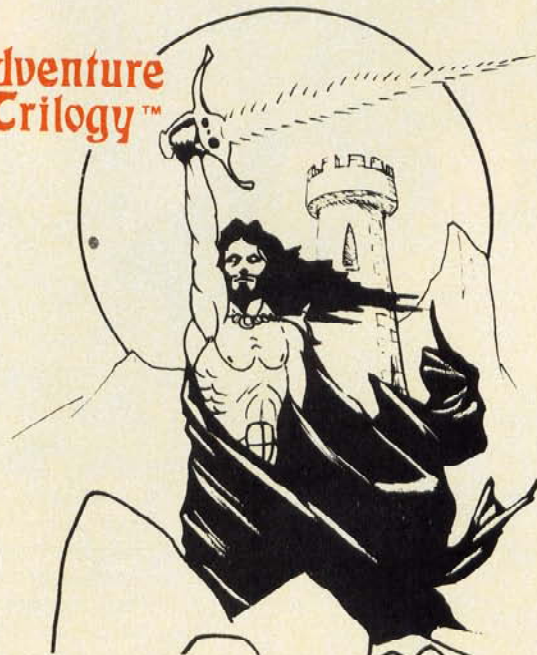
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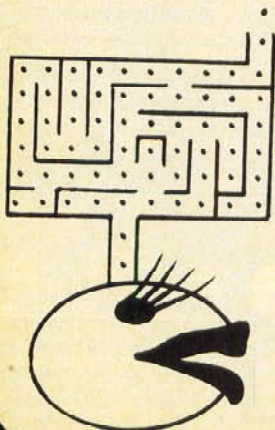
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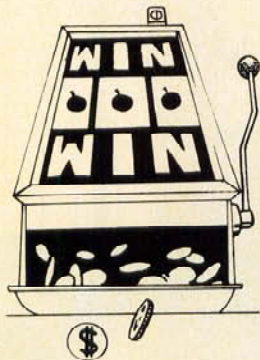
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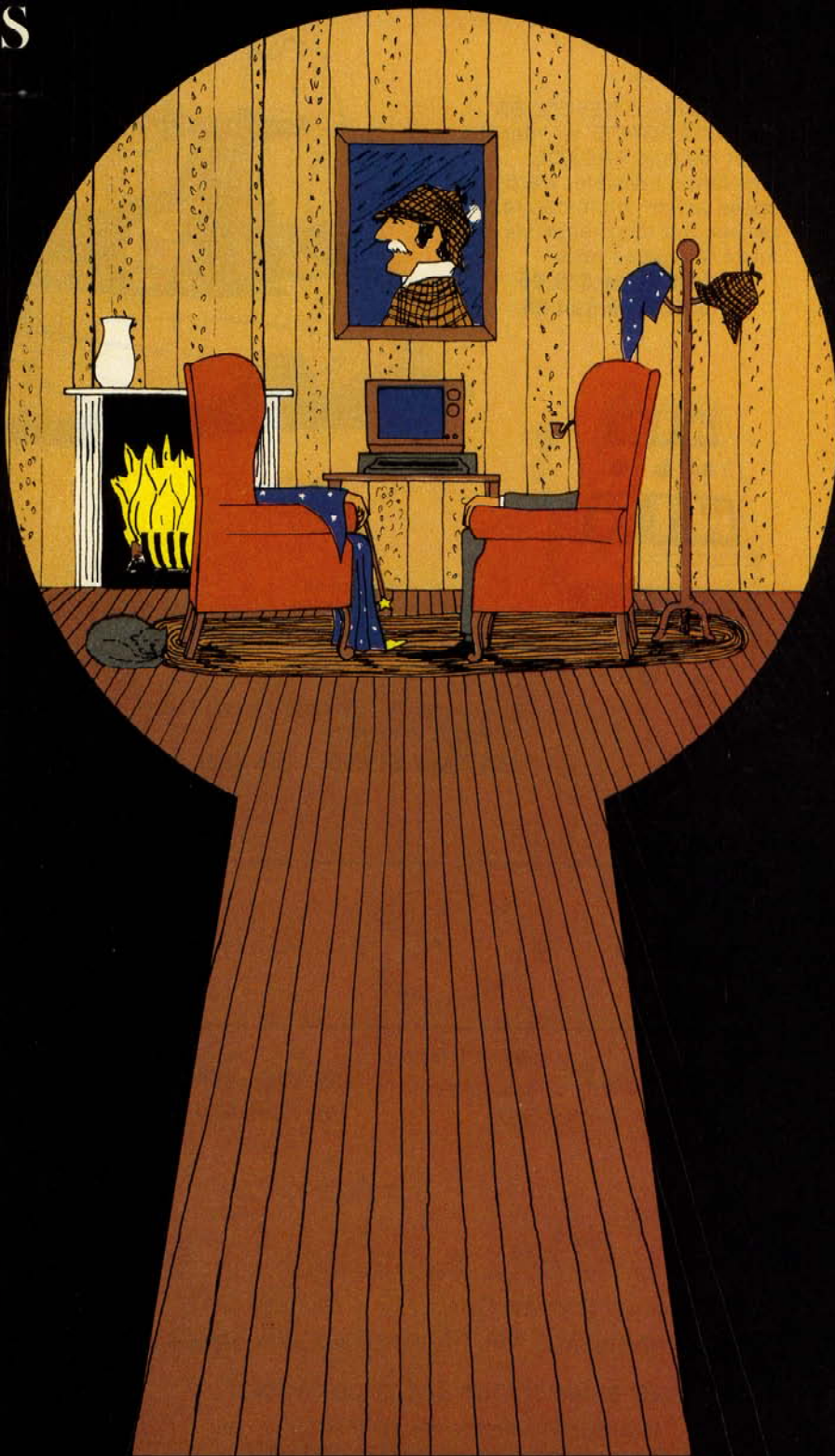
A Challenge For Psychics And Sleuths

By Bob Delbourgo

Versions of the *Mastermind* game abound. This one, I think, is different, more versatile and more challenging. It can be played with color/number characters or with letters, which may be repeated any number of times in the hidden combination (as clearly happens in some words). Any number of persons can play. You can play solo in *Numbermind*, but *Lettermind* requires at least two players, because only true words are concealed and a dictionary has not been included in the program. Scoring is 10 points for every character correctly found and positioned; 2 points for every character correctly found but not correctly positioned, and -1 point for every guess after the first. Up to 15 guesses are permitted. Of course, scores are updated after each round.

I have restricted the number of hidden characters (N) to a maximum of eight, as there is simply no room on your video screen to display any more than 8 x 15 guesses, although in principle the analysis (lines 34 to 40, and 84 to 90) extends to any number of characters. Scoring is such that novices to the game can, without grave penalty, start with a small number of hidden characters, (two or three for example) and build up to larger values as they develop their mental reflexes. Expert players are invited to risk more by attempting larger values (six or more). Even they will find eight hidden characters hard to crack in 15 tries!

All set? Thinking caps on . . .



7.....	0176
16.....	04BD
30.....	06F1
43.....	08A3
58.....	0AA6
70.....	0DE9
91.....	10E2
END...	12FB

The listing:

```

1 CLS0:POKE359,13:SCREEN0,1:FORI
=1024TO1534STEP2:R=RND(26):S=RND
(8):POKEI,R:POKEI+1,127+16*S:NEX
TI
2 PRINT@235,"MASTERMIND";:PRINT@
427,"r.delbourgo";:PRINT@456,"15
,willowdene av."::PRINT@481,"hob
art,tasmania, australia7005";:PL
AY"L30V3001C02C03C04C05C04C03C02
C01C02C03C04C05C04C03C02C01CP1"
3 CLS0:PRINT@169,"LETTERMIND (L)
";:PRINT@238,"OR";:PRINT@297,"NU
MBERMIND (N)";
4 I$=INKEY$:IFI$=""THEN4
5 IFI$="N"THEN8
6 IFI$="L"THEN59
7 GOTO4
8 CLS:PRINT" --NUMBERMIND INSTR
UCTIONS--":PRINT
9 PRINT"THIS COMPUTER VERSION OF
THE POPULAR GAME USES THE TR
S-80C GRAPHIC CHARACTERS."
10 PRINT"THERE ARE 8 DIFFERENT H
IDDEN COLOURS AND YOU CAN CHO
OSE YOUR LEVEL OF DIFFICULTY BY
HAVING UPTO 8 HIDDEN CHARACTERS.
"
11 PRINT"YOUR GUESSES ARE ENTERED
AS COLUMNS. AFTER TYPING I
N NUMBERSACCORDING TO A COLOUR C
ODE, THE COMPUTER ASSESSES YOUR
GUESS:"
12 PRINT"R=# CHARACTERS RIGHTLY
PLACED":PRINT"W=# CHARACTERS WRO
NGLY PLACED":PRINT"T=# GUESSES
";
13 FORX=1TO5000:NEXTX
14 PRINT" ANY NUMBER CAN PLAY AN
D EACH PLAYER HAS UP TO 15 GU
ESSES.":PRINT"SCORING IS 10*R+2*
W-T+1":PRINT"NOTE THAT CHARACTER
S MAY WELL BEREPATED!":PRINT:PR
INT"GOOD LUCK AND GOOD THINKING!
":PRINT:FORX=1TO5000:NEXTX
15 CLS0:INPUT"ENTER NUMBER OF PL
AYERS";P:DIMS(P):DIMN(P):DIMP$(P
):DIMA$(P):DIMA(8,P):DIMB(8,P):D
IMC(8,P)
16 FORJ=1TOP:PRINT"PLAYER #"J",
YOUR NAME";:INPUTP$(J):NEXTJ

```

```

17 FORJ=1TOP:FORI=1TO8:A(I,J)=0:
B(I,J)=0:C(I,J)=0:NEXTI,J
18 FORJ=1TOP
19 CLS0:PRINTP$(J);", HOW MANY C
HARACTERS? (MAXIMUM OF 8
)"::INPUTN(J):N(J)=INT(N(J)):IF
N(J)>8ORN(J)<1THEN19
20 T=0:R=0:W=0
21 FORI=1TON(J):R=RND(8):B(I,J)=
R:C(I,J)=R:NEXTI
22 CLS0:PRINT@0,"T";:PRINT@32*(N
(J)+1),"R";:PRINT@32*(N(J)+2),"W
";:PRINT@416,"COLOUR CODE IS:"::
FORI=1TO8:PRINT@443+8*I,"=";I;:N
EXTI23 FORI=1TO8:PRINT@442+8*I,C
HR$(127+16*I);:NEXTI
24 T=T+1:IFT>15THEN47
25 FORI=1376TO1439:POKEI,128:NEX
TI:PRINT@352,P$(J);", YOUR GUESS
";:INPUTA$(J):IF LEN(A$(J))<>N(J
) THEN25
26 PRINT@384,"IS THAT CORRECT (Y
/N)?";
27 I$=INKEY$:IFI$=""THEN27
28 IFI$="N"THEN25
29 IFI$="Y"THEN31
30 GOTO26
31 FORI=1408TO1439:POKEI,128:NEX
TI:FORI=1TON(J):A(I,J)=VAL(MID$(
A$(J),I,1)):NEXTI
32 PRINT@2*T,HEX$(T);:FORI=1TON(
J):POKE1024+T*2+32*I,127+16*A(I,
J):NEXTI
33 R=0:W=0:FORI=1TON(J):C(I,J)=B
(I,J):NEXTI
34 FORI=1TON(J):IFA(I,J)=C(I,J)T
HENR=R+1:A(I,J)=0:C(I,J)=0
35 NEXTI
36 FORI=1TON(J):IFA(I,J)=0THEN40
37 FORK=I+1TOI+N(J)-1:L=K-N(J)*I
NT((K-1)/N(J))
38 IFA(I,J)=C(L,J) THEN W=W+1:A(
I,J)=0:C(L,J)=0:GOTO40
39 NEXTK
40 NEXTI
41 PRINT@32*(N(J)+1)-1+2*T,R;:PR
INT@32*(N(J)+2)-1+2*T,W;
42 IFR=N(J) THEN 44
43 GOTO24
44 FORH=1TO6:PLAY"04L255T255V30A
BCDGEEADFCBFGEAD":NEXTH
45 CLS0:PRINT"WELL DONE!"
46 GOTO49
47 FORI=1376TO1439:POKEI,128:NEX
TI:PRINT@352,"YOU'VE BLOWN IT, "
;P$(J):PLAY"01T255L255V30GFEDCGF
EDCGFEDCGFEDCDDDDDD":PRINT@384,"
HIDDEN SET IS ";:FORI=1TON(J):PO
KEI421+I,127+16*B(I,J):NEXTI
48 FORX=1TO5000:NEXTX:CLS0:PRINT

```



```

"TRY HARDER!"
49 S(J)=S(J)+10*R+2*W-T+1
50 PRINT:PRINTP$(J);", YOUR SCOR
E IS"S(J):FORX=1TO2000:NEXTX
51 NEXTJ
52 CLS0:PRINT@0,"
SCORES":PRINT
53 FORJ=1TOP:PRINTP$(J),S(J):NEX
TJ
54 PRINT@486,"ANOTHER ROUND?(Y/N
)";
55 I$=INKEY$:IFI$=""THEN55
56 IFI$="Y"THENGOTO17
57 IFI$="N"THENCLS0:END
58 GOTO55
59 CLS:PRINT" -- LETTERMIND INS
TRUCTIONS--":PRINT
60 PRINT"THIS GAME REQUIRES TWO
PLAYERS AT LEAST. EACH PLAYER H
AS UP TO 15 GUESSES TO FIND A HI
DDEN REALWORD (UP TO 8 LETTERS;
PLEASE NO PLURALS) ENTERED SEC
RETLY BY ANOTHER PLAYER."
61 PRINT"GUESSES WILL BE ENTERED
AS COLUMNS AND THE COMPUTE
R WILL ASSESS EACH GUESS AS FO
LLOWS:"
62 PRINT"R=# LETTERS RIGHTLY PLA
CED":PRINT"W=# LETTERS WRONGLY P

```

```

LACED":PRINT"T=# GUESSES"
63 PRINT"SCORING IS 10*R+2*W-T+1
":PRINT"GOOD LUCK AND GOOD THINK
ING!";
64 FORX=1TO5000:NEXTX
65 CLS0:INPUT"ENTER # OF PLAYERS
(>1)";P1:DIMQ(P1):DIMM(P1):DIMP
1$(P1)
66 FORJ=1TOP1:PRINT"PLAYER # "J",
YOUR NAME";:INPUTP1$(J):NEXTJ:D
IMB1$(8,P1):DIMA1$(8,P1):DIMC1$(
8,P1):DIME$(P1):DIMD$(P1)
67 FORJ=1TOP1:FORI=1TO8:A1$(I,J)
="":B1$(I,J)="":C1$(I,J)="":NEXT
I,J
68 FORJ=1TOP1:CLS0:PRINT"ENTER T
HE HIDDEN WORD (3 TO 8 LETTERS
LONG) FOR ";P1$(J);:INPUTD$(J):
M(J)=LEN(D$(J))
69 IFM(J)>8 OR M(J)<3THEN68
70 NEXTJ
71 FORJ=1TOP1
72 T=0:R=0:W=0
73 CLS0:PRINT@0,"T";:PRINT@32*(M
(J)+1),"R";:PRINT@32*(M(J)+2),"W
";:PRINT@416,"HIDDEN WORD IS"M(J
)"LETTERS LONG"
74 FORI=1376TO1439:POKEI,128:NEX
TI:PRINT@352,P1$(J)", YOUR GUESS
";:INPUTE$(J):IFLEN(E$(J))<>M(J)
THEN74
75 PRINT@384,"IS THAT CORRECT (Y
/N)?";
76 I$=INKEY$:IFI$=""THEN76
77 IFI$="N"THEN74
78 IFI$="Y"THEN80
79 GOTO76
80 FORI=1TOM(J):A1$(I,J)=MID$(E$(
J),I,1):B1$(I,J)=MID$(D$(J),I,1
):C1$(I,J)=B1$(I,J):NEXTI
81 IFT>15THEN98
82 PRINT@2*T+2,HEX$(T+1);:FORI=1
TOM(J):PRINT@T*2+2+32*I,A1$(I,J)
;:NEXTI
83 R=0:W=0:FORI=1TOM(J):C1$(I,J)
=B1$(I,J):NEXTI
84 FORI=1TOM(J):IFA1$(I,J)=C1$(I
,J)THENR=R+1:A1$(I,J)="":C1$(I,J)
)="
85 NEXTI
86 FORI=1TOM(J):IFA1$(I,J)="THE
N90
87 FORK=I+1TOI+M(J)-1:L=K-M(J)*I
NT((K-1)/M(J))
88 IFA1$(I,J)=C1$(L,J)THENW=W+1:
A1$(I,J)="":C1$(L,J)="":GOTO90
89 NEXTK
90 NEXTI
91 PRINT@32*(M(J)+1)+1+2*T,R;:PR
INT@32*(M(J)+2)+1+2*T,W;

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```

92 IFR=M(J)THEN 95
93 T=T+1:IFT>14THEN98
94 GOTO74
95 FORH=1TO6:PLAY"D4L255T255V30A
BCDEEADEFCEBGEAD":NEXTH
96 CLS0:PRINT"WELL DONE!"
97 GOTO99
98 FORI=1376TO1439:POKEI,128:NEX
TI:PRINT@352,"YOU'VE BLOWN IT,"
;P1$(J):PLAY"01T255L255V30GFEDCG
FEDCGFEDCGFEDCDDDDDD":PRINT@384,
"THE HIDDEN WORD WAS ";D$(J);:FO
RX=1TO3000:NEXTX:CLS0:PRINT"TRY
HARDER!"
99 Q(J)=Q(J)+10*R+2*W-T+1
100 PRINT:PRINTP1$(J);", YOUR SC
ORE IS"Q(J):FORX=1TO2000:NEXTX
101 NEXTJ
102 CLS0:PRINT@0,"
SCORES":PRINT
103 FORJ=1TOP1:PRINTP1$(J),Q(J):
NEXTJ
104 PRINT@486,"ANOTHER ROUND?(Y/
N)";
105 I$=INKEY$:IFI$=""THEN105
106 IFI$="Y"THENGOTO67
107 IFI$="N"THEN CLS0:END
108 GOTO105

```

Software Review

Mathwar Offers Skill Drill Plus Game

No one is talking to me at home. My children think I'm cruel and selfish. I spend hours at my CoCo playing an elementary arithmetic tutor. Sounds crazy, huh? It all started when I received *Mathwar* by Harmonycs to review. After reading the very brief documentation, which adequately explains how the program is used, I *CLOAD*ed it. I had to choose the skill I wanted to work on; addition or subtraction and then a skill level. When the gameboard appeared, I couldn't believe my eyes! On the screen was one of my favorite games. Sometimes I find it on restaurant tables in the form of a triangle. The object is to eliminate pegs by jumping over them until only one is left on the board. There are many names for this type of game, but I know it as Hi-Q. In order to play *Mathwar*, you have to choose a move by selecting a fighter and the space for it to jump to and then correctly answer arithmetic questions that are given at a predetermined level of difficulty. There are four choices here. In levels one and three, the numbers being added or subtracted are not higher than 19. Levels two and four have numbers that go up to 99. Also, levels one and two require no borrowing or exchanging, whereas levels three and four do. Incorrect answers are key beeped, but no other negative feedback is given. When only one fighter is left or no more legal moves are possible, the screen clears and a "YOU WON!" message appears. A new screen then gives the percentage of correct answers to the math questions.

The publisher recommends, and I agree, that an older child or adult assist the younger child the first few times he plays. The game portion could be a little complicated at first. The program is written so that unnecessary keystrokes and difficult input methods are eliminated and the child will have no difficulty in handling it himself in a short time. The author purposely does not make any recommendations as to age or grade level because each child's individual abilities should always be kept in mind. I observed children aged eight to 12 playing and their reactions were very positive. I believe the math skill level is most appropriate for eight to 10 year olds. Interest is maintained because both the math questions and gameboard are different each time. As expected, the children definitely enjoyed the challenge of the game more than the math problems.

In my estimation, *Mathwar* is a terrific program for kids of all ages.

(Harmonycs, P.O. Box 1573, Salt Lake City, Utah, \$11.95 tape)

—Stephanie Snyder

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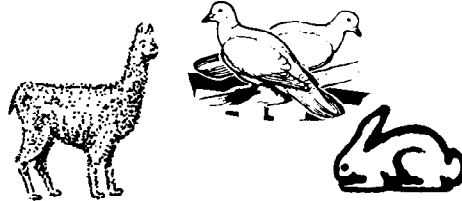
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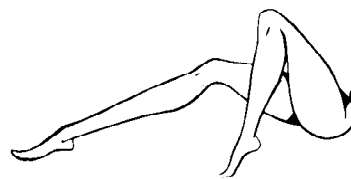
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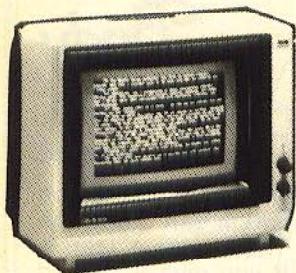
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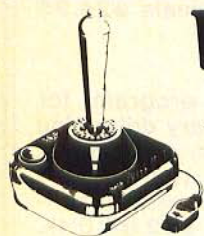
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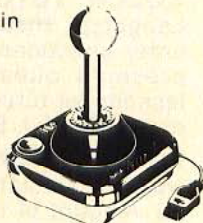


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BY WES FAUSKE

I have been a contented owner of a TRS-80 Color Computer since June of 1981. Previously I owned a TRS-80 Model I and then an Apple II. In the Color Computer, I found the versatility I have been looking for. This program was written to demonstrate some of the untapped potential of the CoCo. The program uses the SG24 graphics mode which has a resolution of 64 x 192 in eight colors. This mode is supposed to use 6K of RAM, but *Stained Glass* uses only 3K of video RAM. Some of you might want to try to figure out why. The program creates continuously changing symmetrical patterns.

Type this program very carefully, being sure to save it to tape or disk before you attempt to run it. The slightest error could make you have to turn off the computer to regain control. Once safely saved type *RUN* and then *EXEC 13015*. Press any key to begin. Hit any key except *BREAK* to pause the display, and any key to continue. Press *BREAK* to return to *BASIC*. Now sit back and see why they call it a Color Computer.

Stained Glass can be saved as machine code by typing *SCAVEM "STNDGLAS",12993,13311,13015*. To load and use the program in this form, type *CLOADM* and then *EXEC 13015*. It's compatible with all versions of *BASIC* and 16K or 32K.

The listing:

```

1 ' STAINED GLASS
2 ' BY
3 ' WES FAUSKE
10 CLEAR200,12992
15 FORM=12993TO13311
20 READD:POKEM,D:NEXTM
25 DATA80,82,69,83,83,32,65,78,8
9,32,75,69,89,128,140,64,0,38,24
9,142,50,142,142,52,0,134,128
30 DATA167,128,140,64,0,38,249,1

```

```

42,50,193,198,13,166,128,173,159
,160,2,90,38,247,141,67,39,252
35 DATA134,1,198,3,142,255,192,1
41,30,134,26,198,7,141,24,134,3,
183,50,214,182,1,22,141,29,129,0
40 DATA39,45,134,128,183,50,206,
183,50,207,32,59,70,36,6,48,1,16
7,128,32,2,167,129,90,38,242,57
45 DATA177,50,214,37,5,176,50,21
4,32,246,57,173,159,170,49,173,1
59,160,0,57,134,8,183,50,214,182
50 DATA1,23,141,226,76,198,16,61
,203,122,247,50,206,192,5,247,50
,207,134,16,183,50,214,182,1,24
55 DATA141,202,129,1,35,8,183,50
,214,182,1,24,141,190,183,50,208
,134,15,176,50,208,183,50,209
60 DATA134,48,183,50,214,182,1,2
5,141,169,129,1,35,8,183,50,214,
182,1,25,141,157,72,183,50,210
65 DATA134,94,176,50,210,198,16,
61,253,50,212,182,50,210,198,16,
61,253,50,210,141,142,39,8,129,3
70 DATA39,81,141,134,39,252,190,
50,210,48,137,52,0,246,50,208,18
2,50,206,167,133,246,50,209,182
75 DATA50,207,167,133,190,50,212
,48,137,52,0,167,133,246,50,208,
182,50,206,167,133,190,50,210,48
80 DATA137,58,0,167,133,246,50,2
09,182,50,207,167,133,190,50,212
,48,137,58,0,167,133,246,50,208,
182,50,206,167,133,126,51,4,57

```


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A Mixed Bag Of BASIC

By Richard A. White
Rainbow Contributing Editor

Magazine deadlines being what they are, I am writing this well before the July issue goes into the mail. So, I have no idea what bugs will be found in *COMMWP* or what fixes and improvements you intrepid programmers will make. Yes, there are bugs. That was Version 1, not Version 3 or 4. And I am curious to see if you find the same bugs I have found. No, I did not put them there to mess you up and make you think. I left them there for that reason. Bugs come too easily for anyone to try to write them. Anyway, as you develop new pieces of code to fix or improve *COMMWP*, send a copy to my attention care of the *Rainbow*. On down the road I will pull together the better offerings into an article or two.

Another Bug in BASIC And Insanity Avoided

The staff at the *Rainbow* will be glad to know that we have saved them another drain on their taxes, specifically housing one Ian Budd in a Kentucky mental institution. Ian had the unfortunate experience of uncovering an erratic bug in the floating point decimal routine in CoCo. The following short program demonstrates the Budd Syndrome.

```
10 Y = 75.96 : X = 72 + 3.96 : PRINT X, Y
20 IF X = Y THEN PRINT "GOOD" ELSE PRINT "BAD"
```

Obviously, since $72 + 3.96 = 75.96$ and the computer prints that result to the screen for X, it will also find $X = Y$ and print GOOD. Wrong. The computer finds that $X < Y$ and prints BAD. But, change X and Y to $Y = 75.75 : X = 72 + 3.95$ and the program works properly.

Certain other combinations also return the wrong answer and Ian could find no pattern. He was trying to write a double entry bookkeeping program and erratic behavior like this was totally intolerable. He tried converting the numbers to integer values before making the comparison, but that did not work either. However, in CoCo BASIC there is no true 2-byte integer. Numbers are all stored in 5-byte format and a misplaced bit anywhere in that array will cause a faulty comparison even though the numbers printed on the screen look equal and integer. And there is a clue to the fix:

(Richard White has a long background with micro-computers and specializes in BASIC programming. With Don Dollberg, he is the author of the *TIMS* data base management program.)

To display a number on the screen, the computer must convert it to character format. If we do this for X and Y and then make the comparison, the problem goes away. Try the program below and see for yourself.

```
10 Y = 75.96 : X = 72 + 3.96 : XS = STR$(X)
   : YS = STR$(Y) : PRINT XS, YS
20 IF XS = YS THEN PRINT "GOOD" ELSE PRINT
   "BAD"
```

"... weird things can happen if the test code after IF is faulty and . . . a wrong result can be obtained without producing an error message."

Each string consists of a leading space (CHR\$(32)) and the ASCII values for each character in the number. There can be no effects from rounding or whatever was causing the error when comparing certain numeric variables.

Of course many of you are crying WHY?? Now that I have a fix, I have not gone looking for why, but you sure can. I would suggest writing a program including the above code to set values into X and Y. Then use *VARPTR* to report the locations of X and Y in the variable table. Remember to define any variables used in your *VARPTR* code or any variables that may follow it at the start of the program so the variables are not moved in the table. A simple $R=0$ puts R into the table and it will not cause trouble later. Now, if you have a resident monitor like in *Toolkit*, you can break the program and look at the five bytes stored for X and for Y. Perhaps as easy is to write a BASIC line to *PEEK* those locations and print the results to the screen. Put it in as a high line number using variables that have been defined or used in the program. *RUN* your program, *BREAK* it, and type *GOTO* (line number) to check the bytes in X and Y. If there is a difference, we will at least know the *IF* routine in BASIC is doing its job. That would leave the floating point routine at fault and decoding that is a job for a real expert.

IF's True-False Test

I noted last month that weird things can happen if the test code after an *IF* is faulty and that a wrong result can be

obtained without producing an error message. Basically the computer performs whatever is called for after the *IF* and looks for a result that tells it what to do next. If it gets a "0" it reads the test as false and does not do the code following the *THEN*. If an *ELSE* is present it goes to the code following it. If it gets any number back, it interprets the test to be true and goes to the code following the *THEN*. You can test this out using the following short program.

```
10 INPUT "DEMO =?"; DEMO: IF DEMO THEN PRINT
"TRUE": GOTO 10
ELSE PRINT "FALSE": GOTO 10
```

Here is a typical keyboard session.

```
DEMO =? 0
FALSE
DEMO =? 1
TRUE
DEMO =? 2
TRUE
DEMO =? -1
TRUE
DEMO =? A
```

? REDO That is because *INPUT* is looking for numbers only.

Note that the variable *DEMO* alone was used after *IF*. *IF* is looking for a number and a variable is as good a place as any to get a number. Just pressing the *ENTER* key without entering anything puts a 0 into the variable so that works. The following does not work and produces a syntax error.

```
10 INPUT "DEMOS =?"; DEMOS: IF DEMOS THEN
PRINT "TRUE": GOTO 10
ELSE PRINT "FALSE": GOTO 10
```

The *IF* routine in BASIC cannot convert a string variable to a number so it quits. The following makes a test that prints FALSE if DEMOS\$ is nothing.

```
10 INPUT "DEMOS =?"; DEMOS$: IF DEMOS$ <> ""
THEN PRINT "TRUE": GOTO 10
ELSE PRINT "FALSE": GOTO 10
```

Get That Arrow Again

Jerel Williams of Cincinnati brought my attention to something I had partly understood and forgotten. His son Bryce wrote a simple maze game for his younger sister. Really an excellent effort for an 11 year old. However, an arrow key had to be hit each time to move through the maze. An auto repeat, so one could hold down a key and continue moving, was called for. How could this be done from BASIC? It turns out there is a "keyboard rollover table" in memory locations 338 to 345 (hex 152-159). As long as there are no keys pressed, each location holds a 255. When a key is pressed, the value in the location assigned to that key is reduced by a specified amount. For example, the up arrow puts a 247 in 341. Even better, down arrow puts a 247 in 342, left puts 247 in 343 and right puts 247 in 344. From here it was simple to *PEEK* these locations in order, check each value returned and go off to the appropriate routine to move when a 247 is seen.

I could present Jerel's table of values. Rather I will present the following short program to allow you to investigate these locations on your own.

```
5 CLS: PRINT @64, " ";
10 FOR X=338 TO 345:PRINT X" "PEEK(X): NEXT
:PRINT @64, " ";
: GOTO 10
```

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When you run this, you get a listing of the memory location numbers followed by the value in that location. Press individual keys and see the numbers change on the screen. When two or more keys are pressed at the same time, either values in two or more locations change or if two keys are reported by one memory location, that location is reduced more than that caused by either key singly. Press a "9" and note that 223 appears in 339. This is 255 minus 32. **CLEAR** key subtracts 64 from 255 and puts 191 into 339. If **CLEAR** and 9 are pressed at the same time, 64 and 32 are subtracted from 255 and the result in 339 is 159. Thus it is possible to determine which keys are pressed at any time.

You can use this from BASIC to get responses requiring two keys to be pressed at the same time. The advantage is elimination of accidental responses in a program. Escape sequences are a natural where a two-key entry assures that is what the user wants and not a random call by five-year-old hands roaming the keyboard. Suppose you did choose **CLEAR-9** as your escape. The following line would do the job:

```
155 P = PEEK(339) : IF P = 159 THEN 1000
```

Location 339 holds 159 as long as the **CLEAR** and 9 keys are pressed so all the user needs do is hold those keys down and wait for the program to execute line 155.

Merging BASIC Programs

There are a number of reasons for wanting to merge BASIC programs or perhaps parts of BASIC programs. John Reid of Woodside, New York, wrote that he wanted to merge a number of short programs into one large program and select the smaller programs from a menu. Another reason might be so that a routine used in one program could be reused with perhaps modest modification in another. Those with R.S. disk drives have the Disk BASIC **MERGE** command. This command runs a BASIC program saved in ASCII in from the disk through BASIC's tokenizing routine much as if the stream of characters were coming from the keyboard. BASIC tokenized the lines and inserts them into the program. Where there are existing lines in the program with the same numbers as those in the disk program, the lines from the disk are substituted. Otherwise the new lines from disk are inserted in the program in their correct numerical order.

Those not yet blessed or cursed with a disk drive have a number of other options. Both **EDTASM+** from Radio Shack and **Toolkit** from Azirin permit loading two files and merging them as one program. Other programming utilities may provide similar abilities. I have used only those mentioned. With **EDTASM+**, the programs must be saved as ASCII files. They are then loaded into the editor in sequence. All the line numbers of the second program must be higher than those in the first program. While you can

renumber lines with **EDTASM+**, line numbers following **THEN**, **GOTO**, and **GOSUB** commands are not corrected as they are when **BASIC RENUM** is used. You would need to figure these out and change lines by hand which on any program of more than 10 lines would be a horror. Use **BASIC's RENUM** command, **CSAVE** the program and then **CLOAD** it back in as the send program during the merge operation. The combined file could then be saved and loaded into the computer as one program.

In **Toolkit**, there is a **.PROT** command that sets the Start of BASIC pointers (memory locations 25 and 26) to the end of the existing program. A new program can then be loaded. Again, line numbers of the second program need to be all higher than those of the protected program. In this case, the second program can be renumbered with Extended BASIC's **RENUM** after it is loaded. The merge is achieved by sending **Toolkit** a **.REST** command.


"Escape sequences are a natural where a two-key entry assures that is what the user wants and not a random call by five-year-old hands roaming the keyboard."

If you have Extended BASIC but none of the utilities mentioned, you can stick the following two lines of code in the first program loaded.

```
50 CLS :PH=PEEK(27) :PL=PEEK(28) :PRINT @96,
"LOAD RECORDER WITH PROGRAM TO BE
MERGED AND PRESS ANY KEY" :FORX=0TO0
:X=(INKEY$="") :NEXT
:PRINT@96,"ENTER FILE NAME OF PROGRAM
TO BEMERGED":LINEINPUTNA$
51 PRINT"TO MERGE PROGRAMS AFTER
"NA$" IS LOADED, POKE25,30
AND POKE26,1" :POKE25,PH :POKE26,PL-2
:CLOADNA$:END
```


This fragment expects you to be in default **PCLEAR 4**. The End of BASIC address is obtained from memory locations 27 and 28. Once the tape with the second program is in the recorder and its name entered, the end of the first program is made the Start of BASIC for the new program by **POKEing** PH into 25 and PL-2 into 26. Then the second program is loaded. You restore the first program and effect the merge by **POKEing** the original Start of BASIC pointers, 30 and 1 back into 25 and 26. Note that PL-2 was set rather than PL in the start addressed for the second program. BASIC puts three null (0) bytes at the end of a program and one null at the end of each line. The End of BASIC address in 28 is one byte after the third null byte. Since we are going to merge the programs we want only one null after the last line of the first program. By subtracting two from PL, we load the first two bytes of the second program over the last two nulls at the end of the first.


In some instances, you will want to **PCLEAR** less than four graphics pages to get more program and variable memory. This changes the value in 25 by 6 for each page of graphics given up. In fact, you can do a **PCEAR0** by typing **POKE25,6:NEW** before loading a program. You may wish to change the fragment above to **PEEK** Start of BASIC before changing it and print these values on the screen for your reference later.



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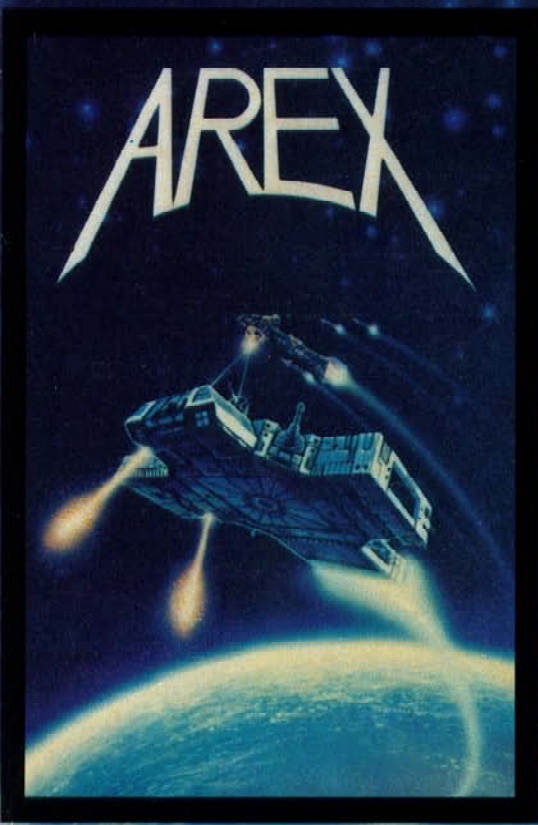
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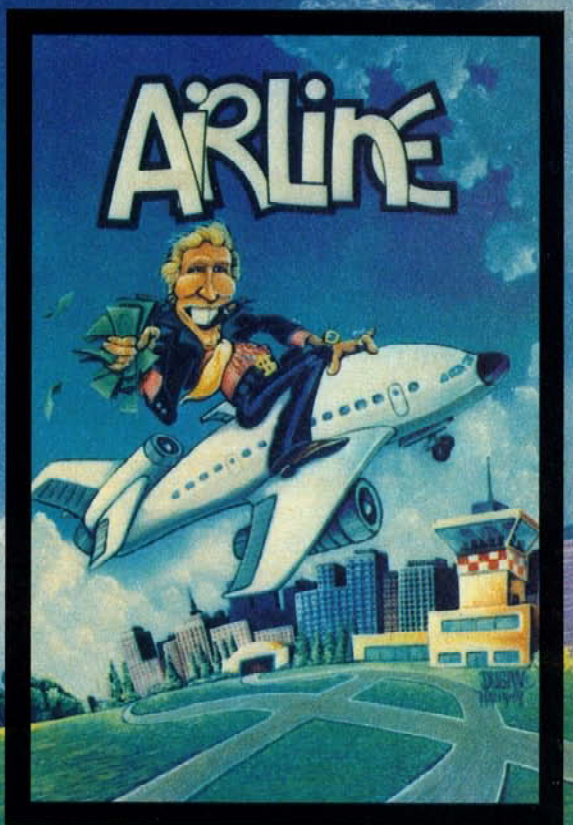
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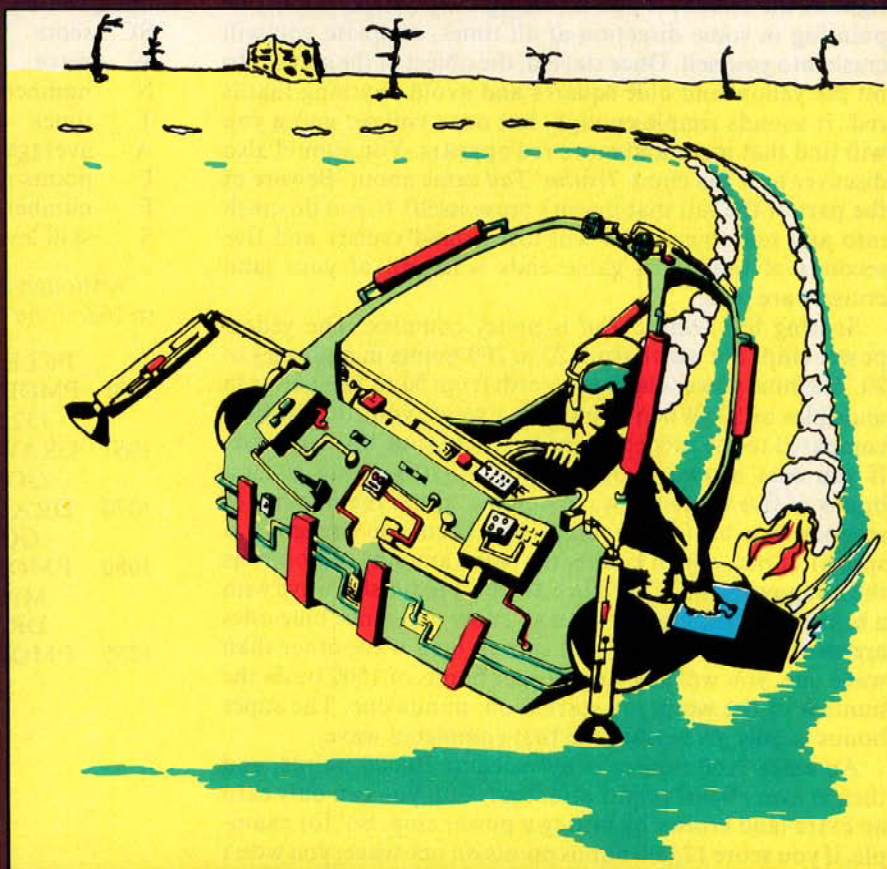
By Mike Hall

It is the year 2013. The earth has just been devastated by war. You are the last remaining human, and your only chance of survival is to leave the earth as soon as possible. Fortunately, you have found a spaceship that was left over from the war. Unfortunately, it doesn't have enough energy left to fly!

Your mission: Roam the earth in your nuclear powered land cruiser and gather yellow and blue power chips for the spaceship in as little time as possible. But watch out! If you cruise out of the safe zone or run into the nuclear waste that is left behind by your land cruiser, you will immediately perish!

Does the above scenario sound exciting? Well, then, you're in luck, because it's the scenario for the game below called *Trailin' Tail*. It is a progressively faster and harder, race-against-the-clock, arcade style game. *Trailin' Tail* requires 32K Extended BASIC and one joystick.

After *CLOADing* and *RUNning* the program, you will be presented with the title page and asked whether to play with the keyboard controls or with the joystick. (If you have disk, this is the



(Mike Hall is a high school junior in Hartland, Wisconsin. He is a self-taught programmer who actively participates in the Milwaukee Area Color Computer Users' Group, the CoCo-MUGS.)

point at which the scores will be read in. See the disk user's note below.) The keyboard controls are just the four arrow keys. If you choose the joystick option, use the right one. You will note, once you have played both ways, that *Trailin' Tail* is really two games in one. The keyboard game only allows for movement in four directions, whereas the joystick game allows for movement in eight directions. After choosing your controls, you will be asked which wave to start on. The higher the wave, the faster (and more difficult) it is. Once the wave is chosen, you will be presented with the starting game board. The red border denotes the "safe zone," so don't run into the walls! Your status is designated above the border. At the far left, in blue, is the score. In the middle, in yellow, is the wave number. To the right of that, in blue, is the number of land cruisers remaining. And at the far right, in red, is the number of power chips you have to collect before advancing to the next wave.

To start the game, just follow the directions on the lower right of the screen. If you are using the joystick, it must be pointing in some direction at all times, otherwise you will crash into yourself. Once started, the object of the game is to hit the yellow and blue squares and avoid anything that is red. It sounds simple enough, but once you get going you will find that more and more red appears. You should also discover how the name *Trailin' Tail* came about. Beware of the part of the tail that doesn't erase itself! If you do crash into any red object, you will lose a land cruiser and five seconds of time. The game ends when all of your land cruisers are gone.

Scoring for *Trailin' Tail* is pretty complex. The yellow power chips are worth from 20 to 200 points in multiples of 20. The blue power chips are worth from 50 to 500 points in multiples of 50. When you finish a wave, your time will be compared to the predetermined average time for that wave. If you beat it, two things happen. First, you are given a bonus of five times the wave number, times the number of seconds you beat the average by. Then you are given a special bonus, which counts the same amount of points as the last power chip. Therefore, it is best to finish a wave with a blue power chip rather than a yellow one, since blue ones are worth more. Also, if you started on a wave other than wave one, you will be given a super bonus of 1500 times the number of the wave you started on, minus one. The super bonus is only given after the first completed wave.

An extra land cruiser is awarded at 10,000 points, and then at every 5,000 points after that. But, you can only earn an extra land cruiser by hitting a power chip. So, for example, if you score 12,000 bonus points on one wave, you won't get your extra land cruiser until you hit a power chip on the next wave.

Wave nine is the fastest wave you will encounter. *Trailin' Tail* still gets more difficult on waves 10 and up, but instead of getting faster, obstacles start appearing and more power chips must be gathered in order to advance to the next wave. Obstacles appear in the form of large, red circles. They show up *after* you press the joystick button or an arrow key. Then, a slight delay occurs, allowing you to change your initial direction by pressing a different arrow key or by moving the joystick lever, and the game continues as usual.

One of *Trailin' Tail*'s best features is its top 10 score routine. If you have scored high enough to make the top 10, *Trailin' Tail* will notify you with an alarm (otherwise it will just start displaying the top 10 scores). Three large boxes will appear on the screen with a flashing letter in the left one. Just move the joystick lever up or down until you find the

appropriate number or letter. Then, push the joystick button, and that initial will be entered. Repeat this process with the other two boxes. When all three initials have been entered, *Trailin' Tail* will remember those initials (and your score), and display them on the top 10 screen. While on the top 10 screen, you have two options: either you can push the joystick button and start a new game, or you can push the E key and end the program. (If you have disk, the top 10 scores will be saved before the program ends. See the note below.)

Note for disk users: *Trailin' Tail* checks to see if you have disk. If you do, it will automatically keep a disk file of the top 10 high scores. But you must create this file prior to the very first time you run the program. To do so, just *ENTER* the following statement while in the OK mode: OPEN "O",#1,"TTSCORES/T10":CLOSE.

For those of you who like to modify programs, the remarks below have been left in, and a list of the main variables follows. (There are no references to the remark lines, so they can be deleted if you like.)

SC score
W wave
N number of land cruisers remaining
T timer
A average time
E points needed for next land cruiser
F number of power chips remaining
S skill level

Although it is made for 32K, I believe *Trailin' Tail* will fit in 16K if the following lines are changed to read as follows:

```
0 PCLEAR2:'16K VERSION
1050 PMODE2,1:PCLS:FORQW=1TO20:PRINTSTRING$
      (32,"!"):NEXTQW:SCREEN0,1
1060 DRAW"BM34,20;S8;C1":M$"CONGRATULATIONS":
      GOSUB1000
1070 DRAW"BM12,60":M$="TEN OF TRAILIN TAIL"
      :GOSUB1000
1080 PMODE2,1:DRAW"BM4,40":M$="YOU HAVE
      MADE THE TOP":GOSUB1000:SCREEN1,1:
      DRAW"S4"
1350 PMODE2,1:PCLS:SCREEN1,1
```

60.....0378	900... 126F
180.... 060C	1060... 150A
310.... 08D3	1160... 17B7
520.... 0B19	1360... 1A03
600.... 0DA3	1530... 1C16
770.... 102A	1800... 1E5E
	END... 2023

The listing:

```
0 PCLEAR4:'32K VERSION
1 '*****
2 '***** TRAILIN TAIL *****
3 '***** BY MIKE HALL *****
4 '**3019 SYLVESTER DRIVE**
5 '***HARTLAND, WI 53029***
6 '*****
7 'COMPLETED MARCH 3, 1983*
8 '*****
9 'set screen and variables
```


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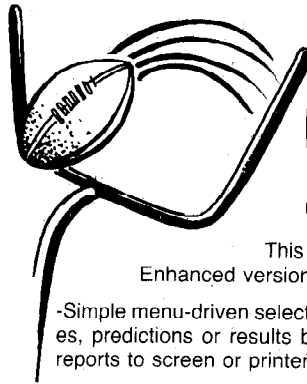
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```

4),B(4),E(10),S(11),S*(11),G(50)
:FORZ=1TO43:READCH*(Z):PLAY"L255
;ABA":NEXT:FORZ=1TO10:S(Z)=0:S*(
Z)="":NEXT
20 PMODE1,1:PCLS:SCREEN1,0:DRAW"
BM30,24;C3;S8":M*="TRAILIN TAIL"
:GOSUB1000
30 DRAW"BM100,180;C4":M*="BY":GO
SUB1000:GET(100,164)-(125,190),G
,G:FORY=164TO30STEP-4:PLAY"03CB"
:PUT(100,Y)-(125,Y+20),G,PSET:NE
XT
40 DRAW"BM60,70;C3":M*="MIKE HAL
L":GOSUB1000:DRAW"BM62,72;C2":GO
SUB1000
45 GOSUB2000
50 DRAW"BM10,100;C2":M*="CHOOSE
1 OR 2":GOSUB1000:DRAW"BM10,120;
C3":M*="1 IS KEYBOARD":GOSUB1000
:DRAW"BM10,140":M*="2 IS JOYSTIC
K":GOSUB1000
60 V=RND(191):C=RND(4):DRAW"C"+S
TR*(C):LINE(180,V)-(255,191-V),P
SET:A*=INKEY$:IFA*=""THEN60ELSEI
FA*="1"THENKY=1ELSEIFA*="2"THENK
Y=0ELSE60
70 PCLS:DRAW"BM10,140;C4":M*="WH
ICH WAVE WOULD YOU":GOSUB1000:DR
AW"BM10,160":M*="LIKE TO START O

```

```

N":GOSUB1000:DRAW"BM70,180;C3":M
*="1 TO 9":GOSUB1000
80 H=RND(255):V=RND(120):C=RND(4
):DRAW"C"+STR*(C):LINE(H,V)-(255
-H,V),PSET:A*=INKEY$:IFA*=""THEN
80
90 W=VAL(A*):IFW<1ORW>9THEN70
100 PMODE1,1:PCLS:SCREEN1,0:SB=(
W-1)*1500:SC=0
110 E=10000:F=15:T=0:N=4:M*=STR*
(SC):DRAW"BM0,12;C3S8":GOSUB1000
120 M*=STR*(N+1):DRAW"BM170,12;C
3":GOSUB1000:M*=STR*(F):DRAW"BM2
10,12;C4":GOSUB1000
149 'start of wave
150 M*="WAVE":DRAW"BM90,12;C2S8"
:GOSUB1000:M*=STR*(W-1):DRAW"BM1
32,12;C1":GOSUB1000:M*=STR*(W):D
RAW"BM132,12;C2":GOSUB1000
160 DRAW"C1":LINE(10,24)-(245,18
1),PSET,BF:DRAW"C2"
170 GOSUB650:Z=1:GOSUB690:GOSUB6
60:Z=2:GOSUB690:GOSUB670:Z=3:GOS
UB690:PSET(128,96,4)
180 A(4)=0:X=128:Y=96:C=0:S=W+1:
IFS>10THENS=10
190 DRAW"C4":FORZ=0TO9:LINE(Z,Z+
14)-(255-Z,191-Z),PSET,B:NEXT
200 IFKY=1THENM*="PRESS AN":DRAW
"BM140,130;C2S8":GOSUB1000:M*="A
RROW":DRAW"BM156,150":GOSUB1000:
M*="KEY":DRAW"BM166,170":GOSUB10
00:A*=INKEY$:GOTO220
210 M*="PRESS THE":DRAW"BM134,13
0;C2S8":GOSUB1000:M*="JOYSTICK":
DRAW"BM136,150":GOSUB1000:M*="BU
TTON":DRAW"BM146,170":GOSUB1000:
GOTO230
220 GOSUB270:A*=INKEY$:IFA*=""TH
EN220ELSE240
230 GOSUB270:PP=PEEK(65280):IFPP
=254ORPP=126THEN240ELSE230
240 DRAW"BM170,12;C1":M*=STR*(N+
1):GOSUB1000:DRAW"BM170,12;C3":M
*=STR*(N):GOSUB1000:DRAW"C1":LIN
E(134,118)-(245,181),PSET,BF
250 IFW>9THENFORQQ=5TOW/2:H=RND(
90)+75:V=RND(90)+50:CIRCLE(H,V),
13,4:PAINT(H,V),4,4:NEXT:FORQQ=1
TO999:NEXT:OD$=A$:A*=INKEY$:IFA$
=""THENA$=OD$
260 TIMER=T:IFKY=1THEN440ELSE300
270 CC=CC+1:IFCC>99THENC=1:GOTO
290
280 RETURN
290 SCREEN1,1:FORZ=1TO9:NEXT:SCR
EEN1,0:RETURN
299 'main program
300 J=JOYSTK(0):K=JOYSTK(1)
310 PLAY"L255;01;A"

```

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 - * read an EPROM into color computer RAM
 - * write RAM buffer out to EPROM
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 - * verify the programming of an EPROM
 - * compare the contents of RAM buffer against an EPROM
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 3. Fill RAM buffer with FF hex
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- Provisions for write protect switch, or can jumper the board to write protect RAM

- Jumpers configure the memory type used on the board. Provisions for inserting DIP switches in place of the jumpers
- Gold plated edge connector
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* RAM may not work with series E or later color computers.

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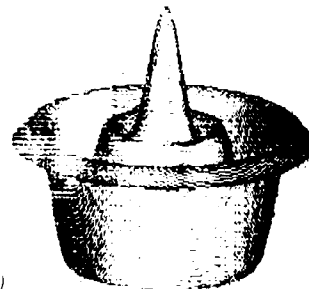
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```

320 IFKY=1THEN430
330 IFJ=0THENX=X-S
340 IFJ=63THENX=X+S
350 IFK=0THENY=Y-S
360 IFK=63THENY=Y+S
370 IFPPPOINT(X,Y)<>1THEN700
380 C=C+1:IFC>99THEN900
390 X(C)=X:Y(C)=Y
400 IFC>197THENC=100
410 PSET(X,Y,4)
420 GOTO300
430 A$=INKEY$:IFA$=""THEN480
440 IFA$="^"THENYA=-S:XA=0
450 IFA$=CHR$(10)THENYA=S:XA=0
460 IFA$=CHR$(8)THENXA=-S:YA=0
470 IFA$=CHR$(9)THENXA=S:YA=0
480 X=X+XA:Y=Y+YA
490 GOTO370
499 'end of wave
500 T=TIMER:FORZ=1TOS:PLAY"L640"
+STR$(Z)+";1;2;3;3;4;5;6;6;7;8;9
;9;10;11;12;12":NEXT
510 F=15:T=INT(T/60):DRAW"C1":LI
NE(10,24)-(245,181),PSET,BF:IFW>
9THENF=W-9+F
520 M$="TIME TO COMPLETE":DRAW"B
M20,40;C2":GOSUB1000:M$="WAVE "+
STR$(W):DRAW"BM30,60":GOSUB1000:
M$=STR$(T):DRAW"BM180,60":GOSUB1

```

```

000
530 AA=(15-W)*10:IFAA<100THENA=
100
540 M$="AVERAGE TIME":DRAW"BM20,
80;C4":GOSUB1000:M$=STR$(AA):DRA
W"BM180,80":GOSUB1000
550 T=AA-T:IFT<1THEN580
560 M$="BONUS X"+STR$(W*5):DRAW"
BM20,110;C3":GOSUB1000:FORD=1TOT
:DRAW"BM180,110;C3":M$=STR$(D*(W
*5)):GOSUB1000:DRAW"BM180,110;C1
":PLAY"L20001;ABA":GOSUB1000:NEX
T:DRAW"BM180,110;C3":GOSUB1000
570 M$="SPECIAL BONUS":DRAW"BM20
,150;C2":GOSUB1000:DRAW"BM21,149
":GOSUB1000:M$=STR$(P):DRAW"BM18
0,150":GOSUB1000:P=T*(5*W)+P:FOR
D=1T01999:NEXT:GOSUB1020:GOTO590
580 M$="NO BONUS":DRAW"BM20,110;
C3":GOSUB1000:FORZ=1T0999:NEXT:G
OSUB1020
590 IFSB>1THENDRAW"BM20,180;C4":
M$="SUPER BONUS":GOSUB1000:P=SB:
SB=0:M$=STR$(P):DRAW"BM170,180":
GOSUB1000:GOSUB1020:FORZZ=1T04:D
RAW"BM20,180;C"+STR$(ZZ):M$="SUP
ER BONUS":GOSUB1000:NEXTZZ:FORZ=
1T0999:NEXTZ
600 W=W+1:T=0:GOTO150
649 'pick coordinates of boxes
650 A(1)=RND(105)+130:B(1)=RND(6
0)+24:RETURN
660 A(2)=RND(105)+10:B(2)=RND(60
)+24:RETURN
670 A(3)=RND(105)+10:B(3)=RND(72
)+98:RETURN
680 A(4)=RND(105)+130:B(4)=RND(7
2)+98:RETURN
690 LINE(A(Z),B(Z))-(A(Z)+10,B(Z
)+10),PSET,BF:RETURN
699 'score or crash
700 IFPPPOINT(X,Y)=4THEN850
710 IFPPPOINT(X,Y)=3THEN730
720 P=RND(10)*20:GOTO740
730 P=RND(10)*50
740 PLAY"L255;V31;03;ADEBCDGGFFA
ACDFBEDEBCD;V15;BCGGDFEGDFACABAC
DBDGE;V6;ABBCDACFDEGDFEFBGGGA;V15
"
750 F=F-1:GOSUB1020:IFSC=>E THEN
E=E+5000:PLAY"T7L402;10;03;3;7;L
2;10;L4;7;L2.;10;T2":DRAW"BM170,
12;C1":M$=STR$(N):GOSUB1000:DRAW
"BM170,12;C3":N=N+1:M$=STR$(N):G
OSUB1000
760 IFF=0THEN500
770 IFX>128ANDY<=96THENQ=1ELSEIF
X>128ANDY>96THENQ=4ELSEIFX<=128A
NDY<=96THENQ=2ELSEIFX<=128ANDY>9
6THENQ=3

```

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Quote from the June 1983 issue of HOT COCO. Re: FLEX by David Wasler, pg. 143.
"Frank Hogg Color FLEX has been on the market the longest and has the most software support. It is also the easiest to use. After you receive it, just put it in your drive and type RUN "FLEX"."

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LOOK AT THESE FEATURES ED

ED is both line and screen oriented. This means that you can edit by line number or by using screen type editing where you move the cursor to where you wish to edit and then make your changes. The line editing mode is very handy for programming as most assemblers and compilers refer to line numbers when an error occurs, thus making it easy to correct if the editor like ED can go to a line number to edit. Once there, ED can switch to screen editing to make the corrections.

ED also has cut and paste type of editing, where you can split a line and move the other half. You can also delete and rename files on disk from ED, edit more than one file without leaving ED, and many more. Here is a list of features:

- Menu** will list the command set for ED
- Set** allows changing editor characters
- Cursor** allows changing cursor control strings
- X** sends out a user defined string
- Status** list flags and other internal editor settings
- Head** allows setting and listing of headers and tabs
- Tab** allows setting tab stops
- Width** set screen width
- Number** toggle number flag
- Renumber** renumbers the lines
- Verify** toggle the verify flag
- Zone** set or reset the zone flag for string searches
- Top** go to the top of the text (also works)
- Bottom** go to the bottom of the text (! also works)
- Next** target line becomes the current line
- Find** finds target string
- Append** appends a string to the current line
- Change** changes this to that in the text
- CChange** like above but asks you first
- Copy** copy a block a text
- Cut** cut the current line at a specified column
- Delete** a line or block of lines
- Expand** tabs in the text
- Insert** insert after the current line
- Move** move a block of text
- Overlay** the line
- Print** a line or block of lines
- Replace** a line or lines
- Splice** a line to the current line
- Stop** save the text to disk and edit
- Abort** exit the editor without changing anything
- New** allows working with files larger than available memory
- Edit** restart the editor with a new file
- Dir** list the directory of the disk
- Read** insert a file from disk into the file in memory
- Write** write a block of lines to a file on disk
- Save** save the file to disk
- List** list a line or group of lines
- FEDL** deletes a file on disk
- FREN** renames a file on disk
- CMACRO** create a macro
- LMACRO** list one or all macros
- DMACRO** delete a macro
- MACRO** execute a macro
- CALCULATE** performs math functions with results in binary, decimal, and hex
- EXEC** exec a text file as a set of commands for the editor
- Bell** rings the terminal bell (useful in macros)
- REM** used to document macros.

As you can see, ED is a very versatile and powerful editor for all your editing needs. It is particularly useful for the programmer that needs a flexible editor!!

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LOOK AT THESE FEATURES ASM

ASM is a fast and versatile (8 bit) macro assembler. It has the necessary elements to support structured constructs like WHILE and FOR etc. These are the ability to define macros with substitutable parameters, conditional assembly directives, and the ability to change the value of a label or symbol. In addition, source code may be assembled in modular form. That is as a series of LIBRARY files. A short file containing a list of file specifications in standard assembler source format may call as many library files as desired. Symbols default to a maximum length of 6, but may be redefined to a maximum length of 3 to 30 characters.

ASM supports auto fielding and automatic label generation. Labels may be automatically generated and accessed within expressions.

This function has great power when used within macros. An example is the BASIC statement PRINT "HI". A macro would be created as:

An example would be:	PRINT MACRO	would expand into:
BRA :1	LDX #:1	PRINT "HI"
FCC "HI",4	JSR PSTRNG	LDX L0001
: EQU *	BRA :2	JSR PSTRNG
becomes:	: FCC "&1",4	BRA L0002
	: EQU *	L0001 FCC "HI",4
	: ENDM	L0002 EQU *
L0001 EQU *		

ASM supports the following directives or pseudo operators.

FCC	form constant character(s)	MACRO	define a macro
FCS	form constant string	ENDM	end a macro definition
FCB	form constant byte	EXITM	exit macro being called
FDB	form double byte	DUP	duplicate lines n times up to 'ENDD'
SPC	insert spaces in the output listing	ENDD	end duplication bracket
LEN	set up length of output line for printing	IF	conditional assembly control
OPT	switch assembler options	ELSE	complement true-false flag
PAQ	skip to next page	ENDIF	end conditional assembly clause
ORG	define a new origin (*)	ENDC	end conditional assembly clause
RAM	define a new storage counter origin (.)	WHILE	incremental conditional assembly control
EQU, SET	(re-) assign a value to a symbol	WELSE	complement sense of WHILE test
END, MON	signal end of source code	ENDW	end WHILE clauses
NAM, TTL	specify a name or title	LIB	open a library source code file
STTL	specify a subtitle	SYM	define length of significant characters for symbols
RMB	reserve memory bytes		
ERR	print error message		
RPT	repeat following line n times		

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```

1370 LINE(0,0)-(255,21),PSET,B:D
RAW"C1"
1380 FORD=1TO10:Y=D*16+20:DRAW"B
M91,"+STR$(Y):M$=STR$(D):GOSUB10
00
1390 DRAW"BM130,"+STR$(Y):M$=S$(
D):GOSUB1000
1400 DRAW"BM171,"+STR$(Y):M$=STR
$(S(D)):GOSUB1000
1410 NEXTD
1420 FORX=0TO90STEP2:LINE(X,22)-
(X,191),PSET:NEXT:GOSUB1480
1430 FORX=0TO90STEP2:LINE(X,22)-
(X,191),PRESET:NEXT:GOSUB1480
1440 FORX=1TO89STEP2:LINE(X,22)-
(X,191),PSET:NEXT:GOSUB1480
1450 FORX=1TO89STEP2:LINE(X,22)-
(X,191),PRESET:NEXT:GOSUB1480
1460 IFG=1THENG=0ELSEG=1
1470 SCREEN1,G:GOTO1420
1480 PLAY"L3201C02C03C04C05C"
1490 PP=PEEK(65280):IFPP=126ORPP
=254THENPMODE1,1:PCLS:SCREEN1,0:
GOTO50
1495 A$=INKEY$:IFA$="E"THEN3000
1500 RETURN
1510 'data for characters
1520 DATABRHU4ERFD4GNLBR2
1530 DATAR2U6NGD6R2

```

```

1540 DATABUSER2FDGL2GD2R4
1550 DATABUSER2FDGNLFDGL2NHBR3
1560 DATABR3U6G3R4BD3
1570 DATABUFR2EU2HL3U2R4BD6
1580 DATABU3R3FDGL2HU4ER2BD6BR
1590 DATABU6R4DG3D2BR3
1600 DATABRHUER2EUHL2GDFR2FDGNL2
BR
1610 DATABRR2EU4HL2GDFR3BD3
1620 DATABR4,BR4,BR4,BR4,BR4,
BR4
1630 DATAUSER2FD2NL4D3
1640 DATARU6NLR2FDGNL2FDGNL3BR
1650 DATABR4BU5HL2GD4FR2EBD
1660 DATARU6NLR2FD4GNL2BR
1670 DATAU6NR4D3NR3D3R4
1680 DATAU3NR3U3R4BD6
1690 DATABUU4ER3BD4NLD2L3NHR3
1700 DATAU3NU3R4NU3D3
1710 DATAR2U6NL2NR2D6R2
1720 DATABUNUFR2ENU5BD
1730 DATAU3NU3RNE3F3
1740 DATANU6R4
1750 DATAU6F2DUE2D6
1760 DATAU6F4NU4D2
1770 DATABRHU4ER2FD4GNL2BR
1780 DATAU6R3FDGL3D3BR4
1790 DATABRHU4ER2FD4GNL2BUHF2
1800 DATAU6R3FDGL3RF3
1810 DATABUFR2EUHL2HUER2FBDS
1820 DATABU6R4L2D6BR2
1830 DATABUNU5FR2ENU5BD
1840 DATABU6D4F2E2U4BD6
1850 DATANU6E2UDF2NU6
1860 DATAUE4NUG2H2NUF4D
1870 DATABU6DF2E2NUG2D3BR2
1880 DATABU6R4DG4DR4
1999 'read scores from disk
2000 IFPEEK(188)=6THENRETURN
2010 OPEN"I",#1,"TTSCORES/T10"
2015 IF EOF(1)=-1 THEN2050
2020 FORZQ=1TO10
2030 INPUT#1,S(ZQ)
2035 INPUT#1,S$(ZQ)
2040 NEXTZQ
2050 CLOSE#1
2060 RETURN
2999 'write scores to disk
3000 IFPEEK(188)=6THENEND
3010 OPEN"O",#1,"TTSCORES/T10"
3020 FORZQ=1TO10
3030 WRITE#1,S(ZQ)
3035 WRITE#1,S$(ZQ)
3040 NEXTZQ
3050 CLOSE#1
3060 END

```

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Talk About Your Chopped Down Ford!

By Joel Robbins

One thing I keep forgetting and relearning on CoCo is almost nothing is impossible. Although I had written many programs and done "the impossible" many times, when my son asked me to create a car designing program, I told him it would be too hard and complicated. I just thought that all of the dimensions, angles, circles and interconnected lines would make it a real headache.

Two months passed before I ran out of other programming projects. Frustrated at not having a program to work on, I finally and half-heartedly sat down to begin writing *Autodesigner*. To my amazement it was basically done in two evenings.

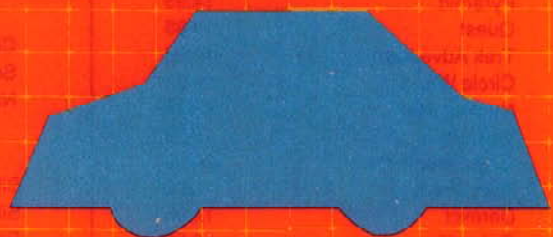
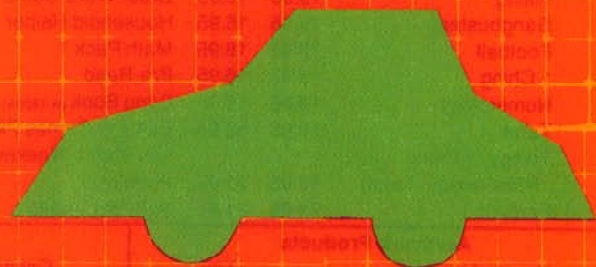
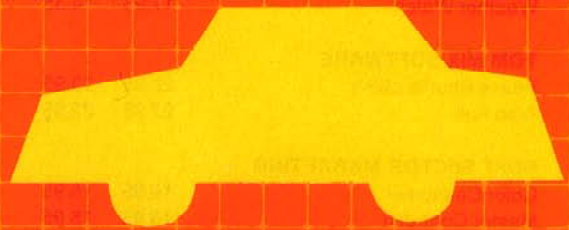
The real guts of the program are from lines 78 to 94. Line 79 draws the bottoms of the cars, which are always the same length. To make the cars look shorter, the vertical dimensions are lengthened. After line 85 all of the *LINE* commands contain only the second coordinate, which makes this section look so uncomplicated.

The one complicated part was thinking only in variables (EE, GR, etc.) and making sure that the new input was added to or subtracted from the correct previous input before the dimensions were set to the graphics generating routine. Labeling lines 85 through 91 with *REM* (') statements helped me keep things straight.

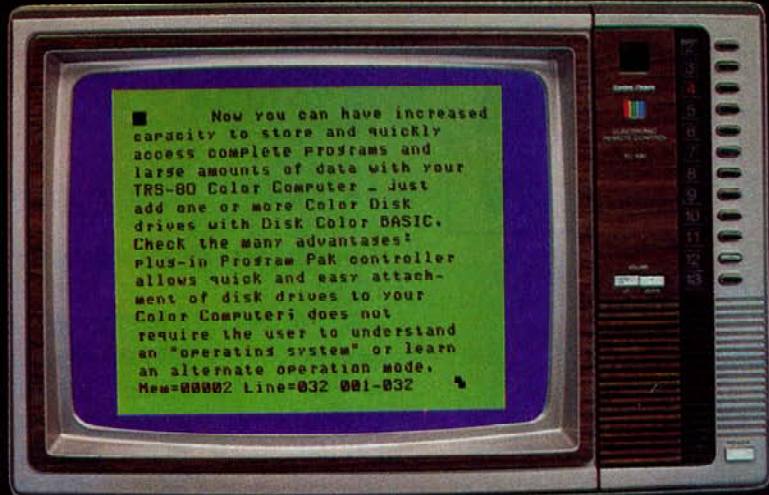
The inputting of dimensions, and the feature which allows the user to change one dimension without changing the others, turned out to occupy the largest amount of space (lines 18 to 73 and 96 to 102).

I added the sample design option last. The dimensions for it are located in line 108. The section makes it much easier to become acquainted with the workings of *Autodesigner* and gives the program an early graphics display.

A few standard menus and directions were the finishing touches. I knew my boy would like the program, but my friends who have seen it even like it more. It's that frustrated car designer in all of us. I used to want to be an architect, too. In fact, my wife thought that I should write a program that would design houses. Is she kidding? All of those dimensions, rectangles and interconnected lines would make it a headache to program.



(Joel Robbins has been enjoying the color computer for about a year and a half, and has published a number of his programs. He has a wife and two children and teaches high school literature.)



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ND DESIGN YOUR OWN CARS. THE
NUMBERS IN ( ) ARE SUGGESTED LI
MITS. ALL OF THE DIMENSIONS A
RE INNER-RELATED SO PLAN ACC
ORDINGLY."
8 PRINT@288," YOU CAN CHANGE TH
E DESIGN AT ANY TIME BY TOUCHI
NG <ENTER>."
9 PRINT@416," TOUCH <S> FOR SAMP
LE DESIGN OR <N> FOR NEW DES
IGN."
10 SA$=INKEY$
11 IFSA$="S"THEN108
  
```

```

12 IFSA$="N"THEN14
13 GOTO 10
14 CLEAR
15 IU=1
16 CLS
17 GOTO 23
18 PRINT:CLS:PRINT"          CHAN
GES"
19 PRINT "FRONT WH = 1      REAR
WH = 2      BTWN WHEELS = 3  GRILL
E HI = 4    HOOD LENGTH = 5  HOOD S
LOPE = 6    WNDSHLD HI = 7    WNSHD
LD SL = 8   ROOF LENGTH = 9   BCK W
ND HI = 10  BCK WND SL = 11   TRUNK
LEN = 12   TRUNK SLOPE = 13  PAINT
= 14
20 INPUT IN
21 IFIN>14THEN20
22 ON IN GOTO 23,25,29,33,37,41,
45,49,53,57,61,65,69,73
23 INPUT "SIZE OF FRONT WHEEL(10
-40)";FW
24 WF=FW
25 INPUT "REAR WHEEL(10-40)";RW
26 WR=RW
27 IFIU=1THEN29
28 GOSUB 104
29 INPUT "DISTANCE BETWEEN WHEEL
S(50-180)";A
30 AB=A:A=A/2:A=120-A:B=A+AB
31 IFIU=1THEN33
32 GOSUB 104
33 INPUT "HEIGHT OF GRILLE(0-70)
";GR
34 GR=170-GR
35 IFIU=1THEN37
36 GOSUB104
37 INPUT "LENGTH OF HOOD(0-120)"
;EE
38 EE=EE+5
39 IFIU=1THEN41
40 GOSUB 104
41 INPUT "SLOPE OF HOOD(0-50)";F
F
42 FF=GR-FF
43 IFIU=1THEN45
44 GOSUB 104
45 INPUT "HEIGHT OF WINDSHIELD(0
-40)";HH
46 HH=FF-HH
47 IFIU=1THEN49
48 GOSUB 104
49 INPUT "SLOPE OF WINDSHIELD(0-
50)";GG
50 GG=EE+GG
51 IFIU=1THEN53
52 GOSUB 104
53 INPUT "LENGTH OF ROOF(0-90)";
II
54 II=GG+II
  
```

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55 IFIU=1THEN57
56 GOSUB 104
57 INPUT "HEIGHT OF BACK WINDOW(
0-50)";LL
58 LL=HH+LL
59 IFIU=1THEN61
60 GOSUB 104
61 INPUT "SLOPE OF BACK WINDOW(-
30 TO +30)";KK
62 KK=II+KK
63 IFIU=1THEN65
64 GOSUB 104
65 INPUT "LENGTH OF TRUNK(0-50)"
;MM
66 MM=KK+MM
67 IFIU=1THEN69
68 GOSUB 104
69 INPUT "SLOPE IF TRUNK(-10 TO
30)";MN
70 MN=LL+MN
71 IFIU=1THEN73
72 GOSUB 104
73 INPUT"PAINT(1-4)";ZP:IFZP>4TH
EN73
74 IFIU=1THEN 76
75 GOSUB 104

```

```

76 PCLS
77 SCREEN 1,0
78 LINE(0,180)-(255,180),PSET
79 LINE(0,170)-(255,170),PSET
80 PAINT(10,181),3,4
81 CIRCLE(A,180-WF),FW,0'FRONT W
HEEL
82 CIRCLE(A,180-WF),3,0
83 CIRCLE(B,180-RW),WR,0'REAR WH
EEL
84 CIRCLE(B,180-RW),3,0
85 LINE(0,170)-(5,GR),PSET'GRILL
86 LINE-(EE,FF),PSET 'HOOD
87 LINE-(GG,HH),PSET 'WINDSHIELD
88 LINE-(II,HH),PSET'ROOF
89 LINE-(KK,LL),PSET'BACK WINDOW
90 LINE-(MM,MN),PSET'TRUNK
91 LINE-(255,170),PSET'BACK BUMP
ER
92 PAINT(120,169),ZP,0
93 PAINT(10,169),ZP,0
94 PAINT(240,169),ZP,0
95 GOSUB110
96 BS$=INKEY$
97 IF BS$=""THEN96ELSE98
98 CLS:PRINT@32,"TOUCH <C> TO CH
ANGE DESIGN TOUCH <N> FOR N
EW START"
99 PU$ = INKEY$
100 IU=0
101 IF PU$="C"THEN18
102 IFPU$="N"THENSELSE99
103 END
104 INPUT"TOUCH <D> FOR DESIGN O
R <ENTER> TO MAKE OTHER CHANGES"
;IP$
105 IF IP$ ="D"THEN76ELSERETURN
106 PRINT@32,"ADD DESIGN FEATURE
S IN LINE 2000"
107 PAINT(110,160),0,0
108 ZP=3:WR=22:RW=22:FW=20:WF=20
:A=180:AB=A:A=A/2:A=120-A:B=A+AB
:GR=140:EE=100:FF=120:HH=90:GG=1
20:II=170:LL=120:KK=190:MM=240:M
N=140
109 GOTO 76
110 WH=WR:HW=FW
111 IF WR<6THENRETURN
112 IFFW<6THENRETURN
113 FORTI=1TO6
114 HW=HW-1
115 CIRCLE(A,180-WF),HW,0
116 NEXTTI
117 FORTI=1TO6
118 WH=WH-1
119 CIRCLE(B,180-RW),WH,0
120 NEXT TI
121 IFTI=0THENTI=1ELSETI=0
122 IFTI=0THENRETURN
123 GOTO 76

```

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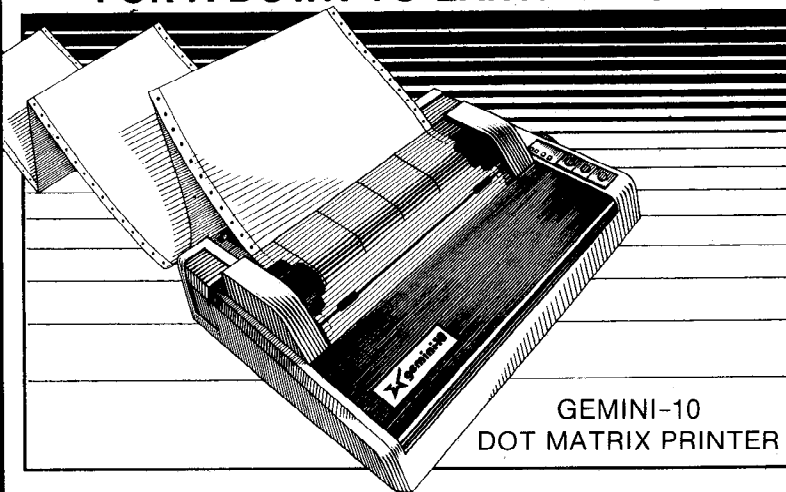




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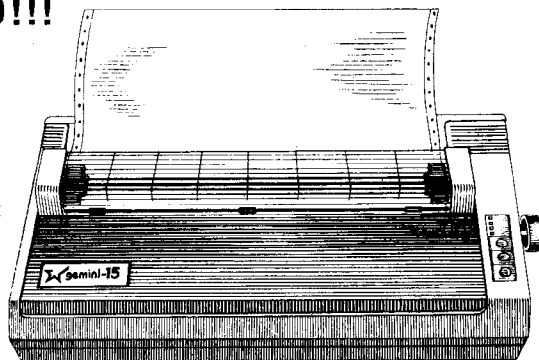
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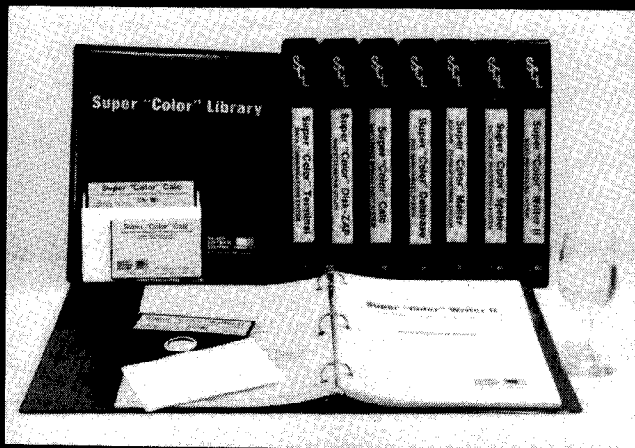
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RAINBUG IV

Part four of a series on our new machine language monitor being developed by the author, *Rainbow* Technical Editor, Dan Downard



To a machine language programmer the most noticeable omission in Non-Extended BASIC is a utility for saving binary programs on the cassette recorder. This month, we are going to add all of the tape commands, *Punch*, *Load* and *Verify* along with a disk "zapper" for the floppy crowd. At the same time, we will finish our review of the 6809 microprocessor commands by discussing interrupts and the condition code register (CC).

Before we start I would like to mention a bug in *EDTASM+*. For some unknown reason, the assembler translates the LDA .X instruction improperly when converting it to machine code. Always use the form LDA 0,X when assembling this instruction, it will save you a lot of debugging. If you have been following this series, you probably have noticed that I use *EDTASM+* for assembling *Rainbug*. For the beginner, I would recommend purchasing the ROM Pack as an excellent method of getting your feet wet. It lacks some of the features found in disk-based assemblers, but is easy to operate and comes with excellent instructions. There have been several rumors of a Radio Shack disk-based Editor-Assembler for the CoCo, but I guess we will have to wait for the "super" CoCo to get one. For those of you with a disk and *EDTASM+*, I would recommend Roger Schrag's "Patching *EDTASM+* to Run on Disk" in the December 1982 *Rainbow*. It works fine.

What do you need to get started in machine language programming? With the *EDTASM+* ROM Pack, *SDS80C*, or for that matter, any of the editor-assembler tapes advertised, all you need is a 4K Non-Extended BASIC CoCo. If

you just want to enter a ML program into memory out of a magazine article all you need is a monitor such as *Rainbug*. Machine language will run on any 6809 computer with minor modifications. For small programs, usually the only changes necessary are to the routines, or addresses, that input from the keyboard and output to the screen.

Condition Codes

The Condition Code Register (CC) is an internal 8-bit register within the 6809 processor used to indicate the result of instructions or operations. Each bit has a separate function and five of these bits are set/reset depending on the previous data instruction. They are the half carry (H), negative (N), zero (Z), overflow (V) and carry (C) bits. Two of the bits are related to interrupts: the fast interrupt request mask (F) and the interrupt request mask (I). The entire flag (E) reflects the status of the stack pointer.

Flag	Bit#	Description
C	0	A carry or borrow was generated by the previous operation.
V	1	A signed arithmetic overflow was caused by the last operation.
Z	2	The result of previous operation was zero.
N	3	Contains the value of bit 7 from the previous operation.
H	5	A carry was generated by bit 3.
F	6	Used to mask the FIRQ line.
I	4	Used to disable any IRQ input.
E	7	Indicates how many registers were saved by the last interrupt.

Condition codes are generally used to control the flow of the program. They are the elementary form of the IF . . . THEN statement. Most of the time they are combined with a branch statement to form what is called a conditional

(Dan Downard is an electrical engineer and has been involved in electronics for 24 years through ham radio (K4KWT). His interest in computers began about five years ago and he has built several 68XX systems.)

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branch. For example, the mnemonic BEQ stands for branch if equal. If the processor encounters this instruction it will examine the zero (Z) bit in the CC register and the program will branch to a new location if it is set.

Interrupts

The 6809 has six vectored interrupts, three hardware and three software. What's an interrupt? What's a vector? Sometimes during a normal program we wish external inputs to halt program execution and perform another task. An example would be an action game. While the processor is busy updating graphics on the screen how does it know that the fire button has been pressed?

A hardware interrupt is a dedicated input into the processor that stops program execution, performs another task, and then restores the program counter to its previous value. A software interrupt does the same thing when certain instruction codes are encountered.

"Vectored" means that, when the processor recognizes an interrupt, the program counter is pointed to a certain address for further action. The reset button on the rear of your computer is actually a vectored interrupt. When you depress the reset, the processor jumps to the address stored at location \$FFFE. Examining address \$FFFE will give you the start of BASIC, or \$A027.

Another interrupt that is used in the CoCo is the FIRQ. Pin 8 of the cartridge connector is indirectly connected to the FIRQ line of the 6809 to indicate the presence of a ROM Pack. When a FIRQ interrupt is recognized program execution is transferred to \$C000 or the address of the ROM Pack.

Following are the 6809 interrupts:

Interrupt	Nnemonic	Vector
Reset	RESET	\$FFFE
Non-maskable	NMI	\$FFFC
Software	SWI	\$FFFA
Interrupt Request	IRQ	\$FFF8
Fast Int. Request	FIRQ	\$FFF6
Software 2	SWI2	\$FFF4
Software 3	SWI3	\$FFF2

Rainbug

This month we are going to add several new commands to *Rainbug*. They consist of tape loading, saving and verification, disk examination and printer control. The new commands can be used as follows:

- @— Toggle printer on or off. This command must be entered following a prompt.
- P— xxxx yyyy zzzz filename-Save a machine language binary format file. xxxx=starting address, yyyy=ending address, zzzz=execute address. Filename must meet BASIC specifications.
- L— Same as BASIC *CLOADM* command.
- V— Same as BASIC *SKIPF* command.
- D(X)— Read/write to disk. X=R for read. X=W for write.

All of the commands are self-explanatory with the exception of the D(X) command. After a DR command, you are prompted for the drive, track and sector which must be entered in HEX. The data in this sector of the disk will be transferred to a buffer located at \$2000-\$20FF where it may be examined or changed using the M command. After the data is changed it can be written back to any sector using the DW command. Be careful!

Summary

Next month, we will wrap up *Rainbug* with the program execution and breakpoint commands. I will try to show you how to use some of the routines already in the BASIC ROMS for your own ML programs. Also, some tips on modifying existing programs will be discussed. If you have any questions or suggestions of future topics that need discussion, please write in care of the magazine.

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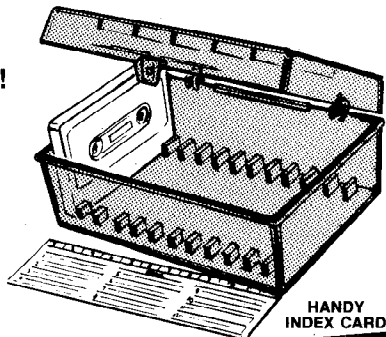
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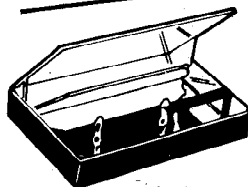
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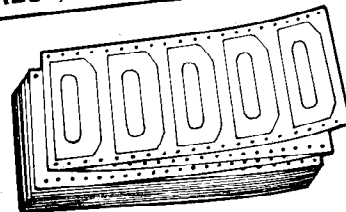
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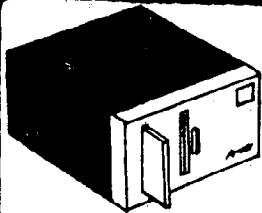
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333F BF #1E7	#4330	STX	#01E7		48			
3342 AE 8C B5	#4340	LDX	ENDA,PCR		45			
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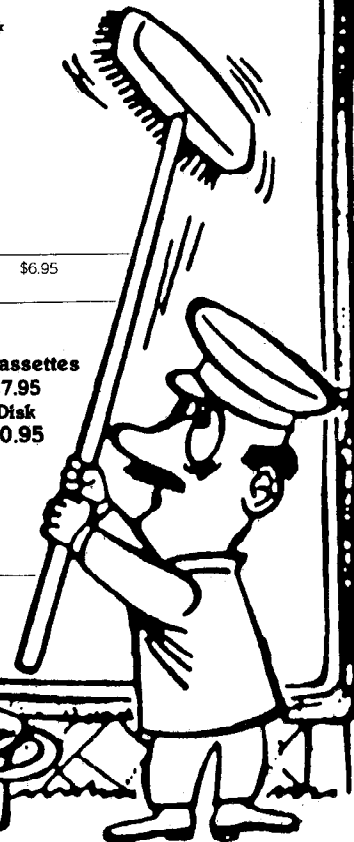
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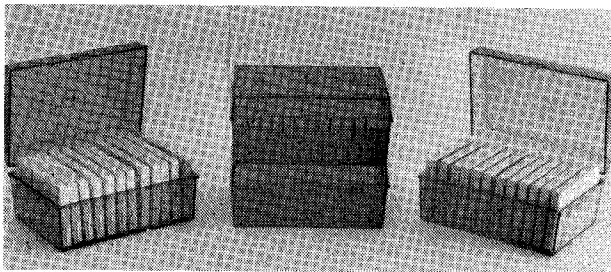
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3396	81	57	04510	WRITE CMPA 0057
3398	1026	FE0C	04520	LBNE ERROR
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33A4	17	FDDF	04560	LBSR PDATA
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33AC	1026	FD08	04590	LBNE ERROR
33B0	8E	3355	04600	DIO LDX #DMS61
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33B6	17	FCDA	04620	LBSR BLDNBN
33B9	86	319A	04625	LDA NUMBER+1
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33C8	86	319A	04665	LDA NUMBER+1
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33DA	87	32FF	04710	STA SE
			04715	*USE DSKCON FOR I/O
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33E0	86	32FC	04730	LDA RW
33E3	A7	00	04740	STA 0, X
33E5	86	32FD	04750	LDA DR
33E8	A7	01	04760	STA 1, X
33EA	86	32FE	04770	LDA TR
33ED	A7	02	04780	STA 2, X
33EF	86	32FF	04790	LDA SE
33F2	A7	03	04800	STA 3, X
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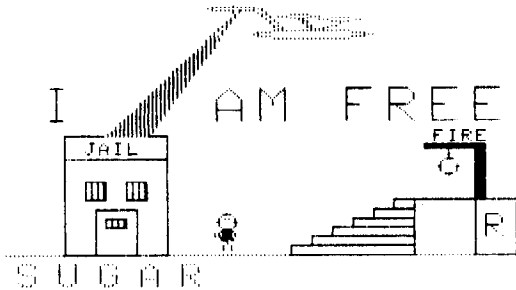
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TWO FOR THE 10

By Thomas Szlucha

Move over VIC, shove down ZX-81, here comes the MC-10, Micro Color Computer by Radio Shack. It is about time Tandy paid serious attention to the \$100 computer market. The original CoCo is a bit overpriced for this important "learners" category. The addition of the Micro Color with its salient features should serve well in rounding out Tandy's fleet. One of the two features that I believe set this micro apart from its main competitors is the built in RS-232 communication port for modem or printer hook-up. The other is a decent version of Color BASIC (by Microsoft). This version has some math function enhancements over the original Color BASIC and should serve well as an introductory language. There are some commands missing as well as some hidden commands which will be described in a future article.

This article is not meant to be a review of the Micro CoCo, but a presentation of some programs designed to help owners, who are likely new to computing, put this excellent machine to work.

The first program, shown in Listing 1, is called *MCmaze*. It is a game that demonstrates techniques which can be useful in building BASIC games. The first technique that should be mentioned as you study the listing is the use of multiple statement lines, a technique only vaguely mentioned in the MIC (a new nickname?) instruction manual. Multiple statement lines are useful in conserving memory space, saving a line number each time one is used. To separate functions, the colon (:) is used. Lines 70 and 80 of the maze program are good places to use (:), the *SET* statements separately would have taken up seven lines. Care should be used in applying this technique on lines with logical *IF* statements because program flow will continue to the end of the line only when the logic statement is satisfied. Also, do not make the lines too long, Micro Color BASIC only allows 128 bytes (characters) per line. If you are converting a program that you would like to compress, use care that you do not eliminate a needed *GOTO* line number by using multiple statements.

Back to *MCmaze*. Up through line 250, the instructions are presented and the maze is drawn. The car movement,

A Pair of programs for the new MC-10 demonstrate some useful techniques.

lines 270-410, is the heart of this program. Lacking joystick controls on MIC, control of the car steering is provided by using the *INKEY\$* command to sense pressing of certain keys on the keyboard. In the normal course of this program, looping is taking place constantly from lines 270-410. The keyboard is being sensed several times a second at line 280. The value of the key pressed is assigned to the variable *IK\$*. (Note, the variable has a \$ after it because this is a string variable, i.e., not treated as a normal number by MIC).

In the next line, there is a test to see if there was a key pressed. If so, the new value is passed to variable *K\$*, if not then *K\$* keeps its old value. This is an important trick to keep the car moving between keyboard presses. Lines 300-330 check to see which direction and calculate a new position (*X1*, *Y1*) for the car each time through the loop. In line 340, the old position (*X*, *Y*) is turned off with the *RESET* command, otherwise you would draw a line on the screen corresponding to where the car has gone. This would be great for some programs, *Color Etch-a-Sketch* for instance, but not desired here. Lines 350 and 360 sense whether the car has reached the finish or crashed by looking at the color *POINT* of the new location the car is about to move to. If things are O.K., the new car position is *SET* (line 370) and the variables keeping track of the previous position of the car are updated in line 380. Before going around again, at line 400, a delay is added which is dependent on the level of difficulty requested. The program just sits there and counts to "D" allowing the game to be made easier for slow fingers.

The rest of the program consists of the various subroutines taking care of the crash count and finishing displays. Overall, even with all the *REM* statements used, this game takes less than one-half the memory available in MIC.

The second program, called *MCspell* (Listing 2), has a more serious purpose. This program is designed to help a child learn spelling by selecting the misspelled word out of a group of words. To maintain attention and concentration, the program has a game aspect in that the misspelled word is not simple picked out, but "shot down" with a "ray gun."

In designing this program, considerable use was made of data arrays. The focus of the program description will be explaining and handling arrays with the MC-10.

An array is a special type of variable that can have many different values and is used when you would like to treat it the same way (mathematically or logically) each time you use it in a program. The lists of words used in this spelling

(Mr. Szlucha, a technical specialist in Product Development at Xerox Corporation, holds several patents relating to xerography. Microcomputing is a hobby enjoyed by his whole family.)

program are excellent examples of the uses of arrays. The list of correct words keyed or read into this program are assigned to an array variable $WS(n)$. Specifying the value of n , from 1 to 30 in this case will return a different word from the spelling list. For example:

$WS(1) = \text{"tree"}$
 $WS(2) = \text{"grow"}$
 $WS(3) = \text{"try"}$
 to
 $WS(30) = \text{"kite"}$

In this program, to keep the lists separate, two arrays are used $WS(n)$ to store the "correct" words and $MSS(n)$ to store the misspelled words. The value associated with each element of the array is entered one of two ways in this program. If the "key-in word list option" is chosen (line 400), then *INPUT* statements are used to enter the words from the keyboard. There is also an option to use "built-in" words. These words are read into the array using the *READ* command (lines 210 and 240). The words reside in *DATA* statements at the end of the program and can be changed if desired from BASIC.

When using an array, you must define for the computer the maximum size that is intended for the array. This is done with a dimension statement that is placed in the program prior to the use of the array variable. The computer sets aside the memory associated with the anticipated array size. If you exceed the *DIM* or forget it, you will generate an error. There is one exception to this; arrays of 10 and less do not have to be dimensioned, space is made available for them automatically.

This program, as it currently exists, handles a total of 45

words. By changing the dimensions of the arrays and the various counting variables you could increase the list of words considerably.

These programs will increase the library of the new MC-10 owners and hopefully spark ideas for new programs. Welcome to a new computer and to the many friends that it will bring to a fascinating hobby.

Note: there are very few differences in dialect between Color BASIC and Micro Color BASIC. These programs should work on a 4K CoCo, but the following changes should be made to work correctly with the arrow keys.

MCmaze—Line 300 change "S" to CHR\$(09)
 Line 310 change "W" to CHR\$(94)
 Line 320 change "A" to CHR\$(08)
 Line 330 change "Z" to CHR\$(10)

MCspell—Line 1140 change "S" to CHR\$(09)
 Line 1150 change "A" to CHR\$(08)



Listing 1:

```

1 REM MAZE RACE
2 REM SUBMITTED BY
3 REM THOMAS SZLUCHA
4 REM FAIRPORT NY. 14450
5 REM
10 CLS0
20 GOSUB1010
30 INPUT"LEVEL OF DIFFICULTY (1-
3)";D:D=(3-D)*20+1
35 TI=0:C=0
40 CLS0
50 REM SET-UP MAZE AND BARRIERS
60 FOR I=0 TO 63
70 SET(I,0,4):SET(I,1,4):SET(I,2
8,4):SET(I,29,4)
80 SET(0,INT(I/2),4):SET(1,INT(I
/2),4):SET(62,INT(I/2),4):SET(63
,INT(I/2),4)
90 NEXT I
100 FOR J=4TO24 STEP4
110 RD=4+RND(24):RR=38+RND(22)
120 SET(RD,J-1,4):SET(RD+4+RND(3
0),J-2,4)
130 IFINT((J/4)/2)=(J/4)/2THEN14
0
135 GOTO170
140 FOR I=1TO57
150 SET(I,J,4):SET(I,J+1,4)
160 NEXT I:GOTO 200
170 FOR I=6TO62
180 SET(I,J,4):SET(I,J+1,4)
190 NEXT I
200 NEXT J
210 SET(0,27,2)
220 REM INITIAL LOCATION OF CAR
230 X=60:Y=3
250 SET(X,Y,1)
260 REM MAIN LOOP WHICH MOVES CA
R (TO LINE 410)
270 X1=X:Y1=Y
280 IK#=INKEY#
  
```

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```
10 PRINT "EXAMPLE": FOR X=A TO M: FOR Y=S TO P:  
P:Z=X+Y:PRINT Z:NEXT Y:NEXT X
```

```
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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```

290 IF IK$<>" THEN K$=IK$
300 IF K$="S" THEN X1=X+1
310 IF K$="W" THEN Y1=Y-.5
320 IF K$="A" THEN X1=X-1
330 IF K$="Z" THEN Y1=Y+.5
340 RESET(X,Y)
350 IF POINT(X1,Y1)=4 THEN GOTO
500
360 IF POINT(X1,Y1)=2 THEN GOTO
600
365 SOUND 10,1
370 SET(X1,Y1,5)
380 X=X1:Y=Y1
390 TI=TI+1:PRINT@480,"TIME";TI;
400 FORT=1TOD*2:NEXT
410 GOTO270
500 C=C+1:PRINT@493,"CAR #";C;"C
RASHED";
510 FOR T=1 TO 1000:NEXT T:PRINT
@480,"
";
520 K$=""
530 IFC=3THENGOTO620
540 GOTO 230
600 PRINT@480,"FINISHED COURSE!
TIME=";TI;
610 GOTO630
620 PRINT@480,"TIME =" ;TI"TO WRE

```

```

CK THREE CARS";
630 FOR T=1 TO 1000:NEXT T:PRINT
@480,"PLAY AGAIN <Y>/<N>
";:INPUT R$
640 IFR$="Y"THENCLS0:GOTO30
650 END
1000 REM INSTRUCTIONS
1010 PRINT"AVOID WALLS AND BARRI
ERS. IF YOU CRASH YOU START AT TH
E BEGINNING AGAIN ";
1020 PRINT"- YOU HAVE THREE CARS
AND WILL BE TIMED, NOTE:THE LEV
EL OF DIFFICULTY = SPEED"
1030 PRINT
1040 RETURN

```



Listing 2:

```

10 REM MICSPELL
20 REM WRITTEN BY
30 REM THOMAS SZLUCHA
40 REM FAIRPORT NY. 14450
50 REM 5/29/83
90 DIM W$(30),MS$(15)
100 CLS
105 PRINT@73,"MICRO-SPELLER"
110 PRINT@138,"SELECTIONS"
130 PRINT@192,"<1> READ BUILT-IN
WORD LIST"
140 PRINT"<2> KEY-IN WORD LIST"
150 PRINT" "
160 INPUT R
170 IF R<1 OR R>2 THEN 160
180 ON R GOTO 200,400
200 FOR I=1 TO 30
210 READ W$(I)
220 NEXT I
230 FOR I=1 TO 15
240 READ MS$(I)
250 NEXT I
260 GOTO 1000
400 CLS:PRINT@68,"CREATE SPELLIN
G LIST"
410 PRINT" DATA ARRAYS CONSIST O
F :          30 - CORRECTLY SPELLE
DD WORDS    15 - MISSPELLED WORDS
"
430 N$="CORRECT"
440 FOR I=1 TO 30
450 GOSUB 600
460 NEXT I
470 N$="INCORRECT"
475 T=1
480 FOR I=1 TO 15
490 GOSUB 600
500 NEXT I
510 PRINT"FINISHED"
520 PRINT"PRESS ANY KEY TO PLAY"

```



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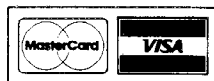
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```

:INPUT R$:GOTO 1000
600 PRINT@384,"ENTER ";N$;" WORD
#";I
605 IF T=1 THEN INPUT MS$(I):GOT
O 615
610 INPUT W$(I)
615 PRINT@416,"          "
620 RETURN
999 REM MAIN PROGRAM
1000 CLS0
1010 N=N+1
1015 R1=RND(15)
1020 R2=RND(15)+15
1025 R3=RND(15)
1040 P=RND(3)
1050 A$=W$(R1):B$=W$(R2)
1060 C$=MS$(R3)
1070 IF P=1 THEN PRINT@226,C$:PR
INT@236,B$:PRINT@246,A$
1080 IF P=2 THEN PRINT@226,B$:PR
INT@236,C$:PRINT@246,A$
1090 IF P=3 THEN PRINT@226,A$:PR
INT@236,B$:PRINT@246,C$
1100 PRINT@36,"SHOOT THE MISSPEL
LED WORD"
1110 PRINT@100,"MOVE GUN WITH AR
ROW KEYS          SHOOT BY PRESSIN
G SPACE BAR"
1115 X1=24

```

```

1120 SET(2+X1,31,4):SET(4+X1,31,
4):SET(6+X1,31,4):SET(4+X1,30,4)
:SET(4+X1,29,4)
1125 X=X1
1130 K$=INKEY$:IF K$="" THEN 113
0
1140 IF K$="S" THEN X1=X+20:IF X
1>44 THEN X1=44
1150 IF K$="A" THEN X1=X-20:IF X
1<0 THEN X1=4
1155 IF K$=" " THEN 1300
1160 RESET(2+X,31):RESET(4+X,31)
:RESET(6+X,31):RESET(4+X,30):RES
ET(4+X,29)
1250 GOTO 1120
1300 FOR Y=29 TO 16 STEP-1
1310 SET(X+4,Y,5)
1320 NEXT Y
1330 H=H+1
1360 IF INT(X/20)+1 =P THEN 1400
1370 SOUND50,4:SOUND20,6
1380 CLS0:PRINT@132,"that word i
s indestructable"
1385 FOR T= 1 TO 1000:NEXT T
1390 GOTO 1070
1400 CLS2:SOUND100,2:CLS4:SOUND2
00,3:CLS6:SOUND255,3:CLS0
1410 PRINT@128,"TERRIFIC !! RID
THE GALAXY OF  MORE MISPELLED
WORDS"
1420 FOR T=1 TO 1000:NEXT T
1440 IF N=10 THEN 1500
1450 GOTO1000
1499 REM END ROUTINE
1500 CLS0:SOUND50,4:SOUND50,6:SO
UND155,6:CLS4
1510 PRINT@128,H;"SHOTS TO KILL
10 ALIENS !!!!!"
1520 PRINT@320,"PLAY AGAIN <Y>/<
N>";
1530 INPUT R$: IF R$="Y" THEN N=
0:H=0:GOTO 1000
1540 END
2000 REM 30 WORDS SPELLED O.K.
2010 DATA ONCE, THREE, TEST, NICE, G
RAY, HAPPY, CITIES, CUTE, HEAVY, EIGH
T
2020 DATA MACHINE, THEIR, AWAKE, RI
DGE, FRIEND, DANCING, COMING, CHAIR,
KEEP, DOZEN
2030 DATA MAGIC, MOVIES, FRIENDLY,
PERCH, HAYLOFT, BUILDINGS, FORESTS,
BABBLING, BANANA, READS
2040 REM 15 MISPELLED WORDS
2050 DATA DISE, THIER, MASHINE, FRE
IND, JUDGE, DOSEN, FONE, KUTE, KEAP, C
ITYS
2060 DATA READES, WINDOES, LAFFING
, DANSING, HIDD

```

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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 rule books are very difficult to understand. If you are a beginner, first try *Worlds of Wonder* or *Tunnels & Trolls*. Programs in "GameMaster's Apprentice" are based on the game system used in *Worlds of Wonder* and *RuneQuest*. For general information about fantasy role playing games, try the following book, excellent for beginners.

Through Dungeons Deep by Robert Plamondon. From Reston Publishing Company, 11400 Sunset Hills Road, Reston, VA 22090.

Copyright (C) 1983 by DragonQuest, P.O. Box 310, Menlo Park, CA 94025. Portions of "GameMaster's Apprentice" are from a book-in-progress called *Adventurer's Handbook: A Beginner's Guide to Role Playing Games*.

(Bob Albrecht and George Firedrake are two of the most prolific authors in the microcomputer world today. Specialists in writing for beginners, they are authors of numerous books, including TRS-80 Color Basic.)

GameMaster's Dice

GameMaster's Dice come in many shapes, from tetrahedrons (four sides) to icosahedrons (20 sides). We assume you are already acquainted with ordinary six-sided dice. We use the abbreviation D6 to mean one six-sided die.

- D6 is one six-sided die
- 1D6 is one six-sided die
- 2D6 are two six-sided dice
- 3D6 are three six-sided dice
- and so on.



We also use less familiar dice, such as:

D4



D4 is a tetrahedron, with sides numbered 1 to 4. The number rolled is the one that is right side up after you throw the die.

D8



D8 is an octahedron, with eight sides numbered 1 to 8.

D12



D12 is a dodecahedron, with 12 sides numbered 1 to 12.

D20



D20 is an icosahedron, with 20 sides numbered 1 to 20.



DIGIT DICE

A **digit die (DD)** can be a 10-sided die, with sides numbered 0 to 9, or an icosahedron with 20 sides numbered 0 to 9 (each number appears twice).

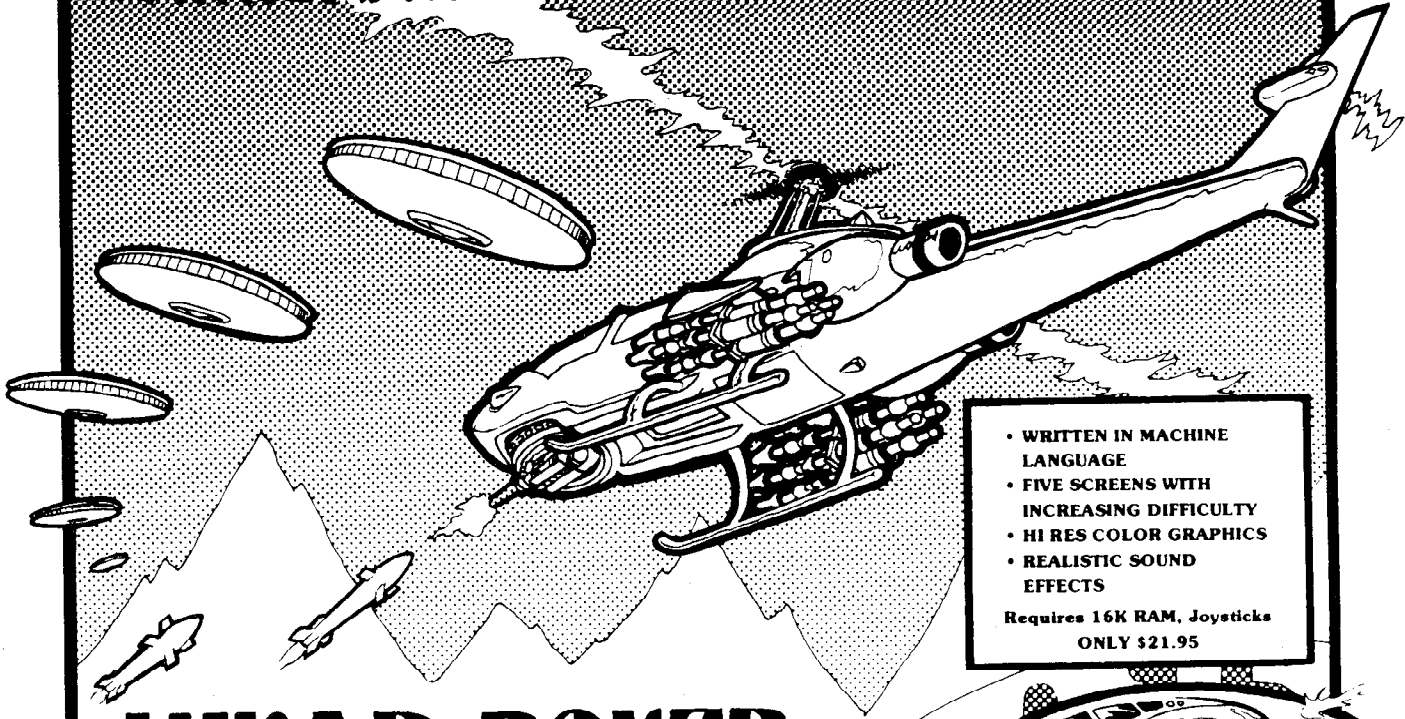
We use digit die (DD) to roll a **decimal digit**, 0 to 9. However, sometimes we want to roll D10, a number from 1 to 10. Easy—roll a DD and use 0 to mean 10.

REMEMBER: A digit die (DD) is a 10 or 20-sided die whose faces are numbered 0 to 9.

D100 is a **percentage** roll, also called a **percentile** roll, with numbers from 00 to 99. To make a percentage roll, use a DD (digit die), roll it twice. The first roll is the 10's digit; the second roll is the one's digit. If you roll a 3 the first time and a 7 the second time, the number is 37.

Or use two digit dice of different colors. One color (silver? gold? yellow?) is the 10's digit and the other (white? copper?) is the one's digit.

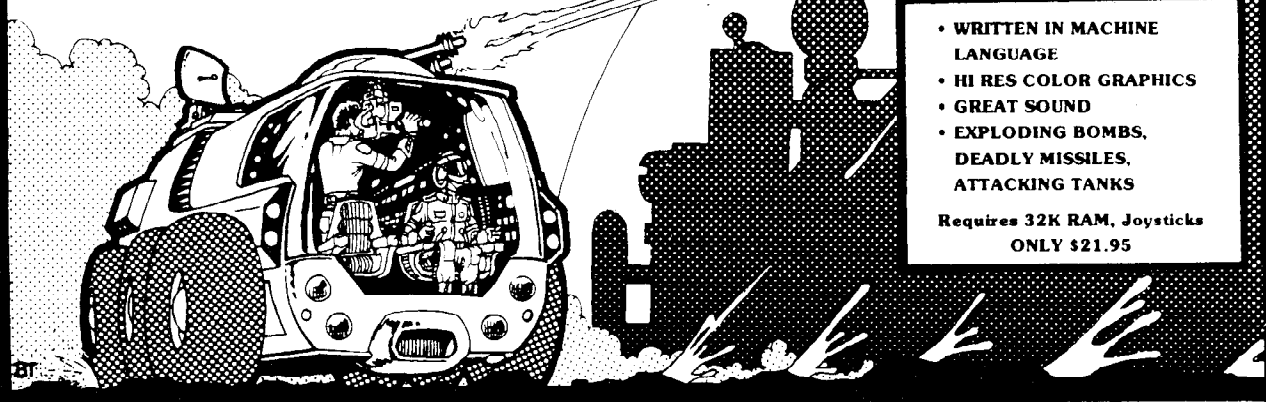
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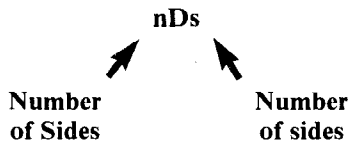
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We have written a general purpose subroutine to roll n dice, each with s sides.



You can also make a digit die (DD) roll or a percentile (P) roll. Our dice subroutine appears in the following program in lines 13000 through 13260. However, you may change the line numbers, since no line numbers appear in the statements in the subroutine.

```

100 REM**GAMEMASTER'S DICE
110 CLS
120 INPUT "DICE"; DICE$
130 GOSUB 13010
140 PRINT DICE
150 PRINT
160 GOTO 120
  
```

```

13000 REM**DICE SUBROUTINE GMT 1
13010 IF DICE$="" THEN DICE=0: R
      ETURN
  
```

```

13020 REM**PERCENTILE OR DIGIT?
13030 IF DICE$="P" THEN DICE=RND
      (100)-1: RETURN
13040 IF DICE$="DD" THEN DICE=RN
  
```

```

D(10)-1: RETURN
  
```

```

13050 REM**FIND 'D' IN DICE$
13060 FOR KK=1 TO LEN(DICE$)
13070 : PD = KK
13080 : XX$ = MID$(DICE$, PD, 1)
13090 : IF XX$="D" THEN KK=LEN(D
      ICE$)
13100 NEXT KK
  
```

```

13110 REM**NN IS NUMBER OF DICE
13120 IF PD=1 THEN NN=1
13130 IF PD>1 THEN NN=VAL(DICE$)
  
```

```

13140 REM**SS IS NUMBER OF SIDES
13150 LD = LEN(DICE$)
13160 SS$ = RIGHT$(DICE$, LD-PD)
13170 SS = VAL(SS$)
  
```

```

13180 REM**ROLL THE DICE
13190 DICE = 0
13200 IF NN=0 THEN RETURN
13210 IF SS=0 THEN RETURN
13220 FOR KK=1 TO NN
13230 : DD = RND(SS)
13240 : DICE = DICE + DD
13250 NEXT KK
13260 RETURN
  
```

The subroutine is similar to our *GameMaster's Dice* program in the June issue of *the Rainbow*. Look in that issue for a detailed description of how the program works. Think of the subroutine as a procedure that converts the string DICES to the number DICE.



Here is a test run of the subroutine.

```

DICE? 3D6
13
DICE? 0D6      Zero dice
0
DICE? 3D0      Zero sides
0
DICE? DD       Digit Die
4
DICE? P        Percentile roll
67
DICE? D
0
DICE? 1D3
2
DICE? D5       Same as 1D5
3
DICE? and so on. It seems to work.
  
```

If you want to use "D" instead of "DD" to mean "Digit Die," change line 13040.

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The Character File

We challenge you to rewrite our latest *CHARACTER FILE* program (July, 1983) so the records are first read into arrays of subscripted variables, as follows:

1st record:

```
NAYMS(1), STR(1), CON(1), SIZ(1), INQ(1),  
          POW(1), DEX(1), CHA(1)
```

2nd record:

```
NAYMS(2), STR(2), CON(2), SIZ(2), INQ(2),  
          POW(2), DEX(2), CHA(2)
```

and so on.

Our program begins by reserving memory space for string and numeric arrays, then uses a subroutine to read the information into the arrays.

```
100 REM**CHARACTER FILE PROGRAM  
110 CLEAR 1000  
120 DIM NAYM*(50), STR(50), CON(50),  
      SIZ(50), INQ(50), POW(50), DEX(50),  
      CHA(50)  
130 GOSUB 13010: 'LOAD ARRAYS
```

We reserved space for up to 50 records, including *END-FILE*. Here is our subroutine to read the records into the arrays. The information is in *DATA* statements.

```
13000 REM**LOAD ARRAYS SUBR  
13010 RR = 0  
13020 RR = RR + 1  
13030 READ NAYM*(RR), STR(RR), CON  
      (RR), SIZ(RR), INQ(RR), POW(RR), DEX  
      (RR), CHA(RR)  
13040 IF NAYM*(RR)="ENDFILE" THE  
      N RETURN ELSE 13020
```

```
30000 REM**CHARACTER RECORDS  
30010 DATA ALOYSIOUS, 10, 11, 10  
      , 12, 10, 12, 9  
30020 DATA BAROSTAN, 17, 17, 13,  
      8, 7, 15, 6  
30030 DATA BRIDLA, 11, 12, 10, 1  
      5, 6, 11, 16  
30040 DATA DERNFARA, 13, 13, 8,  
      13, 4, 17, 6  
30050 DATA JOLEEN, 13, 11, 7, 13  
      , 8, 17, 13  
30060 DATA ROKANA, 9, 9, 9, 17,  
      18, 9, 10  
30070 DATA ENDFILE, 0, 0, 0, 0,  
      0, 0, 0
```

The menu segment (blocks 200 and 400) is the same as last time. For your convenience, here it is again.

```
200 REM**TELL HOW TO USE  
210 CLS  
220 PRINT "YOU CAN FIND A CHARAC  
      TER RECORD"  
230 PRINT "BY NAME OF CHARACTER  
      OR YOU CAN"  
240 PRINT "SCAN THE ENTIRE CHARA
```

```
CTER FILE."
```

```
250 PRINT @128, "MENU:"  
260 PRINT @194, "TO FIND A RECOR  
      D, PRESS '1'"  
270 PRINT @226, "TO SCAN ENTIRE  
      FILE, PRESS '2'"  
280 PRINT @258, "TO RETURN TO ME  
      NU, PRESS '0'"  
299 :  
400 REM**WAIT FOR KEY  
410 KEY$ = INKEY$  
420 IF KEY$="" THEN 410  
430 IF KEY$="1" THEN 1010  
440 IF KEY$="2" THEN 2010  
450 IF KEY$="0" THEN 210 ELSE 41  
      0
```

You rewrite the *CHARACTER FINDER* module beginning at line 1000 and the *SCAN CHARACTER FINDER* module beginning at line 2000. Remember, the information is now stored in arrays. You may find the *READ RECORD SUBROUTINE* beginning in line 11000 is no longer necessary. Of course, you must rewrite to *PRINT RECORD SUBROUTINE* beginning at line 12000 so the information is obtained from the arrays.

Think of other ways to put the character records into the arrays. For example:

- Enter records from the keyboard.
- Load the information from a cassette file.
- Load the information from a disk file.

You can do any of the above by rewriting the *LOAD ARRAYS SUBROUTINE*.

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We have written a primitive **worksheet** program to help you do this. When you run it, first you see this:

```
1 STR 0
2 CON 0
3 SIZ 0
4 INT 0
5 POW 0
6 DEX 0
7 CHA 0
TOTAL POINTS: 0
CHANGE (1 to 7)?
```

You may now select which characteristic to change by pressing a number key from 1 to 7. CoCo then asks:

NEW VALUE?

Type the new value and press *ENTER*. The new value appears on screen along with a new TOTAL POINTS. You can select a characteristic and enter a new value as many times as you want until you get just the character you want, with exactly the number of TOTAL POINTS the GM said you could have.

Here is our first worksheet program. *Spectaculator* it is not; primitive it is! Perhaps you can improve on it.

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```
100 REM**CONTRIVE A CHARACTER
```

```
200 REM**SET UP ARRAYS
```

```
210 FOR KK=1 TO 7
```

```
220 : READ CH*(KK)
```

```
230 : CV(KK) = 0
```

```
240 NEXT KK
```

```
250 TTL = 0
```

```
260 DATA STR,CON,SIZ,INT
```

```
270 DATA POW,DEX,CHA
```

```
300 REM**PUT WORKSHEET ON SCREEN
```

```
310 CLS
```

```
320 FOR KK=1 TO 7
```

```
330 : PRINT KK,CH*(KK);CV(KK)
```

```
340 NEXT KK
```

```
350 PRINT
```

```
360 PRINT "TOTAL POINTS:" TTL
```

```
400 REM**CHANGE WHICH ONE?
```

```
410 PRINT
```

```
420 PRINT "CHANGE (1 TO 7)?";
```

```
430 KEY$ = INKEY$
```

```
440 IF KEY$="" THEN 430
```

```
450 IF KEY$<"1" THEN 430
```

```
460 IF KEY$>"7" THEN 430
```

```
470 NC = VAL(KEY$)
```

```
500 REM**GET NEW VALUE
```

```
510 PRINT: PRINT
```

```
520 INPUT "NEW VALUE"; NV
```

```
530 CV(NC) = NV
```

```
600 REM**COMPUTE NEW TOTAL
```

```
610 TTL = 0
```

```
620 FOR KK=1 TO 7
```

```
630 : TTL = TTL + CV(KK)
```

```
640 NEXT KK
```

```
700 REM**GO AROUND AGAIN
```

```
710 GOTO 310
```

Use the program to contrive a 74 point character; an 80 point character; a 90 point character. For each number of total points, contrive several characters, each different from the others.

Coming Attractions

Surely, but slowly, we will explore the following things:
The elusive *RND*

GameMaster's Dice

Looking up stuff in files. First, files of information in statements and arrays. Next, cassette files. Eventually, disk files.

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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:

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- 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**

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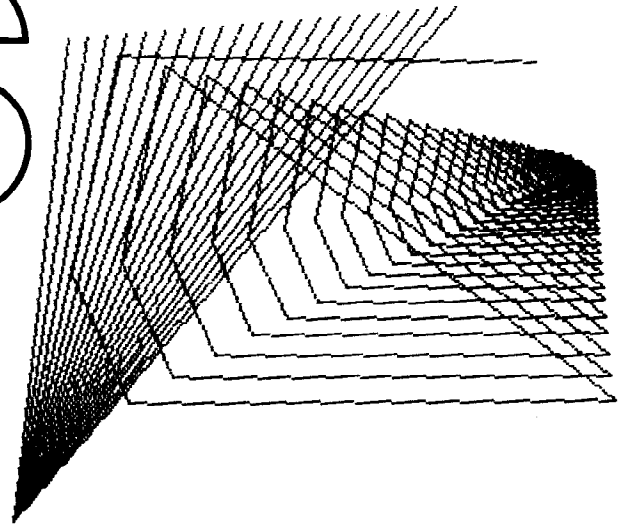
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LINES

By Walter Seay



The following graphics program, *Lines*, generates a series of lines that form new designs with each new screen. Simply *CLOAD* and *RUN* the program. The listing is short, so beginners will enjoy giving this program a try. And, by changing the values in lines 20-50 you can give each screen a new look.

The listing:

```

0  '*****
1  '**
2  '**          LINES          **
3  '**    MARCH 31, 1983      **
4  '**
5  '**    WALTER SEAY        **
6  '**
7  '*****
10 PCLEAR8
20 PMODE4,1:SCREEN1,1:PCLS
30 A=40:B=0
40 LINE(A,10)-(B,188),PSET
    
```

```

50 A=A+8:B=B*2
60 IF A>200 THEN 90
70 GOTO 40
80 REM
90 PMODE4,5:PCLS
100 FORP=1TO4:PCOPY P TO P+4:NEX
TP:SCREEN1,1
110 R=RND(7)
120 FORI=1TOR:X(I)=RND(255):Y(I)
=RND(188):NEXTI
130 X=RND(255):Y=RND(188)
140 PSET(X,Y,C)
150 FORJ=1TO30:FORI=1TOR
160 LINE-(X(I),Y(I)),PSET
170 X(I)=(X(I)-X)*.9+X
180 Y(I)=(Y(I)-Y)*.9+Y
190 NEXTI:NEXTJ
200 FORW=1TO480:NEXTW
210 GOTO100
    
```

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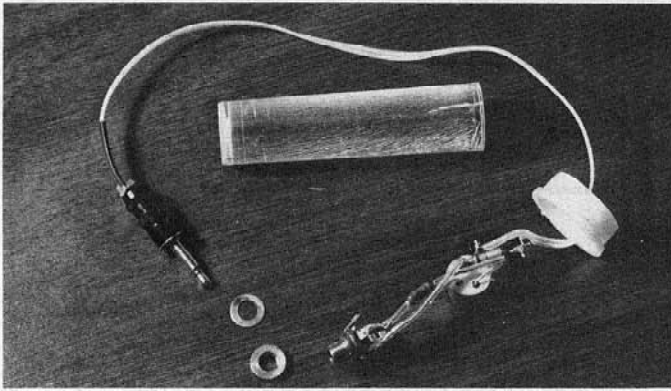
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HARDWARE



End Those Sticky Relay Blues

By Barry E. Becker

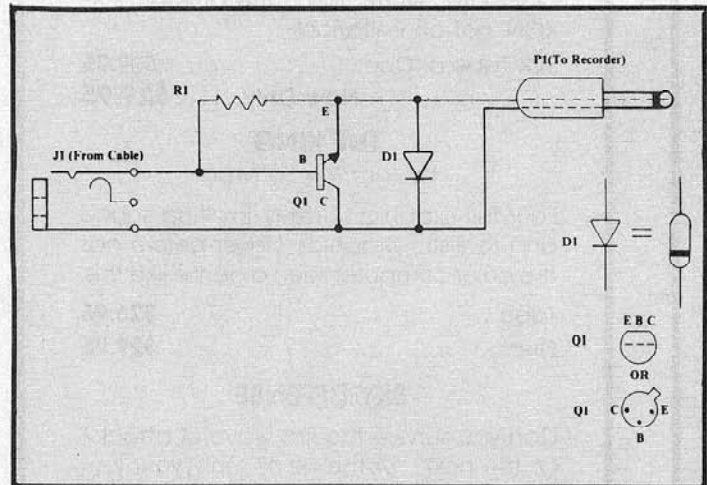
Have you ever loaded a program from cassette and found the tape recorder still running after it should have stopped? Or worse, have you ever been using a program that stored files to tape, and found that the tape ran right to the end while you were thinking about something else? Under such a circumstance, I once invented three new curse words never before heard by man or woman.

The problem is caused by a sticking recorder relay in the Color Computer, and it is apparently not an unusual problem.

A technical type person at a local Radio Shack Computer Center suggested that the current flowing through the contacts creates enough of a magnetic field to hold the reed relay closed, even when the relay coil current is interrupted. The higher the current, the greater the chance of a problem.

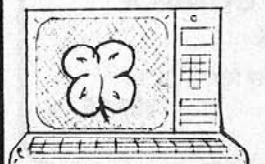
The problem can be solved by reducing the current in the contacts. I have a Panasonic recorder, not a CTR-80, but I suspect the electrical polarities are the same, since the circuit shown here worked with three different brands of recorders (including my son's "portable" lift-it-if-you-can blaster box).

The circuit requires only a few dollars worth of parts, and can be stuffed into a small plastic pill bottle. The circuit is shown in Figure 1. The transistor, type 2N2222 or equivalent acts as a switch and passes the motor current, instead of the relay passing it. The relay contacts now pass only the transistor base current, about 100 times less than the motor current. The resistor prevents any small leakage current from turning on the transistor, and the diode clips any voltage spikes that might appear when the motor current is interrupted.



All of the parts may be purchased at Radio Shack as follows:

Symbol	Radio Shack P/N	Description
Q1	276-2009	Transistor, 2N2222 equivalent
D1	271-1122	Diode, 1N914
R1	271-1339	Resistor, 22K ohms
P1	274-289	Sub-mini phone plug
J1	274-292	Sub-mini phone jack



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HARDWARE

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HOME POWER CONTROL—Part IV

Keep Your Home On Schedule

By A. B. Trevor

Your lights, appliances, water sprinkler valves—in fact, anything electrically activated—can be controlled by your Color Computer, a Plug 'n Power Controller, and the *HOMRUN* program (Listing 1). This program lets you schedule a week at a time when electrical switches are to be turned on, off, dimmed or brightened. You can save these schedules on disk for future use or modify them with the built in editor. Each day's events are displayed by a color bar graph, along with the current day and time.

The previous articles in the Home Control series presented the Plug 'n Power hardware, a simple control program, a real time clock, and a description of the BSR X10 signaling protocol. This last article in the series utilizes all these concepts in the *HOMRUN* program.

ML Overlay

Although *HOMRUN* is written primarily in BASIC, it requires machine language routines for the real time clock and BSR pulse generation. These routines must be in a disk file named *X10CLK.BIN*, which is generated by *X10CLK.BAS* (Listing 2). Note that the data statements in *X10CLK* contain the same machine language as appeared in the first two articles. Lines 200-490 in Listing 2 (the clock routines) correspond to lines 270-710 on page 22 of *the Rainbow*, April, 1983, while lines 500-570 (*X10* routine) incorporate lines 390-500 on page 163 of the February, 1983 issue. If you don't have access to CompuServe or Rainbow on Tape and have already typed in the earlier programs, you can save some time by renumbering and merging the data statements from these earlier programs. (One fix is required: the 39 in line 340 of *PNPCLK* should be changed to 43.)

After loading *X10CLK*, place a diskette containing *HOMRUN.BAS* in drive 0 and run *X10CLK.BAS* once. This will write *X10CLK.BIN* on the disk with *HOMRUN*. Once this has been done, you can delete *C10CLK.BAS*.

Before attempting to load or run *HOMRUN*, 16K users must type *PCLEAR 1*.

(Alexander Trevor is Executive Vice President of computer resources at CompuServe.)

HOMRUN Commands

Your Plug 'n Power controller must be connected to the cassette port and switched to "CTRL" before running *HOMRUN*. If it is not, the warning "BSR is OFF" will appear on the screen until the condition is remedied. Initially, *HOMRUN* will display the help page, which lists the single letter commands. These may be typed whenever the "COMMAND:" prompt appears on the screen:

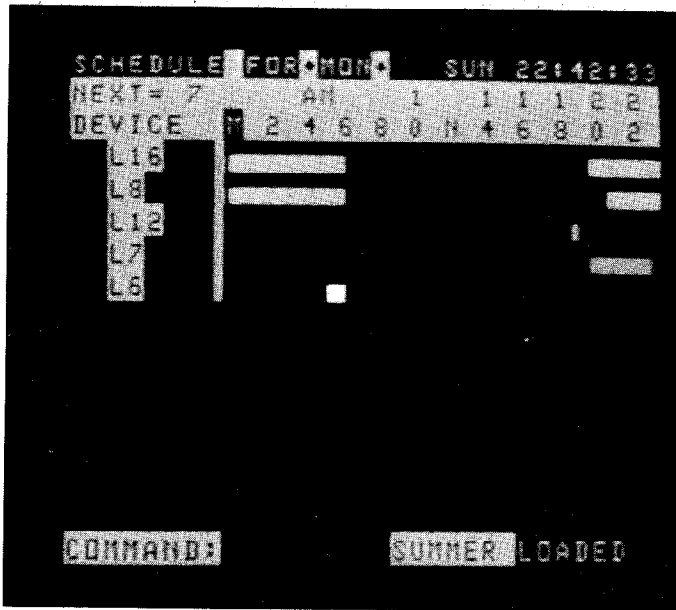
- I Insert an event. You must supply the day, time, device and unit codes (e.g., G3), and action. Action codes are: ON, OFF, CLR, ALL, DIMn and BRn.
- D Detail event editor. Lists events 12 at a time. You can delete an event (D), cause it to be the next one to be executed (E), or just move on to the next event (*ENTER*). The next scheduled event is marked ">" in column 1.
- L Loads a schedule file from disk.
- S Saves the current schedule to a disk file.
- H Types the Help text.
- C Set the Clock.
- V View the schedule for the next day in sequence.
- @ Send a device command immediately.

When a day is requested, at least two letters of the day of the week must be given (e.g., SU, MO, FR). You may also reply "ALL," in which case an event will be generated at the same time every day. Even if you wish an event to occur only four or five days a week, it is quicker to insert the event for "ALL" days, then delete the unwanted days with the "Detail" command. Time must always be entered military fashion (e.g., 23:00) since *HOMRUN* does not use a.m. and p.m.

To reduce the number of events (there is space for only 60 as configured here) consider using the *ALL* and *CLR* commands. Both act on all devices on the given house code; a unit code must be supplied but is ignored in this case. Since the *HOMRUN* program controls all 16 house codes at once, you may be able to use this feature to your advantage.

When you enter several events as you create your electronic home schedule, it is not obvious which event is the one

that should be executed next. *HOMRUN* assumes that the first chronological event (first event after 00:00 Sunday) is the next event for keyboard entered schedules, but this may not be what you want. For example, on Monday you may enter a schedule that includes an event on Sunday and one on Wednesday. *HOMRUN* will wait for the Sunday event, because from its point of view, that is the earliest event. For this reason, you should always review a schedule with the "DETAIL" command to set the desired next event. In the case of schedules loaded from disk, the scheduler is left OFF until you specify the next event.



Schedule Screen

Upon completion of any command, a screen of a day's events will be drawn. This screen is intended to give a rough idea of the state of up to 12 different devices during a day. (You can control more devices, but only the first 12 will be displayed on the screen.) Initially the current day will be displayed, but you can display future days in sequence one at a time with the "View" command. Since the events of one day may affect the next day (e.g., a light turned on yesterday remains on until it is turned off), it is not possible to skip days in the display cycle.

The event screen displays the actual day and time in the upper right corner. The day being displayed is indicated in the center of the first line, as "SCHEDULE FOR *MON*." The second line reveals the next event to be executed by event number. You will have to review the list of events with the "Detail" command to determine the particulars on this event. Time of day, starting at M (midnight) and extending through N (noon) to the next midnight, labels the horizontal axis in two hour increments on lines 2 and 3. Devices (consisting of a single letter house code and one or two digit device code) label the vertical axis.

Horizontal bars are drawn to indicate the hours that a device is to be activated. The bars are white if the device was last turned ON, blue if it was DIMmed, and orange if it was BRighted. Black indicates the device is off. Resolution is one-half hour.

The bottom line will contain the prompt "COMMAND:" when *HOMRUN* is ready to accept another command.

Typing before this prompt appears will be ignored. Finally, if you load or save a disk schedule, the name of the schedule will be shown in the lower right corner.

One warning: although the event screens are nice to look at, *HOMRUN* will work just fine with your TV off—and your screen won't get engraved with an image of your schedule.

Modifications

As supplied, *HOMRUN* is limited to 60 events. This may be expanded by changing the value of NE in line 120, but any significant change will require 32K. To create a 32K version, the ML routines must be relocated. This can be done by changing &H3D00 to &H7D00 in line 20 of *X10CLK.BAS* and line 2915 of *HOMRUN*. *X10CLK.BAS* must be rerun to write the 32K version of *X10CLK.BIN*.

Although it is not nearly as convenient as the disk version, *HOMRUN* may be converted to cassette by changing the value of DV in line 110 to -1. The main problem cassette users will have is remembering to switch the controller from "CTRL" to "CASS" at the appropriate times.

Both programs are again available on CompuServe's ACCESS data base, and may be downloaded with *VIDTEX* or other terminal software to your machine. They are stored as *X10CLK.CC*[70000,130] and *HOMRUN* [70000,130]. I may be contacted via *EMAIL* at 70000,130, or on the Color SIG.

220	...	0275
560	...	050E
910	...	0836
1200	...	0B6B
1480	...	0E38
1840	...	11DF
2190	...	150F
2580	...	181A
END	...	1B93

Listing 1:

```

10 '*****
20 '          HOMRUN
30 '7 DAY SCHEDULING PROGRAM FOR
40 '  PLUG'N POWER CONTROLLER
50 ' (C) A. B. Trevor, Apr 1983
60 '*****
70 '
80 GOTO 2915
100 'USER SETTABLE PARAMETERS
110 DV=1:'      -1 FOR CASSETTE
120 NE=60:'     MAX NUMBER EVENTS
130 DT=12:'    DEVICE TBL SIZE
140 ML=PEEK(39)*256+PEEK(40)+1
150 '      **END OF PARAMETERS**
160 DIM EVNT(6,NE)  :'EVENT ARRA
170 DIM BTAB(16)    :'BSR DIGITS
180 DIM AD$(DT)     :'DEV NAMES
190 DIM ADN(DT)     :'DEV#
200 DIM LST(DT)     :'LAST STATE
210 DIM HUE(6)      :'CMD COLORS
220 DATA 6,E,2,A,1,9,5,D,7,F,3,B
    ,0,8,4,C
230 DATA 0,5,5,0,3,8
240 '
250 CLS 1

```


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```

260 'LOAD BSR TABLE AND COLORS
270 FOR I=1 TO 16: READ A$: BTAB
(I)=VAL("&H"+A$): NEXT I
300 FOR I=0 TO 5: READ HUE(I):
NEXT I
350 'LOAD BSR ROUTINES
360 DEFUSR0=ML : DEFUSR1=ML+3
370 DEFUSR2=ML+6: DEFUSR3=ML+9
400 IF PEEK(ML+12)=&H4F AND PEEK
(ML+13)=&H6A THEN DAY=USR0(-1)+1
:X=USR1(-1): GOTO 480
410 PRINT"LOADING M/L"
420 IF DV=-1 THEN CLOADM"X10CLK"
ELSE LOADM"X10CLK"
430 '
440 'SET THE CLOCK
450 GOSUB 2580
460 X=USR0(DAY-1)
470 X=USR1(HR*256+MIN)
480 EC=0:' INITIALLY NO EVENTS
490 GOTO 2300
500 '
510 'MAIN CONTROL LOOP
520 ' DISPLAY ONE DAY'S SCHEDULE
530 CLS 0
540 DW$=MID$("sunmontuewedthufri
sat",DAY*3-2,3)
550 PRINT0,"schedule for*";DW$;
"*";
560 PRINT032,"          AM
1  1  1  1  2  2 ";
570 PRINT064,"DEVICE  m  2  4  6  8
0 N  4  6  8  0  2 ";
580 IF NX=0 THEN PRINT032,">OFF<
"; ELSE PRINT032,"NEXT=";NX;
590 IF FLNM$<>"" THEN PRINT0497,
FLNM$;" loaded";
600 ' DISPLAY DEVICE CODE
610 FOR DI=1 TO DN
620 IF ADN(DI)=0 THEN 670
630 PRINT0DI*32+66,AD$(DI);
640 SET(15,DI*2+4,1)
650 SET(15,DI*2+5,1)
660 NEXT DI
670 'DISPLAY PREV DAY'S STATE
680 IF NOT NDQ THEN 760
690 TH=0: TM=0: NDQ=0
700 FOR DI=1 TO DN
710 IF ADN(DI)=0 THEN 760
720 LC=LST(DI)
730 IF LC>0 AND LC<>30 THEN GOSU
B 2710
740 NEXT DI
750 ' SCAN EVERY EVENT
760 FOR I=1 TO EC
770 IF EVNT(0,I)<>DAY THEN 900
780 ' LOOK FOR THIS DEVICE
790 TA=EVNT(2,I)*16+EVNT(3,I)-1
800 LET DI=1
810 IF ADN(DI)=TA THEN 840

```

```

820 DI=DI+1: IF DI<=DN THEN 810
830 GOTO 900:' WHEN DISPLAY FULL
840 LC=EVNT(4,I)
850 'DISPLAY DEVICE STATE
860 IF LC<20 THEN FOR DI=1 TO DN
870 GOSUB 2690
880 LST(DI)=LC
890 IF LC<20 THEN NEXT DI
900 NEXT I : 'END OF EVENT GRAPH
910 '
920 PRINT0480,"COMMAND:";
930 IF EC=0 THEN HR=25:GOTO 980
940 'GET TIME TO NEXT EVENT**
950 HR=FIX(EVNT(1,NX)/100)
960 MIN=EVNT(1,NX)-HR*100
970 'WAIT FOR EVENT OR KEY
980 A=USR2(HR*256+MIN)
990 IF A=-1 THEN PRINT0480,"BSR
OFF!";: SOUND 1,20: GOTO 920
1000 IF A>0 THEN 1190
1010 IF EVNT(0,NX)<>USR0(-1)+1 T
HEN 920
1020 IF NX=0 THEN 940
1030 'SEND EVENT TO CONTROLLER
1040 HC=BTAB(EVNT(2,NX))*16
1050 A=768+HC+BTAB(EVNT(3,NX))
1060 X=USR3(A): CD=EVNT(4,NX)
1080 IF CD>30 THEN RP=2*(CD-FIX(
CD/10)*10)+1 ELSE RP=3
1090 A=RP*256+HC+FIX(CD/10)+&H40
00
1100 X=USR3(A)
1110 SOUND 150,3:SOUND 100,3
1120 IF NX<EC THEN NX=NX+1 ELSE
NX=1
1125 PRINT037,NX;
1130 'WAIT TILL NEXT MINUTE
1140 MIN=MIN+1: IF MIN>59 THEN M
IN=0: HR=HR+1
1150 IF HR<24 THEN GOSUB 1180: I
F A>0 THEN 1190 ELSE 940
1160 HR=0: DAY=DAY+1: IF DAY>7 T
HEN DAY=1
1170 GOSUB 1180: IF A>0 THEN 119
0 ELSE 520
1180 A=USR2(HR*256+MIN): RETURN
1190 'PROCESS KEYBOARD COMMANDS
1200 IF A=3 THEN END
1210 CD=INSTR(1,"IDLSH@CV",CHR$(
A))
1220 IF CD=0 THEN PRINT0488,"?";
:SOUND 1,2:GOTO940
1230 CD=CD-1
1240 '          INSERT DEL  LOAD
SAVE HELP IMM D CLCK VIEW
1250 ON CD+1 GOTO 1270,1680,2010
,2150,2290,2430,2530,1640
1260 '
1270 'INSERT COMMAND
1280 IF EC=NE THEN PRINT0490,"FU

```


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```

LL";: GOTO 600
1290 CLS 1:PRINT"<INSERT EVENT>"
1300 GOSUB 2580:'GET TIME
1320 GOSUB 2780:' GET COMMAND
1330 IF DAY=8 THEN ALS=-1 ELSE A
LS=0
1340 IF ALS THEN FOR DAY=1 TO 7
1350 EC=EC+1
1360 ' LOOK FOR TIME LATER THAN
REQUEST
1370 FOR I=1 TO EC-1
1380 IF (EVNT(0,I)>DAY) OR ((EVNT
(0,I)=DAY) AND (EVNT(1,I)>(HR*10
0+MIN))) THEN 1410
1390 NEXT I
1400 I=EC: GOTO 1460
1410 ' MAKE HOLE FOR EVENT
1420 FOR J=EC-1 TO I STEP -1
1430 FOR K=0 TO 5
1440 EVNT(K,J+1)=EVNT(K,J)
1450 NEXT K,J
1460 EVNT(0,I)=DAY
1470 EVNT(1,I)=HR*100+MIN
1480 EVNT(2,I)=HC
1490 EVNT(3,I)=UN
1500 EVNT(4,I)=CX*10+CB
1520 'ADD TO DEVICE TABLE IF NEW
1530 FOR I=1 TO DN

```

```

1540 IF ADN(I)=HC*16+UN-1 THEN 1
610
1550 NEXT I
1560 IF DN=DT THEN PRINT"DISPLAY
FULL":SOUND 201,30:GOTO 1610
1570 DN=DN+1
1580 ADN(DN)=HC*16+UN-1
1590 AD$(DN)=B$
1600 IF NX=0 THEN NX=1
1610 IF ALS THEN NEXT DAY
1620 IF DAY>7 THEN DAY=USR0(-1)+1
1630 GOTO 520
1640 'NEXT DAY'S GRAPH
1650 IF DAY>=7 THEN DAY=1 ELSE D
AY=DAY+1
1660 NDQ=-1
1670 GOTO520
1680 'DETAIL EVENT LISTER/EDITOR
1690 IF EC=0 THEN PRINT@490,"?EM
PTY";:SOUND 1,2:GOTO 940
1695 FOR L=1 TO EC STEP 12
1700 CLS 1:PRINT"<DETAIL EVENTS>
"
1710 PRINT"DELETE, EXEC NEXT, OR
<ENTER>"
1720 PRINT" day time device cod
e"
1730 K=0
1740 FOR J=1 TO 2
1750 PRINT@94," "
1755 IF L+11>EC THEN LM=EC ELSE
LM=L+11
1760 FOR I=L TO LM
1770 IF EVNT(0,I)=0 THEN 1910
1780 DW$=MID$("SUNMONTUEWEDTHUFR
ISAT",EVNT(0,I)*3-2,3)
1790 DC$=CHR$(EVNT(2,I)+64)+RIGH
T$(STR$(EVNT(3,I)),2)
1800 CX=FIX(EVNT(4,I)/10)
1810 CC$=MID$("CLRALLON OFFDIMBR
",CX*3+1,3)
1820 CB=EVNT(4,I)-CX*10
1830 IF NX=I THEN A$=">" ELSE A$
=" "
1840 PRINT A$;DW$;" ";EVNT(1,I);
" ";DC$;" ";CC$;
1850 IF CX>3 THEN PRINT CB;" ";
ELSE PRINT " ";
1860 IF J=1 THEN PRINT: GOTO1910
1870 INPUT A$
1880 A$=LEFT$(A$,1)
1885 IF A$<>"E" THEN 1910
1890 IF A$="D" THEN EVNT(0,I)=0
1900 IF NX>=L AND NX<L+12 THEN P
RINT@32*(NX-L+3)," ";
1905 NX=I: PRINT@32*(I-L+3),">";
: PRINT@32*(I-L+4),"";
1910 NEXT I,J,L
1920 FOR I=1 TO EC:' COMPRESS
1930 IF I=NX THEN NX=I-K

```

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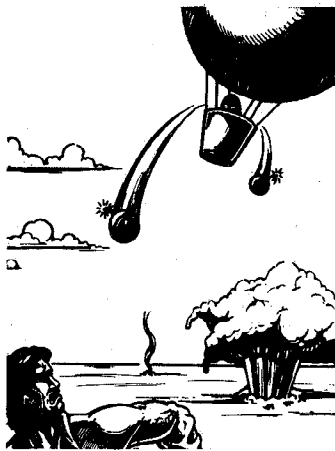


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DFT II

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DFT was made to transfer files between Model I/III's Converted to the color computer, it is the best modem program available for transferring files. You can transfer a basic Model III program to the color computer and run it. All tokens are automatically converted.

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by Tim Purves

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10. ASTROBLAST Mark Data
11. GRAND PRIX Computerware
12. MOON HOPPER Computerware
13. FROGGER Cornsoft Group
14. MS GOBBLER Spectral
15. BALLOON ATTACK Computer Shack

NOTE: Due to the fact we can not obtain tape versions of Zaxxon some of the members of the panel have not seen it. Lancer and Whirly Bird Run likewise have not been evaluated by the panel. Even though these products had been advertised for two for three months they were not available.

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•FOR THE COLOR COMPUTER & TDP 100 • 3424 College N.E., Grand Rapids, MI 49505 (616) 364-4791•



"THE FROG"

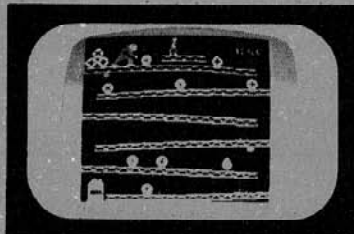
(C) 1983



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ARCADE ACTION

This one will give you hours of exciting play... Cross the busy highway to the safety of the median and rest awhile before you set out across the swollen river teaming with hidden hazards. Outstanding sound and graphics.



THE KING

1982

32K Machine Language
\$26.95 tape
\$29.95 disk

ARCADE ACTION - How high can you climb? Four full graphic screens. Exciting Sound - Realistic graphics. Never before has the color computer seen a game like this. Early reviews say: Just like the arcade - Simply outstanding!



SPACE SHUTTLE

1983

32K Ext. Basic

\$28.95
TAPE
ONLY



This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. 32K Ext. Basic



"TRAPFALL"

By KEN KALISH
(C) 1983



ARCADE ACTION

The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."

16K MACHINE LANGUAGE
TAPE \$27.95
DISK \$30.95

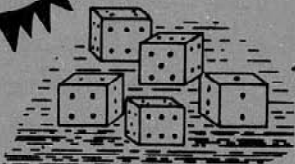


"YAAZEE"

(C) 1983

\$19.95

16K MACHINE LANGUAGE
EXT. BASIC

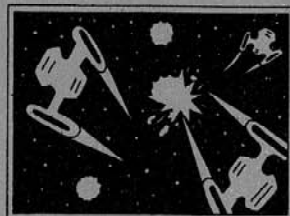


Yaazee is a 2 player game using five dice to get the best poker hand. After game is loaded flashing digit below player number determines which player rolls dice at the start of the game.

PROTECTORS

Exciting fast paced arcade game that looks and plays like the popular arcade game "DEFENDER".

Wave after wave of enemy fighters drop bombs on your city. Destroy them before they destroy your city. Soon the mother ships appear firing laser blasts at you. Watch for the heat seeking mines.



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TAPE TO DISK - Load the contents of most tapes to disk automatically. Machine Language. **\$17.95**

MAIL LIST-Maintain a complete mailing list with phone numbers etc. Ext. Basic. DISK BASED **\$17.95**

THE FIXER-Having trouble moving those 600 Hex programs to disk? The fixer will help. Completely automatic. **\$17.95**

TAPE CAT-All new machine language program lists contents of tapes to printer. Make a catalog of your tapes. **\$17.95**

PROGRAM PRINTER UTILITY-This program will list basic programs to your printer in two column format. Saves paper and makes your listing look professional. Disk based. **\$17.95**



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.

REQUIRES 16K EXT BASIC \$19.95

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. **REQUIRES 16K EXT. BASIC \$19.95**

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**

EDUCATIONAL PACKAGE — SPELLING TEST — WORD DRILL — MATH DRILL — ESTIMATE — ALL FOR — \$69.95

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.
- A full statistical analysis of data may be done and sent to the printer.
- Student test scores may be weighted. **32K EXT BASIC TAPE \$39.95**
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Cassette \$19.95 or Disk (With Source) \$23.95



UNLOCK

A complete disk backup utility. Features included are initialization of any track; copy any track and correct I/O errors, or leave them intact; and verify any track. Track numbers upto track 80 may be used at any time. (ML, 16k or 32k)
Disk (With Source) \$24.95



DISKMON

Examine and fix sector data, also includes disk verify, file information display, and selective disk backup. (ML, 16k or 32k)
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UTILITIES

Chroma-Keys -- Define function keys and save them to disk or cassette. (ML, 16k or 32k)
Cassette \$9.95 or Disk (With Source) \$13.95



Spooler -- Print ASCII files from disk without waiting. (ML, 16k, 32k, or 64k only)
Cassette \$11.95 or Disk (With Source) \$15.95

Command -- Add machine language programs as commands to BASIC. (ML, 16k or 32k)
Cassette \$15.95 or Disk (With Source) \$19.95

GAMES

Prospector -- An ECB Hi-Res graphics game. Can you get the gold out of the mine? (ECB, 16k or 32k)
Cassette \$7.95



Jump-A-Peg -- A Hi-Res version of an ancient strategy game. (ECB, 16k or 32k)
Cassette \$7.95



Euchre -- A Hi-Res version of the card game. Your partner is the computer, the opponent team is played by the computer. (ECB, 32k)
Cassette \$10.95

MISCELLANEOUS

Clock -- A software real-time clock program for the CoCo. Warning: The clock will stop during tape I/O. (ML, 16k or 32k)
Cassette \$9.95 or Disk (With Source) \$13.95



Darkroom Database -- Throw away your Phot-Lab index. Let CoCo look up the facts. Darkroom Data-Base with timer. (Disk, 16k or 32k)
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```

1940 FOR J=0 TO 5
1950 EVNT(J,I-K)=EVNT(J,I)
1960 NEXT J
1970 IF EVNT(0,I)=0 THEN K=K+1
1980 NEXT I
1990 EC=EC-K
2000 GOTO 520
2010 'LOAD FROM DEVICE
2020 CLS1:PRINT"<LOAD SCHEDULE>"
2030 INPUT"FILE NAME";FLNM$
2040 IF FLNM$="" THEN 530 ELSE
OPEN"I",DV,FLNM$
2050 INPUT#DV,EC,DN:' READ HDR
2060 FOR I=1 TO DN
2070 INPUT#DV,ADN(I),AD$(I)
2080 NEXT I
2090 FOR I=1 TO EC
2100 FOR J=0 TO 5
2110 INPUT#DV,EVNT(J,I)
2120 NEXT J,I
2130 CLOSE DV: PRINT FLNM$;" LOA
DED"
2140 FOR I=1TO300:NEXTI:GOTO 520
2150 'SAVE SCHEDULE TO DV
2160 CLS1:PRINT"<SAVE SCHEDULE>"
2170 INPUT"FILE NAME";FLNM$
2180 IF FLNM$="" THEN 530 ELSE O
PEN"O",DV,FLNM$
2190 PRINT#DV,EC,DN:' SAVE HDR
2200 FOR I=1 TO DN
2210 PRINT#DV,ADN(I),AD$(I)
2220 NEXT I
2230 FOR I=1 TO EC
2240 FOR J=0 TO 5
2250 PRINT#DV,EVNT(J,I)
2260 NEXT J,I
2270 CLOSE DV: PRINT FLNM$;" SAV
ED"
2280 GOTO 2140
2290 'HELP
2300 CLS 1
2310 PRINT"<COMMAND LIST>"
2320 PRINT"I      insert event comm
and"
2330 PRINT"D      detail events"
2340 PRINT"L      load new schedule
from disk"
2350 PRINT"S      save schedule to
disk"
2360 PRINT"H      help"
2370 PRINT"C      clock:set time"
2380 PRINT"V      view next day"
2390 PRINT"@      do a direct comma
nd"
2400 PRINT"BRK exit to BASIC"
2410 SOUND 240,2:GOTO920
2420 CLS 1:END
2430 '@ DIRECT COMMAND
2440 CLS 1
2450 PRINT"<DIRECT COMMAND>"

```



```

2460 GOSUB 2780
2470 HC=BTAB(HC)*16
2480 X=USR3(768+HC+BTAB(UN))
2490 IF CB=0 THEN RP=3 ELSE RP=2
*CB+1
2500 FOR I=1 TO 100:NEXT I
2510 X=USR3(&H4000+RP*256+HC+CX)
2520 GOTO 520
2530 CLS 1: PRINT"<SET CLOCK>"
2540 GOSUB 2580
2550 X=USR0(DAY-1)
2560 X=USR1(HR*256+MIN)
2570 GOTO 920
2580 'GET DAY AND TIME
2590 INPUT"DAY OF THE WEEK";A$
2600 IF LEN(A$)<2 THEN 2620
2610 DAY=(INSTR(1,"SUMOTUWETHFRS
AAL",LEFT$(A$,2))+1)/2
2620 IF DAY<1 THEN PRINT"ENTER S
UN,MON...OR 'ALL'":GOTO 2590
2630 INPUT"24 HR TIME (HH:MM)";H
R,MIN
2640 IF HR>23 OR MIN>59 THEN 2630
2650 RETURN
2660 'DRAW LINE TO RIGHT MARGIN
2690 TH=FIX(EVNT(1,I)/100)
2700 IF (EVNT(1,I)-TH*100)>30 THE
N TM=1 ELSE TM=0
2710 TA=HUE(FIX(LC/10))
2720 Y=DI*2+5
2730 IF TA=0 THEN 2760
2740 FOR X=TH*2+16+TM TO 63:SET(
X,Y,TA):NEXT X
2750 RETURN
2760 FOR X=TH*2+16+TM TO 63:RESE
T(X,Y):NEXT X
2770 RETURN
2780 'GET DATA FOR A BSR COMMAND
2790 INPUT"HOUSE & UNIT";B$
2800 IF B$="" THEN 2790
2810 HC=ASC(B$)-64
2820 UN=VAL(MID$(B$,2))
2830 IF HC>0 AND HC<17 AND UN>0
AND UN<17 THEN 2850
2840 PRINT"ENTER AS: C12 (HOUSE
C, UNIT 12)": GOTO 2790
2850 INPUT"ACTION";A$
2860 IF A$="" THEN RETURN
2870 CX=INSTR(1,"CLALONOFDIBR",L
EFT$(A$,2))
2880 IF CX=0 THEN PRINT"CLR,ALL,
ON,OFF,DIM.BR?": GOTO 2850
2890 CX=(CX-1)/2
2900 CB=0: IF CX>3 THEN CB=VAL(R
IGHT$(A$,1))
2910 RETURN
2915 PCLEAR 1: CLEAR 200,&H3D00
2920 IF PEEK(&HC000)<>68 THEN 11
0 ELSE FILES 1:GOTO 100

```

```

270.....0263
400.....0543
END... 08FC

```

Listing 2:

```

10 'BSR M/L BUILDER
20 CLEAR 100,&H3D00:' FOR 16K
30 ML=PEEK(39)*256+PEEK(40)+1
40 FOR I=ML TO ML+564
50 READ A: POKE I,A: NEXT I
60 SAVEM"X10CLK",ML,ML+564,&HA02
7
70 END
200 DATA 22,0,145,22,0,159,22,1,
9,22,1,178,79,106,141
210 DATA 0,32,46,100,48,141,0,26
,134,120,167,132,166,130,45
220 DATA 88,139,1,25,167,132,161
,6,45,28,111,132,32,239,255
230 DATA 255,255,255,255,0,0,7,3
6,96,96,0,255,0,255,0
240 DATA 106,140,242,141,203,110
,156,243,230,140,230,88,88,48,14
1
250 DATA 0,43,58,198,4,206,4,20,
189,165,154,48,140,213,141
260 DATA 10,134,58,167,192,141,4
,134,58,167,192,166,132,68,68
270 DATA 68,68,138,48,167,192,16
6,128,132,15,138,48,167,192,57
280 DATA 19,21,14,32,13,15,14,32
,20,21,5,32,23,5,4
290 DATA 32,20,0,18,32,6,18,9,32
,19,1,20,32,189,179
300 DATA 237,77,45,3,231,140,144
,79,230,140,140,189,180,244,57
310 DATA 140,32,55,190,255,248,2
38,1,239,140,135,51,140,137,239
320 DATA 1,52,2,182,255,3,138,1,
183,255,3,206,1,106,166
330 DATA 196,174,65,167,141,255,
111,175,141,255,108,134,126,48,1
41
340 DATA 0,148,167,196,175,65,13
4,18,167,140,200,53,2,189,179
350 DATA 237,77,45,22,52,4,141,2
6,231,141,255,65,53,2,141
360 DATA 18,231,141,255,58,111,1,
41,255,55,28,239,236,141,255,47
370 DATA 189,180,244,57,95,140,2
03,16,128,10,44,250,139,10,52
380 DATA 2,234,224,57,189,179,23
7,52,4,141,234,231,141,0,60
390 DATA 53,2,141,226,231,141,0,
53,26,16,182,255,32,133,1
400 DATA 38,249,142,7,208,48,31,

```

39,44,182,255,32,133,1,39
 410 DATA 245,23,254,205,236,141,
 254,235,16,163,141,0,17,39,17
 420 DATA 173,159,160,0,39,215,31
 ,137,79,189,180,244,28,239,57
 430 DATA 0,255,79,95,189,180,244
 ,57,204,255,255,189,180,244,57
 440 DATA 50,98,23,254,204,15,112
 ,13,111,16,38,0,70,52,20
 450 DATA 174,141,254,188,191,1,1
 3,134,239,167,159,0,136,182,255
 460 DATA 32,133,1,38,249,142,7,2
 08,48,31,39,31,182,255,32
 470 DATA 133,1,39,245,23,254,112
 ,173,159,160,0,39,226,198,96
 480 DATA 231,159,0,136,48,141,25
 4,144,191,1,13,53,148,48,141
 490 DATA 254,135,191,1,13,126,16
 1,179,126,161,127
 500 DATA 189,179,237,237,141,0,1
 13,132,63,167,141,0,106,141,57
 510 DATA 141,55,141,53,141,46,16
 6,141,0,96,142,0,8,141,19
 520 DATA 166,141,0,86,73,142,0,1
 ,141,9,106,141,0,75,38
 530 DATA 223,57,0,252,73,37,6,14
 1,13,141,16,32,4,141,12
 540 DATA 141,5,48,31,38,239,57,4
 9,140,233,32,3,49,140,229
 550 DATA 52,18,182,255,32,133,1,
 39,249,134,52,74,38,253,198
 560 DATA 3,166,164,183,255,32,13
 4,178,74,38,253,127,255,32,28
 570 DATA 0,90,39,8,134,248,18,74
 ,38,252,32,230,53,146

Software Review

Kodomo-No-Go And Tic-Tac-Toe Two Fun Programs In A Row

Hello all you Tic-Tac-Toe fans out there. If you love Tic-Tac-Toe, here's the ultimate program for you. Its name is *Kodomo-No-Go*, a Japanese version with a 19 x 19 grid. The object is to put five of your markers in a row vertically, horizontally or diagonally. The grid is selected by lettered rows and columns. There are two different ways to play—with a friend or against the computer. When you play with a friend, the only thing the computer does is check the moves to make sure they are on the board. Playing against the computer, you'll find there are six different skill levels. It takes the computer about one minute to make its decision where to move. So don't get restless if you have to wait a while. The instructions tell you to *POKE65495,0* to speed up the game. It was still slow even on Level 1.

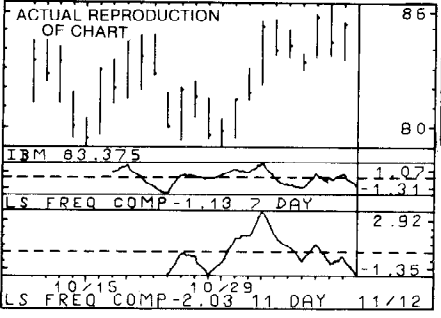
If you don't want to get too complicated with *Kodomo-No-Go*, there's still good old *Tic-Tac-Toe*. You get the usual 3 x 3 playing grid and two skill levels. This program also uses letters to show the location of the move. It doesn't take as long to move in *Tic-Tac-Toe*. You can't beat the computer in the expert level. There is also a two player version where the computer just checks moves.

The only thing I can say is have fun and don't get discouraged. The one problem I had with the game is the length of time it took the computer to move. The graphics use only three colors. I would recommend these games to anyone who enjoys playing Tic-Tac-Toe.

(Intercept Enterprises, P.O. Box 4016, Cherry Hill, NJ 08034, 16K tape, \$14.95, 32K tape, \$19.95)

—Pat Downard





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**FOR THE
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Programs Speak For Themselves With *El Cheapo* A/D Converter

No, I'm not kidding. *El Cheapo A/D Converter* really is the name of the software. Most of you know what "El Cheapo" means. "El Cheapo" is pseudo Spanish for "inexpensive." My wife says that she understands pseudo Spanish just fine but that "A/D Converter" is Greek to her.

Translation: A/D Converter is short for Analog to Digital Converter. An Analog to Digital converter is something that takes continuously variable signals and converts the signals into a stream of binary numbers. Ouch! I just got "elbowed" in the side. She says that my "translation" has not lifted any lingual barriers. Okay. Put simply, an A/D converter gives your computer a set of ears so that it can listen to the real world outside. An A/D converter can take your voice through a microphone and deliver it to your computer in a form that the computer will accept. An A/D converter can also be used to sense the position of a joystick and translate that sense of position into the numerical terms that your computer requires. It is for this purpose that the Color Computer has an A/D converter built in.

El Cheapo is a machine language program which allows the CoCo's built in A/D converters to run at high speed. High speed is necessary to record fast moving wave forms like your voice. Instructions are given on modifying one of

your joysticks to accept voice input from your tape recorder. Once the computer has received the voice (digitized the voice), it is possible for you to rearrange or alter the patterns. You can save the patterns as complete words or cut them up into individual phonemes. The computer could then reconnect the saved words or phonemes to produce artificial speech.

The instructions for *El Cheapo* are complete; however, I recommend that you have some experience with soldering before you attempt to modify your joystick. If everything is done right, the performance of your joystick will not be adversely affected.

It's available for 16 or 32K.

(Zeta Software, P.O. Box 3522, Greenville, SC 29608-3522, \$14.95)

—Dr. Laurence D. Preble

Hint . . .

Slow Scrolling Through Orange

Here's a powerful little *POKE* that will slow your scrolling by creating a horizontal *LIST*. Type *POKE 359,60* and you'll see what we mean. Add a colon (:) and *SCREEN 0,1* and you'll be slow-scrolling across an orange screen. To return to the green screen at full tilt, just type *POKE 359,126*.

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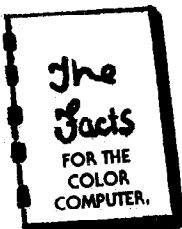
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963	Mark Dowling, San Bruno, CA
MONSTER MAZE	
520,470 ★	Robert L. Bull, Trenton, Ontario
323,490	Philip Morrissey, Gilboa, NY
62,400	Ruben Lipszyc, Sarnia, Ontario
60,000 ☆	Brian Austin, Rotterdam, NY
56,030	Keith Seifried, Greenville, OH
5,090	Steven H. Ng, Scarborough, Ontario
NERBLE FORCE	
315,150 ★	Frank Bottini, St. Louis, MO
49,200	Jim Ganninger, Des Peres, MO
NIBBLER	
14,910 ☆	Christal Glovinsky, Staten Island, NY
OFFENDER	
965,400 ☆	Jim Baker, Florissant, MO
113,200	Justin Marcus
76,350	Johnna Miller, Plymouth, MN
PAC-DROIDS	
577,140 ☆	Richard Cochrane, Wayne, NJ
151,590	Annita Powell, Huber Heights, OH
140,300	John Yapp, Park Forest, IL
94,140	Lee Powell, Huber Heights, OH
49,180	Jimmy McDonald, Summerville, SC
42,600	Justin Marcus
40,960	Stephen Shotts, Blacksburg, VA
27,230	Jerry Hoogwerff Kroon, Rozenburg, Holland
PACET-MAN	
26,800 ★	Vince Lok, Mississauga, Ontario
5,000 ☆	Cameron Amick, Reisterstown, MD
3,392	Norbent Berenyi, Northvale, NJ
PARACHUTE JUMP	
451,000	John Osborne, Kincardine, Ontario
PHANTOM SLAYER	
1,306 ★	Marc Hassler
406	Imre Kertesz, Chandler, AZ
197	Mark Heizler, Ridgefield, CT
180 ☆	Mike Hall, Hartland, WI
PINBALL	
4,000,000 ★	Keith Seifried, Greenville, OH
66,650 ☆	Ken Miller, Yardley, PA

SCORE PLAYER

PLANET INVASION	
286,075 ☆	Larry Plaxton, Medley, Alberta
257,900	Ron Rhead, Willowdale, Ontario
221,350	John Cole, King City, Ontario
207,150	Mike Hughey, King George, VA
84,300	Matt McMann, New Boston, MI
82,000	Harry Sawyer, Watchung, NJ
79,650	Justin Marcus
POLARIS	
256,018 ★	Michael Popovich, Sr., Nashua, NH
212,746	Hwan Joo, Weston, Ontario
170,100	Steve Johnson, Santa Ana, CA
151,154 ☆	Brian Austin, Rotterdam, NY
120,824	Rich VanManen, Grand Rapids, MI
113,773	Linda Herbers, Placentia, CA
101,000	Michael Popovich, Nashua, NH
POLTERGEIST	
4,978 ★	Tim Warr, Bellingham, WA
4,956 ☆	Mark Dowling, San Bruno, CA
4,835	Scott Butler, Springfield, IL
4,745	Bette Munitz, Bellerose, NY
4,630	Jim Ganninger, Des Peres, MO
4,455	Ken Miller, Yardley, PA
4,395	Scott Snyder, Allentown, PA
POPCORN	
560,900 ★	Vince Lok, Mississauga, Ontario
168,680	Steve Johnson, Santa Ana, CA
110,570 ☆	Cameron Amick, Reisterstown, MD
77,970	Raymond G. Myers, Bloomington, IL
56,000	James Quadarella, Brooklyn, NY
38,500	Terry Steen, San Bernardino, CA
PROTECTORS	
594,610 ★	Roland Hendel, Mississauga, Ontario
358,514 ☆	Cameron Amick, Reisterstown, MD
272,000	Douglas Hug, Roseville, CA
154,967	Frankie Jimenez, Mesa, AZ
94,000	Gerry Schechter, Yonkers, NY
RAIL RUNNER	
53,400 ★	Ed Bottini, St. Louis, MO
38,360	Jim Baker, Florissant, MO
13,195	Lenny Munitz, Bellerose, NY
ROBOTTACK	
1,197,800 ☆	Brian Austin, Rotterdam, NY
1,146,750	Justin Marcus
939,300	Robert Kiser, Monticello, MS
773,250	Matt Brenengen, Lake Elmo, MN
708,650	Tony Cappellini & Randy Clemmery, Lemoore, CA
675,600	Tony Cappellini, Lemoore, CA
649,500	Joseph Prisco, Oswego, NY
600,700	Bill Tyler, St. Paul, MN
574,000	Ron Rhead, Willowdale, Ontario
545,850	Jay Stewart, Delhi, NY
507,000	Craig Edelheit, W. Bloomfield, MI
492,650	Alan Burkett, Seneca, SC
406,650	David Lack, Glendale, CA
SEA DRAGON	
36,540 ★	Steve Schweitzer, Sewell, NJ
14,970	Ron Rhead, Willowdale, Ontario
SHAFT	
18,150 ★	Loren Seng, Tuscon, AZ
SHARK TREASURE	
72,000 ★	Marc Hassler
48,000	Ed Bottini, St. Louis, MO
SHOOTING GALLERY	
37,200 ★	Chris Kulawy, St. Johnsville, NY
28,500 ☆	Kenneth Partridge, Warkworth, Ontario
26,000	J.C. MacDonald, Charlottetown, P.E.I., Canada
23,490	David Lender, Brooklyn, NY
16,370	Saul Munitz, Bellerose, NY
16,310	Ron Rhead, Willowdale, Ontario
SKIING	
40,10 ☆	Fred K. Herrmann, Flemington, NJ
49,43	John Scanlan, Prairie Village, KS
52,22	Peter Johnson, Chino, CA
53,57	Jay Stewart, Delhi, NY
57,07	John Osborne, Kincardine, Ontario
SKY DEFENSE	
9,700 ★	Vince Lok, Mississauga, Ontario
6,700 ☆	Mike Anheluk, Fall Creek, OR
6,120	Steve Skrzyniarz, Tacoma, WA
5,200	Cameron Amick, Reisterstown, MD
SOLO POKER	
640 ★	Mary J. Herring, Bloomington, IL
SOLO POOL	
103 ☆	John W. Fraysse, Dahlgren, VA
SPACE ACE	
983 ★	Matt McMann, New Boston, MI
SPACE AMBUSH	
124,460 ★	John Osborne, Kincardine, Ontario

SCORE PLAYER

SPACE ASSAULT	
238,580 ☆	John Cole, King City, Ontario
221,130	Steve Johnson, Santa Ana, CA
216,680	Chris Kulawy, St. Johnsville, NY
160,832	Rich VanManen, Grand Rapids, MI
157,140	David Milbrath, Ann Arbor, MI
112,250	Tim Warr, Bellingham, WA
102,650	Ruben Lipszyc, Sarnia, Ontario
102,410	Keith Seifried, Greenville, OH
97,300	Terry Steen, San Bernardino, CA
55,000	Fred Boyer, Plymouth, IN
41,060	Kanti Dinda, Kingston, Ontario
38,120	Debra Burkett, Morgan City, LA
SPACE INVADERS	
62,300 ☆	Peter Niessen, Carlisle, MA
10,570	Neil Berkman, DeWitt, NY
SPACE RACE	
77,075 ★	John Osborne, Kincardine, Ontario
59,825 ☆	Jim Baker, Florissant, MO
58,100	John Cole, King City, Ontario
31,525	Gregg Scott, Orlando, FL
4,000	Danielle Gardner, Louisville, KY
SPACE SENTRY	
41,129 ★	Steve Skrzyniarz, Tacoma, WA
SPACE SHUTTLE	
595 ☆	Steve Schweitzer, Sewell, NJ
575	Fred Weissman, Brookline, MA
571	Ted McDonald, Summerville, SC
565	John W. Fraysse, Dahlgren, VA
511	Larry Reitz, Toledo, OH
SPACE WAR	
400,190 ☆	Mark Felps, Bedford, TX
116,000	Peter Niessen, Carlisle, MA
52,380	Jim Baker, Florissant, MO
STARBASE ATTACK	
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STARBLASTER	
408,245 ☆	Mark Dowling, San Bruno, CA
325,790	Mike Anheluk, Fall Creek, OR
126,135	Mike Hall, Hartland, WI
80,001	Alan Lewis, Ridgefield, CT
52,050	Greg Leshar, North Chili, NY
STARFIRE	
3,444,500 ★	John DeMuth, Prairie du Chien, WI
2,102,450 ☆	Dean Bouchard, Kingston, Nova Scotia
1,320,150	Joy Bailey, Lexington, NC
1,120,000	Emil Hayek, State College, PA
688,400	Roland Hendel, Mississauga, Ontario
100,000	Tim Warr, Bellingham, WA
STARSHIP CHAMELEON	
861,200 ★	Greg Leshar, North Chili, NY
79,250	Vince Lok, Mississauga, Ontario
72,600 ☆	Jim Baker, Florissant, MO
68,500	Cameron Amick, Reisterstown, MD
64,800	David Rosicky, Pittsburg, PA
62,100	John Osborne, Kincardine, Ontario
STORM	
840,010 ★	Roland Hendel, Mississauga, Ontario
723,335 ☆	Chris Sweet, Harvard, MA
472,320	John Jaworski, Nashua, NH
380,000	Cameron Amick, Reisterstown, MD
240,745	Todd C. Hauschildt, Red Wing, MN
207,840	Greg Leshar, North Chili, NY
55,275	John Osborne, Kincardine, Ontario
STORM ARROWS	
94,000 ★	Steven Ohsie, Houston, TX
TRAPP FALL	
84,542 ★	Keith Seifried, Greenville, OH
77,490	Peter Stumpf, McHenry, IL
59,163	Frank Bottini, St. Louis, MO
VENTURER	
2,152,150 ☆	Greg Scott, Orlando, FL
1,769,400	Todd C. Hauschildt, Red Wing, MN
1,526,200	Peter Niessen, Carlisle, MA
1,126,550	Hwan Joo, Weston, Ontario
919,650	Richard Vehlow, Bayside, NY
WILDCATTING	
23,571 ★	Jenny Petkash, Warren, MI
ZAKSUND	
950,500 ★	Michael Rothman, Solon, OH
617,500	Ed Bottini, St. Louis, MO
119,650	Jeff Fisher, West Branch, MI
74,550	Derrick Kardos, Colonia, NJ
70,300	Steve Schweitzer, Sewell, NJ
62,500	Derrick Kardos, Colonia, NJ
2,600	Robert Frowenfeld, Louisville, KY
ZAXXON	
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401,900 ☆	Mike Hughey, King George, VA
154,000	Ron Rhead, Willowdale, Ontario
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103,800	Alan Lewis, Ridgefield, CT
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72,200	Greg Leshar, North Chili, NY
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TRY THESE TEST PATTERNS ON YOUR COLOR MONITOR

By Mike Dubuc

Color televisions are comprised of a complexity of complicated systems and circuits which have to work in harmony to produce an intelligible image. Of all the systems that exist within the television, the one that is most susceptible to change as well as being the most neglected is the cathode ray tube (picture tube) and beam scanning system.

Simply put, this system is trying to aim and land three separate electron beams simultaneously in a precise location on the center of the CRT while being pulled around the entire face of the CRT by a magnetic force created by the "deflection yoke" (the large coil of wire that encircles the neck of the picture tube). These beams have to maintain the same shape and precision everywhere they land even though the front surface of the CRT changes shape, from being nearly flat in the center to being significantly curved at the edges.

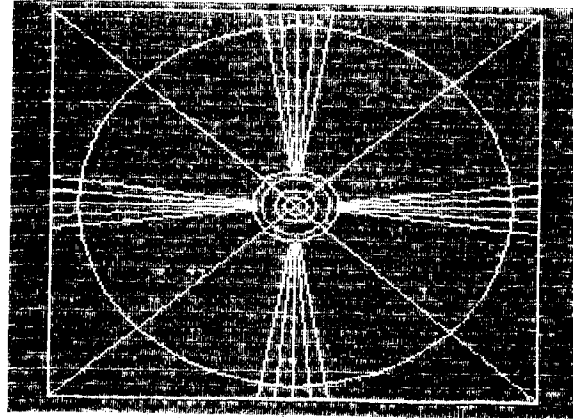
What does all this mean? Well, the concept that I am trying to convey is that to successfully reproduce an image on the CRT, those electron beams must be corrected to overcome and withstand contortion by magnetic fields, errors of physical mislocation and registration, and mechanical shift, as well as component aging and other considerations. Through all this, we expect the beams to stay nearly perfect as they land at the various locations on the phosphor screen, the result being a properly focused picture that is aligned and conforms to the shape of the facepanel of our picture tube.

Physical adjustments and circuitry exist on color televisions that compensate for these imperfections; however, in order to take advantage of these built-in correction features it requires the generation of particular stationary test patterns not normally available to the television viewer. It occurred to me that the CoCo would make a perfect test pattern generator as its graphic and resolution capabilities are somewhat better than those most color televisions can handle.

Drawing on my past 10 years' experience as a cathode ray tube test engineer, I have put together a selection of test patterns in a program called *Congen*. This program, when run properly, allows the user to make all the adjustments necessary to properly align, converge and set up the CRT and beam scanning system on a color television.

The program is a menu driven, self prompting collection of nine modules which are totally user friendly. Some of the patterns may seem to be redundant functions, but I have found more often than not that the alignments are somewhat easier to

(Mike Dubuc is a Quality Assurance Test Engineer with the Display Devices group of the Raytheon ICO Operation. He is involved in state-of-the-art cathode ray tube displays for high performance airborne applications.)



achieve using a combination of all the available patterns. All the geometric patterns have been corrected for the standard 4 x 3 aspect ratio.

There are nine basic functions, and the following list will explain some of the details.

- 1) DOTS Used for dynamic convergence (edge). Lower numbers give most usable patterns.
- 2) CROSSHATCH Also used for dynamic convergence.
- 3) COLOR BAR Used for checking hue—TINT control should be adjustable to obtain noted colors.
- 4) GRAY SCALE Sets up pseudo levels from black to white. Although not a true gray scale, this function should be adequate in showing a television's ability to display seven distinct steps between black and white by varying CONTRAST and BRIGHTNESS.
- 5) CORNER MARKS Allows an evaluation of focus.
- 6) CENTER PATTERN Used for adjusting static convergence (center) and centering the display.
- 7) HORZ/VERT BARS General function useful in aligning, converging, adjusting linearity, etc.
- 8) PURITY/GUN C/O The purity function is used for selecting a particular color screen for adjusting the PURITY MAGNET for best field color saturation, while the GUN C/O provides a stable horizontal line for setting gun cutoff levels on those televisions without set up switches.
- 9) PICTURE SYMMETRY This function sets up patterns for adjusting vertical and horizontal, linearity, height and width (HEIGHT/WIDTH, RS-170 option). It also provides a rectangle for pincushion and barrel distortion and adjustment (to eliminate sides that tend to bow in or out).

Although the intended use of this program assumes that the user is somewhat versed in television alignment and repair, I believe that it is so self explanatory and easy enough to use that anyone could check the performance of their television.

Editor's Note:

Although *Congen* is one of the programs in this issue available on *Rainbow On Tape*, you may order it directly from the author by sending a self-addressed, stamped envelope and \$5 to:

Mike Dubuc
4 Fieldstone Lane
Attleboro, MA 02703

53 0284
155 0531
380 07FC
691 0A59
900 0D3F
1070 0FA0
1200 1233
1420 14CA
END 16BB

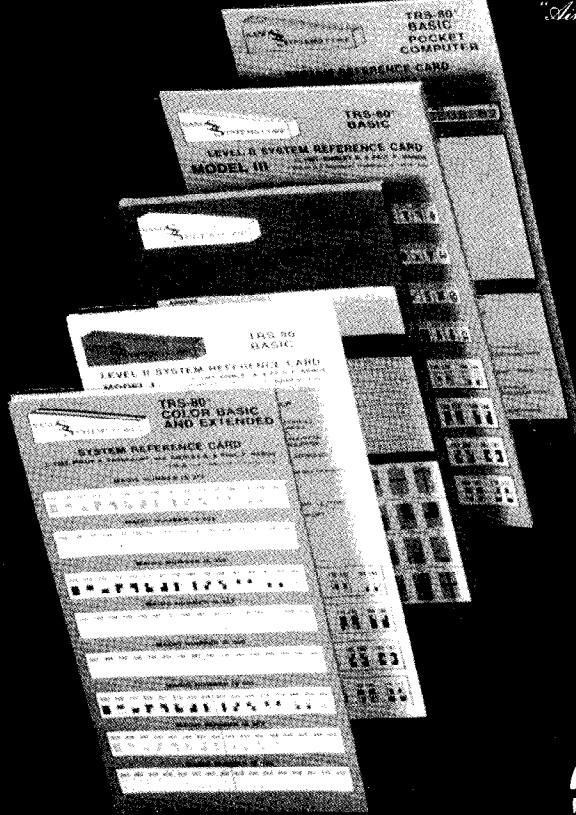
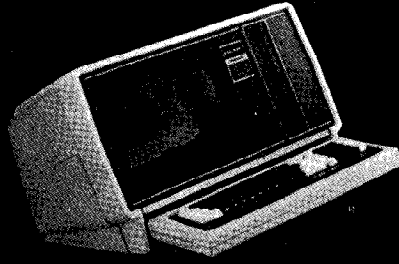
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";:PRINT@164,"TEST PATTERN
\CONVERGENCE";:PRINT@196,"
GENERATOR ";:PRINT@335,"
MIKE DUBUC ";:PRINT@367,"4 F
IELDSTONE LN";:PRINT@399,"ATTLEB
ORO,MA ";:PRINT@431," 02703
";
30 FOR DL=1TO2000:NEXT:CLS(3):GO
SUB2060
40 LN=0:PCLS:CLS(3):PRINT@74,"SE
LECT MODE";
50 PRINT@134,"*** (1) DOTS***";:PR
INT@166,"*** (2) CROSSHATCH***";:P
RINT@198,"*** (3) COLOR*BAR***";:P
RINT@230,"*** (4) GREY*SCALE***";:
PRINT@262,"*** (5) CORNER*MARKS***
";:PRINT@294,"*** (6) CENTER*PATE
RN***";:PRINT@326,"*** (7) HORIZ\VE
RT*BAR***";
53 PRINT@358,"*** (8) PURITY*GUN C
/O***";:PRINT@390,"*** (9) PICTURE
*SYMMETRY***";:PRINT@450,"*PRESS
[M] FOR MENU AND ANY";:PRINT@48
2,"KEY TO RESTART CURRENT MODE*
";
55 A$=INKEY$: IFA$="" THEN GOTO 55EL
SE IFA$="1" THEN N=1 ELSE IF A$="2"
THEN N=2 ELSE IF A$="3" THEN N=3

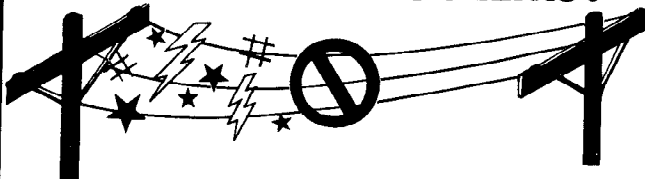
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ELSE IF A$="4" THEN N=4 ELSE IF
A$="5" THEN N=5 ELSE IF A$="6"
THEN N=6 ELSE IF A$="7" THEN N=7
ELSE IF A$="8" THEN N=8 ELSE IF
A$="9" THEN N=9 ELSE GOT
60 ON N GOSUB 70,160,280,599,690
,800,900,1080,1200
70 GOSUB 2060:CLS:PRINT@163,"SEL
ECT SPACES BETWEEN DOTS";:PRINT@
294,"ENTER A NUMBER";:PRINT@326,
"BETWEEN 3 AND 100";
80 INPUT Z
85 PRINT@355,"COARSE (1) OR FINE (
2) DOTS";:GOSUB 2050
86 A$=INKEY$: IF A$="" THEN 86ELSE
IFA$="M" THEN 40 ELSE IFA$="1" TH
EN 50 ELSE IFA$="2" THEN 90 ELSE 85
90 PRINT@384,"INVERSE (1) OR REGU
LAR VIDEO (2)";
91 A$=INKEY$: IFA$="" THEN 91 ELSE I
FA$="M" THEN 40 ELSE IFA$="1" THEN
R=4 ELSE IFA$="2" THEN R=3 ELSE 91
100 CLS:P MODE R,1
110 SCREEN 1,1:PCLS
120 FOR Y=4TO184STEP Z
130 FOR X=4TO256STEP Z
140 PSET(X,Y):PSET(X+1,Y):PSET(X
+1,Y+1):PSET(X,Y+1)
150 NEXT X:NEXT Y
155 LN=1:GOTO 2000
160 PCLS:CLS:GOSUB 2060:PRINT@162
,"SELECT INTERSECTION INTERVAL";
:PRINT@294,"ENTER A NUMBER";:PRI
NT@326,"BETWEEN 3 AND 255";
170 INPUT Z
180 PRINT@384,"REGULAR (1) OR INV
ERSE VIDEO (2)";
181 A$=INKEY$: IFA$="" THEN 181 ELSE
IF A$="M" THEN 40 ELSE IFA$="1" TH
EN R=3 ELSE IFA$="2" THEN R=4 ELSE 181
190 CLS:P MODE R,1
200 SCREEN 1,1
210 FOR Y=4TO184STEP Z
220 LINE(0,Y)-(255,Y),PSET
230 NEXT Y
240 FOR X=4TO256STEP Z
250 LINE(X,0)-(X,191),PSET
260 NEXT X
270 LN=2:GOTO 2000
280 GOSUB 2060:L=0:CLS(0):PRINT@9
8,"THE PROPER COLOR BAR PATTERN"
;
290 PRINT@130,"FROM LEFT TO RIGH
T IS:";
300 FOR W=143 TO 255 STEP 16
310 PRINT@199+L,CHR$(W);:L=L+1:P
RINT@199+L,CHR$(W);:L=L+1:NEXT W
315 PRINT@324,"PRESS ANY KEY TO
CONTINUE";
320 A$=INKEY$: IF A$="" THEN GOTO

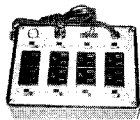
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```

320 ELSE IF A$="M" THEN 40 ELSE G
OTO330
330 CLS(0):PRINT@0,"GRN\YEL\BLUE
\RED\BUF\CYAN\MAG\OR";
340 FORX=0 TO 63
350 FORY=3TO31
360 C=INT(X/8+1)
370 SET(X,Y,C)
380 NEXTY
390 NEXTX
400 A=B+2:B=B+9:IF C=8 THEN GOTO
420 ELSE GOTO340
420 LN=3:GOTO2000
500 SCREEN 0,1:CLS(0)
510 Z=INT(Z/3):IF Z<3 THEN Z=2:C
=2
520 FOR X=0TO63 STEPZ
530 FOR Y=0 TO 31 STEPZ
540 SET(X,Y,C)
550 NEXT Y:NEXT X
560 GOTO 155
599 CLS(2):GOSUB2050:PRINT@165,"
TURN DOWN COLOR CONTROL";:PRINT@
197,"FOR GREY SCALE TRACKING";:F
OR DL=1TO4000:NEXT
600 CLS(0):DATA5,2,8,7,6,1,3,4
601 S=0:D=INT(63/8)
602 FORA=1TO8
603 READ A$:C=VAL(A$)
608 FOR X=S TO D
610 FORY=0 TO 31
630 SET(X,Y,C)
640 NEXT Y
642 NEXT X:S=D:D=D+8
644 NEXT A
645 RESTORE
650 LN=4:GOTO 2000
690 CLS(4):GOSUB2060:PRINT@173,"
SELECT";:PRINT@202,"(1) CROSS MA
RKS";:PRINT@234,"(2) DOTS
";
691 A$=INKEY$:IFA$=""THEN691ELSE
IF A$="M" THEN 40 ELSEIFA$="1" T
HEN700ELSEIFA$="2"THEN780ELSE691
700 DATA0,4,8,4,4,0,4,8
701 DATA246,4,254,4,250,0,250,8
702 DATA246,186,254,186,250,182,
250,190
703 DATA0,186,8,186,4,182,4,190
704 DATA115,91,131,91,123,83,123
,99
705 PMODE 3,1:SCREEN1,1:PCLS
710 FOR X=1TO8:READ A$:NEXT X
720 FOR A=1TO10
730 READ X1,Y1,X2,Y2
740 LINE(X1,Y1)-(X2,Y2),PSET
750 NEXTA
760 RESTORE
770 LN=5:GOTO 2000

```

```

780 CLS(0)
785 SCREEN 0,1
790 SET(1,1,5):SET(62,1,5):SET(6
2,30,5):SET(1,30,5):SET(31,15,5)
795 GOTO 770
800 CLS(8):GOSUB2060:PRINT@173,"
SELECT";:PRINT@202,"(1) CENTER C
ROSS";:PRINT@234,"(2) CENTER DOT
";
805 A$=INKEY$: IF A$="" THEN 805
ELSE IFA$="M" THEN 40 ELSE IF A
$="1" THEN 810 ELSE IFA$="2" THE
N 830 ELSE 805
810 PMODE3,1:SCREEN1,1:PCLS
815 X1=0:X2=255:X=128:Y=91:Y1=0:
Y2=192
816 LINE(X1,Y)-(X2,Y),PSET:LINE(
X,Y1)-(X,Y2),PSET
825 LN=6:GOTO 2000
830 CLS(0):X=31:Y=15
835 SET(X,Y,5):GOTO825
900 CLS(5):GOSUB2060:PRINT@166,"
(1) HORIZONTAL BARS";:PRINT@198,
"(2) VERTICAL BARS";
910 A$=INKEY$:IF A$=""THEN 910EL
SE IF A$="M" THEN 40 ELSE IF A$
="1" THEN 980 ELSE IFA$="2" THEN

```

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```

920 ELSE 910
920 CLS(5):PRINT@164,"COARSE(1)
OR FINE(2) BARS";
930 A$=INKEY$: IF A$="" THEN 930
ELSE IFA$="1" THEN 940 ELSE IFA
$="2" THEN 975 ELSE 930
940 CLS(0):FOR X=0TO63STEP8:FOR
Y=1TO31
950 SET(X,Y,7)
960 NEXT Y:NEXT X
970 LN=10:GOTO 2000
975 PMODE3,1:SCREEN1,1:PCLS
976 FOR X=0TO255STEP32
977 LINE(X,0)-(X,191),PSET
978 NEXTX
979 LN=11:GOTO 2000
980 CLS(5):GOSUB2050:PRINT@164,"
COARSE(1) OR FINE(2) BARS";
990 A$=INKEY$:IF A$="" THEN 990
ELSE IF A$="1" THEN 1000 ELSE IF
A$="2" THEN 1040 ELSE 990
1000 CLS(0):FOR Y=1TO31STEP4:FOR
X=0TO63
1010 SET(X,Y,7)
1020 NEXT X:NEXT Y
1030 LN=12:GOTO 2000
1040 PMODE 3,1:SCREEN1,1:PCLS
1050 FOR Y=0TO192STEP16
1060 LINE(0,Y)-(255,Y),PSET
1070 NEXT Y:LN=7:GOTO2000
1080 CLS(6):GOSUB2060:PRINT@166,
"(1) GUN CUTOFF ADJ";:PRINT@198,
"(2) PURITY ADJ";
1085 A$=INKEY$: IFA$=""THEN1085EL
SEIFA$="M"THEN40ELSEIFA$="1"THEN
1160ELSEIFA$="2"THEN1100
1100 CLS(0):GOSUB2050:PRINT@162,
"CHOOSE DESIRED SCREEN COLOR";:P
RINT@234,"(1) RED";:PRINT@266,"(
2) BLUE";:PRINT@298,"(3) GREEN";
1110 A$=INKEY$: IF A$="" THEN GO
TO1110ELSE IFA$="M"THEN 40 ELSE
IFA$="1" THEN 1120 ELSE IFA$="2"
THEN 1130 ELSE IF A$="3" THEN 1
140
1120 CLS(4):GOTO 1150
1130 CLS(3):GOTO1150
1140 CLS(1):GOTO1150
1150 LN=8:GOTO 2000
1160 CLS0:PRINT@166,"ADJUST SCRE
EN CONTROLS";:PRINT@198,"UNTIL A
WHITE LINE APPEARS";:FORT=1TO20
00:NEXT:PMODE2,1:SCREEN1,1:PCLS(
0)
1165 LINE(4,96)-(252,96),PSET
1167 LN=15:GOTO2000
1200 CLS(7):GOSUB2060:PRINT@170,
"SELECT";:PRINT@230,"(1) PINCHUS
ION";:PRINT@262,"(2) HEIGHT\WIDT
H";:PRINT@294,"(3) RS-170 TEST P

```

```

ATTEN";
1201 A$=INKEY$: IFA$="" THEN 1201
ELSE IF A$="M" THEN 40 ELSE IF
A$="1"THEN 1209 ELSE IF A$="2" T
HEN 1300 ELSE IFA$="3" THEN 1400
ELSE 1201
1209 CLS(5):GOSUB2050:PRINT@162,
"ADJUST PINCUSHION FOR BEST";:PR
INT@198,"LOOKING RECTANGLE";
1210 FOR DL=1 TO2000:NEXT
1220 PMODE3,1:SCREEN1,1:PCLS
1230 LINE(0,0)-(255,191),PSET,B
1240 LN=9:GOTO2000
1300 CLS(6):GOSUB2050:PRINT@162,
"ADJUST HORZ AND VERT HEIGHT";:P
RINT@194,"WIDTH AND LINEARITY CO
NTROLS";:PRINT@226,"TO ACHIEVE T
HE BEST CIRCLE";
1310 FORDL=1TO1500:NEXT
1320 PCLS:C=RND(4):PMODE C,1:SCR
EEN1,1
1330 FORX=5TO105 STEP5:CIRCLE(12
8,96),X,,.88:NEXT X
1340 LN=13:GOTO2000
1400 GOSUB2050:PMODE4,1:SCREEN1,
1:PCLS
1410 LINE(18,4)-(238,188),PSET,B
:LINE(18,4)-(238,188),PSET:LINE(
238,4)-(18,188),PSET
1420 CIRCLE(128,96),98,,.88:CIRC
LE(128,96),20,,.88:CIRCLE(128,96
),16,,.88:CIRCLE(128,96),10,,.88
:CIRCLE(128,96),6,,.88
1430 D=0:B=0:FORT=1TO5:LINE(18,8
4+B)-(110,94+D),PSET:LINE(238,84
+B)-(148,94+D),PSET:D=D+1:B=B+6:
NEXT
1440 D=0:B=0:FORT=1TO5:LINE(112+
B,4)-(126+D,80),PSET:LINE(112+B,
188)-(126+D,114),PSET:D=D+1:B=B+
8:NEXT
1450 LN=14:GOTO2000
2000 A$=INKEY$: IF A$="" THEN GOT
O 2000 ELSE IF A$="M" THEN 40 EL
SE GOTO 2010
2010 IFLN=1THEN70ELSEIFLN=2THEN1
60ELSEIFLN=3THEN280ELSEIFLN=4THE
N599ELSEIFLN=5THEN690ELSEIFLN=6
THEN 800 ELSE IF LN=7 THEN 900 E
LSE IF LN=8 THEN 1100 ELSE IF LN
=9 THEN 1200 ELSE IFLN=10THEN900
ELSEIFLN=11THEN900ELSEIFLN=12THE
N900
2020 IF LN=13 THEN GOTO 1200 ELS
E IF LN=14 THEN GOTO 1200ELSEIFL
N=15THEN1080
2050 L=RND(100):SOUND L,1:RETURN
2060 L=RND(100):SOUND L,3:RETURN

```


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WHAT YOU *GET* IS WHAT YOU *PUT*

By Don Inman
Rainbow Contributing Editor

This month's article will focus on the use of some of the material of past *Rainbow* articles in order to produce moving geometric shapes. I will also use some of the techniques discussed in the book TRS-80® Color Computer Graphics (Reston Publishing Company, Inc.).

Rotating A Rectangle

The rotation of rectangles has been discussed in past *Rainbow* articles. Let's begin this month by drawing a rectangle in four different positions. Then we can progress by stages through several different methods that will produce the effect of a single rotating rectangle.

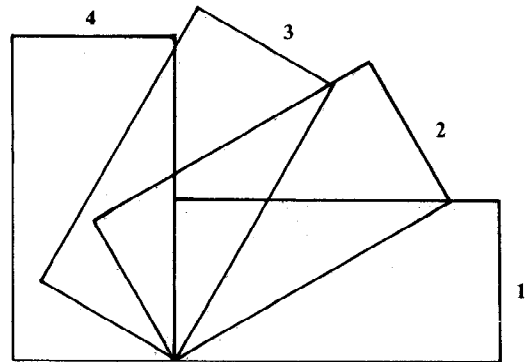
Our first program will be a simplified version of the Rotating Rectangle program that appeared in the March 1983 issue of *the Rainbow*. Each of the four rectangles will have its origin at the point 130,90. The angle of rotation will be 30 degrees or approximately 0.5236 radians. The rectangles will be drawn in the following positions.

As you run the program, notice that even though the rectangles are drawn quickly, you can see the individual lines being drawn. The program demonstrates some of the problems that must be overcome to produce the appearance of smooth motion.

Variables used in the program:

X0,Y0 point of origin for the rectangles
H height of the rectangles
W width of the rectangles
A angle of rotation in radians
X1,Y1 starting point of the sides
X2,Y2 ending point of the sides

Subroutines 1000 and 2000 will be used in program versions that follow. You may want to save the program for alteration.



(Don Inman is the acknowledged master of microcomputer graphics and the author of a large number of books, including TRS-80 Color Computer Graphics and Assembly Language Graphics for the TRS-80 Color Computer with Kurt Inman.)

Rotating Rectangles — Version 1

```

99 REM SET SCREEN
100 PMODE 4,1:PCLS 1
110 COLOR 0,1:SCREEN 1,0
120 '
199 REM ASSIGN VARIABLES
200 X0=130:Y0=90:H=10:W=20
210 '
299 REM ASSIGN ROTATION ANGLE
300 FOR A=0 TO 1.5709 STEP .5236
310 X1=X0:Y1=Y0
320 GOSUB 1000
330 NEXT A
340 '
399 REM LOOP TO VIEW
400 GOTO 400
410 ' END OF MAIN PROGRAM
420 '
430 '
999 REM SET UP END POINTS
1000 X2=X1+W*COS(A)
1010 Y2=Y1-.8*W*SIN(A)
1020 GOSUB 2000
1030 X2=X1-H*SIN(A)
1040 Y2=Y1-.8*H*COS(A)
1050 GOSUB 2000
1060 X2=X1-W*COS(A)
1070 Y2=Y1+.8*W*SIN(A)
1080 GOSUB 2000
1090 X2=X0:Y2=Y0
1100 GOSUB 2000
1110 RETURN
1120 '
1999 REM DRAW LINE
2000 LINE (X1,Y1)-(X2,Y2),PSET
2010 X1=X2:Y1=Y2
2020 RETURN

```

Erase After Drawing

The next step would be the erasure of the previous rectangle as each new one is drawn. A time delay may also be necessary to keep each rectangle on the screen for a brief period before erasure. Since we have nothing on the screen except the rectangles, the simplest way to erase the rectangles is by clearing the screen. These changes could be accomplished by adding the following lines.

```

323 FOR W = 1 TO 100: NEXT W
326 PCLS 1

```

You may often have other objects on the screen that you do not want erased. Erasures of small areas can be achieved by using *GET* and *PUT* statements. You could *GET* a small area of blank screen and *PUT* it over the area that you wish

to erase. It can be done by adding these lines.

```

210 DIM B(20)
323 FOR W = 1 TO 100: NEXT W
326 GET(0,0)-(32,20),B
328 PUT(118,70)-(150,90),B,PSET

```

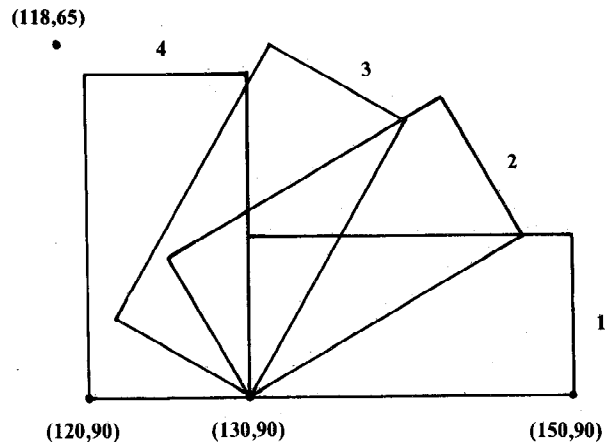
← some blank area

The dimension statement for *GET/PUT* can be calculated by the formula:

$$\text{SIZE} = (\text{LENGTH} * \text{WIDTH}) / N$$

where N = 40 for PMODES 3 and 4
N = 80 for PMODES 1 and 2
N = 160 for PMODE 0

Even though the rectangles are only 20 by 10, they move over a larger area. Therefore, we must consider the complete area of movement.



We will use a length calculated from X=118 to X=150, or 32 units. The width is from Y=65 to Y=90, or 25 units. Plugging these numbers into the formula, we get:

$$\begin{aligned} \text{SIZE} &= (150-118)*(90-65)/40 \\ &= 32 * 25 / 40 \\ &= 20 \end{aligned}$$

Therefore, we can use a single dimension: DIM B(20). The values used in the *GET* and *PUT* arrays for Y is 70 rather than 65. This is possible because we are scaling Y values by 0.8 to take care of the screen distortion. This is consistent with earlier graphic articles that I have written in this series. The Y difference (90-65 = 25) will now be:

$$0.8 * 25 = 20$$

This value is then used in the *GET* and *PUT* statements as:

```

GET(0,0)-(32,20),B and
PUT (118,70)-(150,90),B,PSET

```


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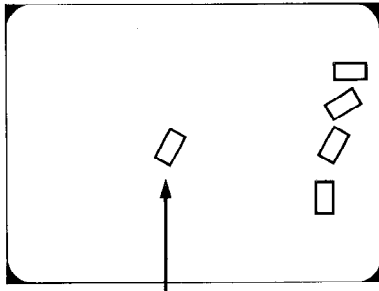
Rotating Rectangles — Version 2

```
99 REM SET SCREEN
100 PMODE 4,1:PCLS 1
110 COLOR 0,1:SCREEN 1,0
120 '
199 REM ASSIGN VARIABLES
200 X0=130:Y0=90:H=10:W=20
210 DIM B(20)
220 '
299 REM ASSIGN ROTATION ANGLE
300 FOR A=0 TO 1.5709 STEP .5236
310 X1=X0:Y1=Y0
320 GOSUB 1000 ← go DRAW
323 FOR Z=1 TO 100:NEXT Z
326 GET(0,0)-(32,20),B
328 PUT(118,70)-(150,90),B,PSET }
330 NEXT A ERASE
340 '
399 REM LOOP TO VIEW
400 GOTO 400
410 ' END OF MAIN PROGRAM
420 '
430 '
999 REM SET UP END POINTS
1000 X2=X1+W*COS(A)
1010 Y2=Y1-.8*W*SIN(A)
1020 GOSUB 2000
1030 X2=X1-H*SIN(A)
1040 Y2=Y1-.8*H*COS(A)
1050 GOSUB 2000
1060 X2=X1-W*COS(A)
1070 Y2=Y1+.8*W*SIN(A)
1080 GOSUB 2000
1090 X2=X0:Y2=Y0
1100 GOSUB 2000
1110 RETURN
1120 '
1999 REM DRAW LINE
2000 LINE(X1,Y1)-(X2,Y2),PSET
2010 X1=X2:Y1=Y2
2020 RETURN
```

Four Rectangles To Make One

Although the rectangles rotated in the previous programs, the time needed to draw the rectangles destroyed the effect that we were trying to create. It was obvious that the rectangles were being drawn, erased, and redrawn in a new position. Let's now investigate another use of *GET* and *PUT*. Each rectangle will be drawn along the right side of the screen. Then we'll use *GET* and *PUT* to "pick off" the rectangles and move them to the center of the screen one at a time.

This version of the program will be faster because the drawings are made first. The erasure has been eliminated since each *PUT* overlays the previous rectangle. The only



position 1
position 2
position 3
position 4

animation here

time lost in the rotation at the center of the screen will be in the execution of the *GET* and *PUT* statements. The motion of the rectangle rotation will be much smoother.

Rotating Rectangles — Version 3

```

99 REM SET SCREEN
100 PMODE 4,1:PCLS 1
110 COLOR 0,1:SCREEN 1,0
120 '
199 REM ASSIGN VARIABLES
200 X0=220:Y0=30:H=10:W=20
210 DIM B(20)
220 '
299 REM FOUR POSITIONS
300 FOR A=0 TO 1.5709 STEP .5236
310 X1=X0:Y1=Y0
320 GOSUB 1000
330 Y0=Y0+30 ← Each rectangle moved down 30 units.
340 NEXT A
350 '
399 REM ROTATE RECTANGLE
400 X=208:Y=10:GOSUB 3000
410 Y=40:GOSUB 3000
420 Y=70:GOSUB 3000
430 Y=100:GOSUB 3000
440 GOTO 400
450 ' END OF MAIN PROGRAM
460 '
470 '
999 REM SET UP END POINTS
1000 X2=X1+W*COS(A)
1010 Y2=Y1-.8*W*SIN(A)
1020 GOSUB 2000
1030 X2=X1-H*SIN(A)
1040 Y2=Y1-.8*H*COS(A)
1050 GOSUB 2000
1060 X2=X1-W*COS(A)
1070 Y2=Y1+.8*W*SIN(A)
1080 GOSUB 2000
1090 X2=X0:Y2=Y0
1100 GOSUB 2000
1110 RETURN
1120 '
1999 REM DRAW LINE

```

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(The Enchanted Forest was reviewed in the Dec. 1982 issue of Rainbow).

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(The Game Show was reviewed in the Jan. 1983 issue of Rainbow).

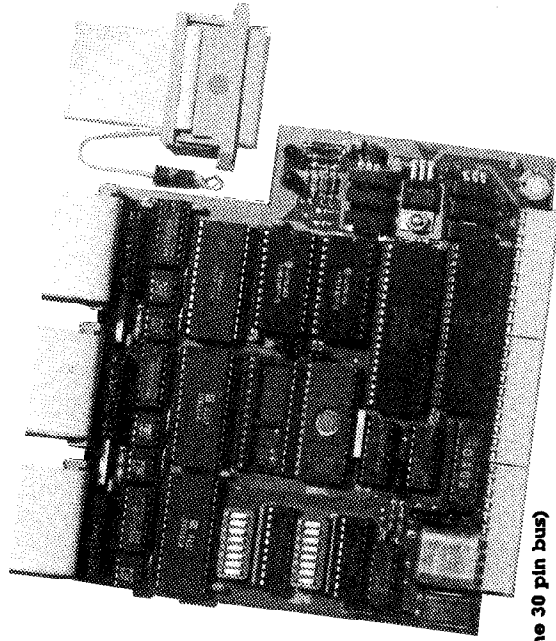
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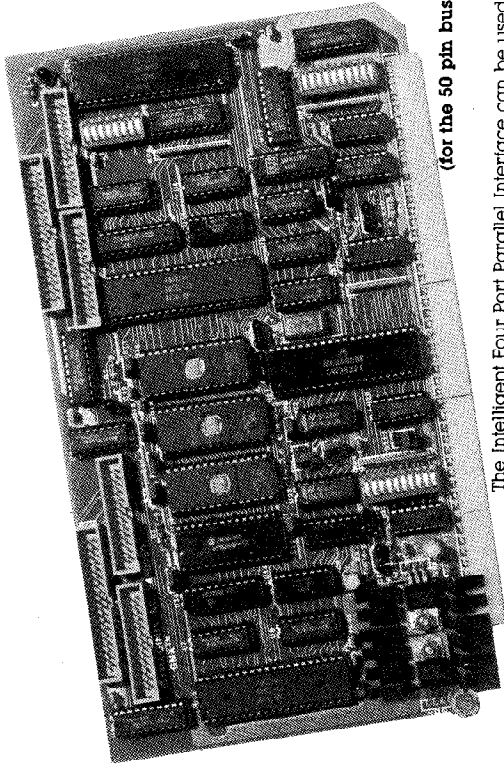
(for the 30 pin bus)

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- Appropriate on-board firmware and operating system drivers are required. Uses up to three #95 cable sets (DB-25S connectors)

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(for the 50 pin bus)

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Features:

- Independent on-board 2MHz 68B09 CPU
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- Full 20-bit address decoding; it can be addressed on any 4 byte boundary in 1M byte of address space
- Compatible with memory-to-memory DMA transfers to/from the GMX 6809 CPU III
- Appropriate on-board firmware and operating system drivers are required. Uses up to four #95 cable sets (DB-25P connectors) or two 36-pin cable sets with Centronics compatible connectors. Centronics compatible cable sets include a back panel connector plate for the Classy Chassis Back panel. Printer cables are also available.

OS-9 firmware and drivers for the Intelligent 3-port Serial Interface

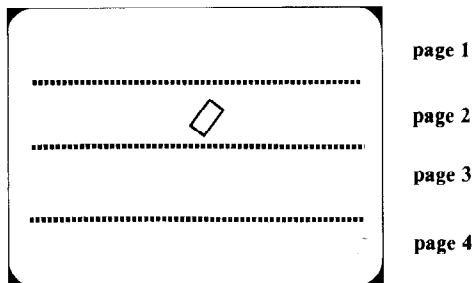
The OS-9 firmware and drivers enhance the performance of multi-user systems, while providing functions equivalent to the standard ACIA type drivers normally used for terminals and serial printers. Input line editing functions (backspace, echo, line clup and repeat, etc.) are handled by the I/O board, rather than the host, allowing the host more time for other processing tasks. The host is only interrupted when a complete input line (terminated by a "CR") is entered, or certain special characters are received. Input and output data are buffered on the I/O board so that the host can perform other tasks while serial data is being transmitted or received. When used with the GMX CPU III, block data transfers between the I/O board and the host use the CPU's memory-to-memory DMA to further enhance throughput. In addition to performance enhancements, features such as software selectable baud rates and transmission characteristics (number of data bits, stop bits, parity, etc.) are provided. The board also transmits "messages" to any or all I/O ports to indicate that the I/O interface is ready and "waiting for the host", and that the host is "on-line" and has opened a path to the port. Messages to individual ports can be disabled.


```

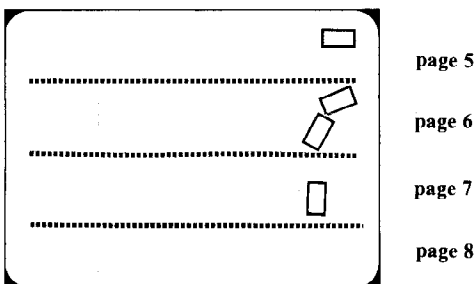
2000 LINE (X1,Y1)-(X2,Y2),PSET
2010 X1=X2:Y1=Y2
2020 RETURN
2030 '
2999 REM GET AND PUT
3000 GET (X,Y)-(X+32,Y+20),B,G
3010 PUT (118,70)-(150,90),B,PSET
3020 RETURN

```

Now that you see how *GET* and *PUT* statements work, you can eliminate the four rectangles on the right side of the screen and place them on pages of memory that will not be shown. Since we are working in *PMODE 4*, four pages of memory are used to fill up the display screen. Eight pages of memory are needed for two screens.



Turn on these Pages
for Rotating



Use these Pages to
Store Four Rectangles

would know about the rectangles on the unseen screen. What you *GET* is what you *PUT*.

Rotating Rectangles — Version 4

```

99 REM SET SCREEN
100 PCLEAR 8
110 PMODE 4,5: PCLS 1
120 COLOR 0,1
130 '
199 REM ASSIGN VARIABLES
200 X0=220:Y0=30:H=10:W=20
210 DIM B(20)
220 '
299 REM FOUR POSITIONS
300 FOR A=0 TO 1.5709 STEP .5236
310 X1=X0:Y1=Y0
320 GOSUB 1000
330 Y0=Y0+30
340 NEXT A
350 PMODE 4,1:PCLS 1
360 '
399 REM ROTATE RECTANGLE
400 X=208:Y=10:GOSUB 3000
410 Y=40:GOSUB 3000
420 Y=70:GOSUB 3000
430 Y=100:GOSUB 3000
440 GOTO 400
450 ' END OF PROGRAM
460 '
470 '
999 REM SET UP END POINTS
1000 X2=X1+W*COS(A)
1010 Y2=Y1-.8*W*SIN(A)
1020 GOSUB 2000
1030 X2=X1-H*SIN(A)
1040 Y2=Y1-.8*H*COS(A)
1050 GOSUB 2000
1060 X2=X1-W*COS(A)
1070 Y2=Y1+.8*W*SIN(A)
1080 GOSUB 2000
1090 X2=X0:Y2=Y0
1100 GOSUB 2000
1110 RETURN
1120 '
1999 REM DRAW LINE
2000 LINE (X1,Y1)-(X2,Y2),PSET
2010 X1=X2:Y1=Y2
2020 RETURN
2030 '
2999 REM GET AND PUT
3000 PMODE 4,5
3010 GET (X,Y)-(X+32,Y+20),B,G
3020 PMODE 4,1:SCREEN 1,0
3030 PUT (118,70)-(150,90),B,PSET
3040 RETURN

```

You can change two lines and add one line to draw the four rectangles on the unseen pages. Lines 100 and 110 are changed and line 120 is added.

```

100 PCLEAR 8 ← we need all 8 pages
110 PMODE 4,5: PCLS 1 ← clear pages 5-8
120 COLOR 0,1 ← (DO NOT turn on screen here)

```

Line 350 is added to clear the first four pages of memory.

```
350 PMODE 4,1: PCLS 1
```

To *GET* rectangles from pages 5-8 and *PUT* them on pages 1-4, the *GET* and *PUT* subroutine is changed to:

```

2999 REM GET AND PUT
3000 PMODE 4,5
3010 GET(X,Y)-(X+32,Y+20),B,G ← notice G is added to get detail
3020 PMODE 4,1: SCREEN 1,0 ← TURN ON pages 1-4
3030 PUT(118,70)-(150,90),B,PSET ← PUT pages 1-4
3050 RETURN

```

The complete fourth version using the above changes follows. The rotation now takes place smoothly, and no one

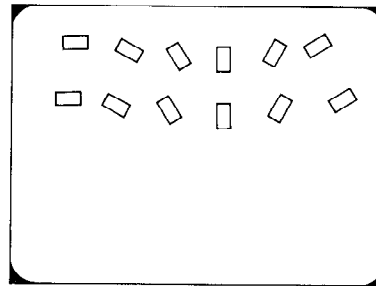
An Application

The final step in any educational experience is the application of what you have learned to some practical objective. Suppose you needed to display a clock in order to time some event. The rectangle could be narrowed to dimensions of 2 by 20. You could then rotate the rectangle to simulate the movement of a time clock.

In the previous programs we have rotated through 90 degrees with four different rectangle positions. This must be extended to 360 degrees of rotation for the clock simulation. We will handle the rotation as before except that we need a clockwise rotation and 12 different positions. We also need a circle to represent the face of the clock.

Version 4 of Rotating Rectangles will serve as the basis for the clock program with these changes and additions.

Pages 5-8 of graphic memory will hold these 12 positions.

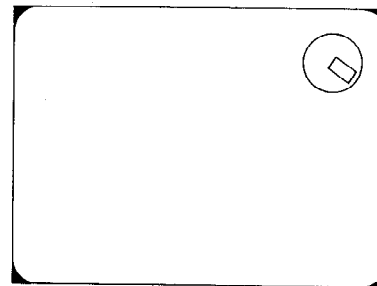


The *FOR-NEXT* loop beginning at line 410 will pick off the top row of rectangles, one at a time, and display them near the center of the screen. The *FOR-NEXT* loop beginning at line 460 will do the same thing for the second row of rectangles.

The clock could be moved to any part of the screen by simply changing the *PUT* statement at line 3030. If you move it, be sure to keep the *PUT* dimensions the same size as the *GET* dimensions. Also, move the circle in line 380.

Example: 3030 PUT(206,16)-(246,48),B,PSET
380 CIRCLE(225,32),30,0,.8

The clock will now appear in the upper right corner of the screen.



If you wish to slow the rate of rotation, put a time delay in the *GET* and *PUT* subroutine following the *PUT* statement.

```

200 X0=20:Y0=30:H=2:W=20      ← XO, YO and H changed
210 DIM B(40)                  ← dimension extended

299 REM FOUR POSITIONS        ← this section changed
300 FOR A=6.2832 TO 3.6651 STEP ← to draw 12 positions
-.5236
310 X1=X0:Y1=Y0              ← 6 positions - top row
320 GOSUB 1000
325 X0=X0+40
330 NEXT A
335 X0=20:Y0=80
340 FOR A=3.1416 TO .5235 STEP -.5236
345 X1=X0:Y1=Y0              ← 6 positions - bottom row
350 GOSUB 1000
355 X0=X0+40
360 NEXT A
370 PMODE 4,1:PCLS 1
380 CIRCLE(125,90),30,0,.8 ← add clock face
390 '
399 REM ROTATE RECTANGLE      ← this section
400 X=0: Y=16                 ← changed for 360
410 FOR N=1 TO 6              ← degree rotation
420 GOSUB 3000
430 X=X+40
440 NEXT N
450 X=0: Y=64
460 FOR N=1 TO 6
470 GOSUB 3000
480 X=X+40
490 NEXT N
500 GOTO 400
510 ' END OF MAIN PROGRAM

3010 GET(X,Y)-(X+40,Y+32),B,G  ← area enlarged
3030 PUT(106,74)-(146,106),B,PSET
T

```

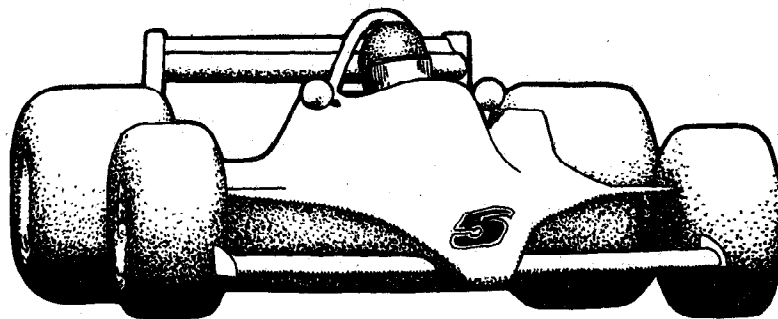
Clock

```

99 REM SET SCREEN
100 PCLEAR 8
110 PMODE 4,5: PCLS 1
120 COLOR 0,1
130 '
199 REM ASSIGN VARIABLES
200 X0=20:Y0=30:H=2:W=20
210 DIM B(40)
220 '
299 REM FOUR POSITIONS
300 FOR A=6.2832 TO 3.6651 STEP -.5236
310 X1=X0:Y1=Y0

```

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.

REVOLUTION		
For 32K Disk	\$24.95	Requires Joysticks
For 32K Cassette	\$21.95	& Extended BASIC

Connecticut residents add 7½% sales tax.
TRS-80 is a trademark of Tandy Corporation.



Inter  Action



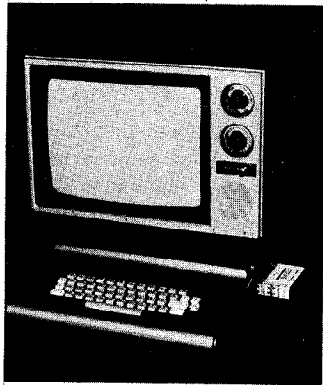
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```

320 GOSUB 1000
325 X0=X0+40
330 NEXT A
335 X0=20:Y0=80
340 FOR A=3.1416 TO .5235 STEP -
.5236
345 X1=X0:Y1=Y0
350 GOSUB 1000
355 X0=X0+40
360 NEXT A
370 PMODE 4,1:PCLS 1
380 CIRCLE(125,90),30,0,.8
390 '
399 REM ROTATE RECTANGLE
400 X=0: Y=16
410 FOR N=1 TO 6
420 GOSUB 3000
430 X=X+40
440 NEXT N
450 X=0: Y=64
460 FOR N=1 TO 6
470 GOSUB 3000
480 X=X+40
490 NEXT N
500 GOTO 400
510 ' END OF MAIN PROGRAM
520 '
530 '
999 REM SET UP END POINTS
1000 X2=X1+W*COS(A)
1010 Y2=Y1-.8*W*SIN(A)
1020 GOSUB 2000
1030 X2=X1-H*SIN(A)
1040 Y2=Y1-.8*H*COS(A)
1050 GOSUB 2000
1060 X2=X1-W*COS(A)
1070 Y2=Y1+.8*W*SIN(A)
1080 GOSUB 2000
1090 X2=X0:Y2=Y0
1100 GOSUB 2000
1110 RETURN
1120 '
1999 REM DRAW LINE
2000 LINE(X1,Y1)-(X2,Y2),PSET
2010 X1=X2:Y1=Y2
2020 RETURN
2030 '
2999 REM GET AND PUT
3000 PMODE 4,5
3010 GET(X,Y)-(X+40,Y+32),B,G
3020 PMODE 4,1:SCREEN 1,0
3030 PUT(106,74)-(146,106),B,PSE
T
3040 RETURN

```

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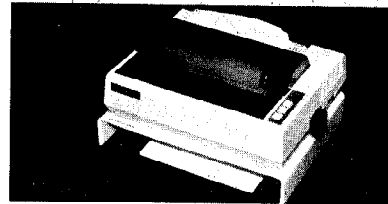
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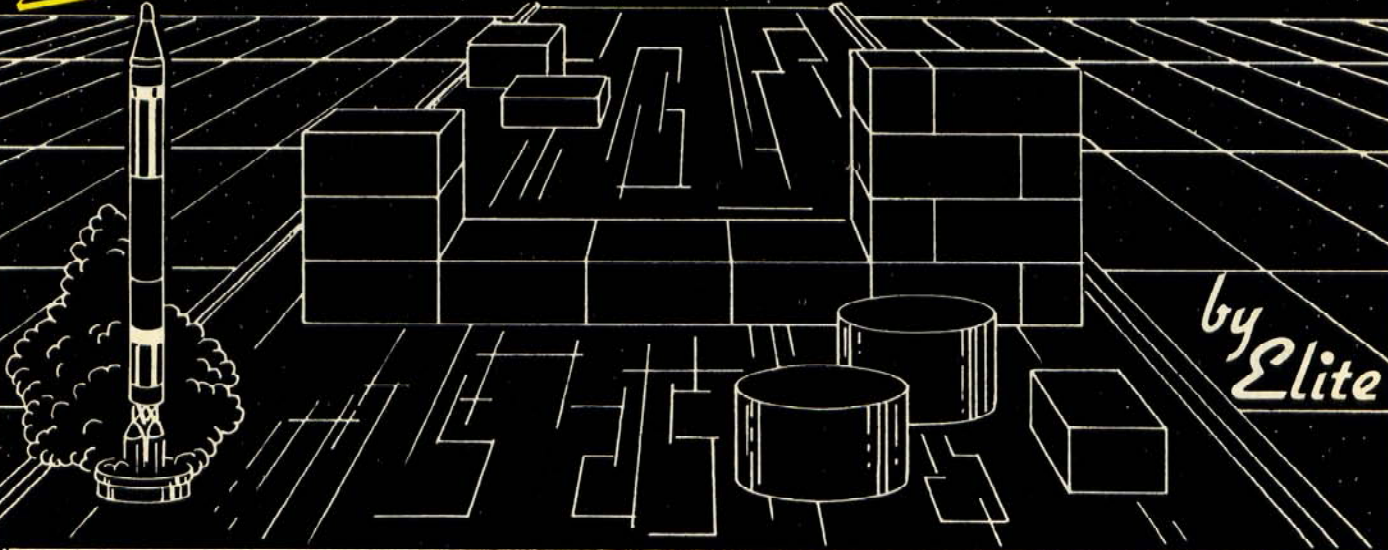
Address _____

City/State _____

Zip _____

We pay shipping on pre-paid orders

ZAKSUND



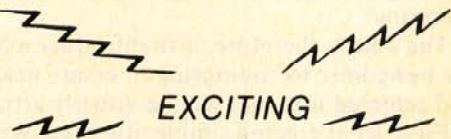
Fly your spaceship through enemy Starbases. Avoid guided missiles, lasers, and firing turrets! Can you reach their leader . . . ZAKSUND?

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ARCADE ★ ACTION
 32K
 MACHINE LANGUAGE

Tidying Up Your Text

By Joseph Kolar

Rainbow Contributing Editor

This article is addressed to the newcomer to computing, but anyone may benefit.

Being the nature of the beast, the color computer is a visual delight. However, too often an otherwise well designed program suffers from lackluster presentation of text. This, and the next article, will help you create neat, well centered text.

"The object . . . is to introduce a few ideas to assist the newcomer to computing to create neater, well planned and centered text that will be visually attractive."

Lots of good programs lose a lot of their impact due to sloppy and thoughtless presentation of text. How often have you seen a few lines of instructions or input requests jammed up into the upper left-hand corner of the display screen, which give a poor visual presentation and defy the laws of centering?

The object, therefore, is to introduce a few ideas to assist the newcomer to computing to create neater, well planned and centered text that will be visually attractive.

First, let us create a simple title page. We want the text on the page to be centered horizontally as well as vertically.

Key in line:

```
100 GOTO 100
```

(Joseph Kolar is a free-lance writer and programmer dedicated to proselytizing for computers in general, and the CoCo specifically.)

This continuous loop will keep the display on the screen so you can *RUN* your program as often as you like to check your progress. It is good policy to keep a "hold display" line just before the balance of your program, because titles are generally written after a program is completed.

Key in:

```
10 FOR I= 1 TO 3:PRINT:NEXT 'THIS LINE WILL  
GIVE YOU 3 BLANK ROWS ON TOP OF  
SCREEN.
```

```
20 PRINT TAB(9)"RAINBOW IDEAS" 'THIS WILL  
CENTER THE TITLE. RUN IT.
```

```
30 PRINT TAB(10)"YOUR NAME" ' THIS WILL  
CENTER YOUR NAME. RUN IT.
```

You will notice that it isn't properly centered. It should be more to the left. Change the "8" to a number you think it should be. *RUN* it. Keep running and changing the number until you are satisfied with the centering.

```
40 PRINT TAB(8)"YOUR TOWN AND STATE"  
'ADJUST IT BY CHANGING THE NUMBER,  
IF NECESSARY. WHEN YOU HAVE THE 3  
LINES NEATLY CENTERED, YOU WILL NO-  
TICE THAT THE TITLE IS TOO HIGH ON  
THE SCREEN. CHANGE THE 3 TO A 5 IN  
LINE 10. THIS WILL ADD TO MORE PRINTS  
TO LINE 10.
```

Look at your handiwork. If you just want a three line title, *BREAK, LIST*. List the routine in your notebook or on a sheet of paper.

```
10 FOR I= 1 TO 5:PRINT:NEXT  
20 PRINT TAB( )" "  
30 PRINT TAB(11)"YOUR NAME"  
40 PRINT TAB(6)"YOUR TOWN AND STATE"  
100 GOTO 100 'TEMPORARY LINE UNTIL TITLE  
IS FINALIZED.
```

This format will always be the same. Substitute your name and address in lines 30 and 40 and put in the appropriate numbers. Line 20, the title, will always be different so the position is unknown.

FHS**Federal Hill Software**

FINE PRODUCTS FOR THE COLOR COMPUTER AND TDP-100

The Handicapper

Use the power of your Color Computer to improve your performance at the track! The Handicapper is two separate programs for thoroughbred and harness horses that apply sound handicapping techniques to produce rankings for the horses in each race. Factors include speed, distance, track condition, post position, past performance, jockey or driver's record and other attributes. With a little practice, you can handicap an entire race in a few minutes and a whole card in less than an hour! Easy enough for the beginner, sophisticated enough for the veteran horseplayer. Cassette comes with both Extended and Standard Basic versions (the only difference is in the graphics). Includes complete documentation and betting guide. Thoroughbred or Harness Handicapper, \$24.95 each on tape, \$29.95 disk. Both programs only \$39.95 tape or disk.

Coco-Accountant

Were your taxes a mess this year? Let Coco-Accountant keep track of your finances and make those deductions a breeze! Using data from canceled checks, Coco-Accountant lists and totals expenses by month, account or payee. It provides a year-to-date summary by account, sorts checks by date, lists to screen or printer and saves data on tape or disk. In addition, 32K version flags tax deductible checks and checks subject to sales tax. It even computes the sales tax you paid, a feature that can pay for the program when deduction time rolls around. Disk version has even more features. There's nothing like this anywhere at the price! 16K handles 200 entries, 32K Up to 450. Requires Ext. Bas. Only \$15.95 on tape, \$21.95 on disk.

Printer Artist

This unique printer utility introduces the Color Computer to the little known but delightful craft called "Artytyping." This is the art of creating pictures using typewritten characters, and Printer Artist puts it at your fingertips. It includes two programs with 12 ready-to-run drawings of ships, birds and animals, holiday and patriotic themes, famous Americans and more. In addition, there are two utility programs and instructions for 40 additional drawings. Create your own file of printer art and save it to tape or disk. Complete documentation. Fun for home or classroom. Only \$19.95 on tape, \$24.95 on disk. Requires Ext. Bas.

Play Blackjaq!

This is as close as you can come to the real thing without using your shirt. A full casino simulation, with up to 5 players and 9 decks. The computer plays vacant hands by card counting rules, keeps track of everybody's winnings and losings, displays two card-counting algorithms and even prints out the results of every hand if a printer is on line! Joystick option for two players. Great for the beginner or experienced player. Use it at home for fun or brush up on your technique before hitting Atlantic City or Las Vegas. Requires 16K Ext. Bas. Only \$19.95 on tape, \$24.95 on disk.

64K Breakthrough!

Did you feel gypped when you found out your "64K" computer still had the same old 32K in Basic? We sure did. So we've developed HID 'N RAM, a program that will access that "hidden" 32K from basic and use it for data storage. Imagine writing a 28K data handling program with every bell and whistle you can think up and still having 32K left for the names, numbers and addresses you're crunching! This isn't one of those arcane 64K "DOS" programs that machine language lovers love to brag about. It's a brief ML driver embedded in a Basic demonstration program that shows you how to store your data in the "other" 32K and access it using regular Basic commands. When you see how it works, you can delete our program and write your own. The ML driver stays with the program! Use it from tape or disk. So what's the catch? There's only one. Your data must be in strings of equal length—which the program takes care of—and that length must be a power of 2 (such as 4, 8, 16, 32 or 64 bytes). And, of course, you must have a 64K computer. That's it. Comes with complete documentation. HID 'N RAM is only \$19.95 on tape, \$24.95 on disk.

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To order programs, send check or money order to **FEDERAL HILL SOFTWARE, 825 William St., Baltimore, MD 21230. Your personal check is welcome—no delays. Add \$1.50 per order for postage and handling.**

To make a new title page, just copy the lines. Guesstimate the tab number and key in your title name. Keep all the lines! Then *CLEAR, RUN*, and if it is off center, move it by changing the number until you are pleased with the result. Before long, as you keep using this technique, you will commit to memory the routine and the tab numbers for your name and address. There is nothing to prevent you from adding more lines to the title. Make sure you center it horizontally and then vertically.

You may center by the guesstimate system or do it the exact way, as follows:

- 1) Count the letters in your title. If you get an odd number for the total, add 1 to the result.
- 2) Divide the result by 2.
- 3) Subtract the result from 16 to get the tab number.

After making a few title pages, use the system you prefer and you will create attractive title pages.

We have to get rid of line 100 and replace it with something else or the program will never be seen.

One way would be to have a time delay to allow adequate time to read and absorb the contents of the title before continuing. Delete line 100 and key in:

```
50 FOR Z= 1 TO 1000:NEXT 'ROUGHLY EACH IS
EQUIVALENT TO 2 SECONDS. RUN IT.
```

You will get an "OK" when the time (1000) is up. Was that enough time? Change the 1000 to 2000 and *RUN* it. If you would like more time, change it to a higher number until you are satisfied that it is just right to read and absorb the message of the title. Never make it overly long because the reader will become impatient.

Write line 50 in your notebook and refer to it until you memorize it and its significance. Note that it isn't necessary

to add "Z" after next, since the computer understands that the next refers to the time waster "Z."

Another way to move on is as follows:

```
Delete line 50 and key in
50 PRINT:PRINT
60 PRINT:INPUT"TO CONTINUE, PRESS
ENTER";01'
```

We skipped three lines below your title via *PRINT* and added line 60 to exit the page. *RUN* it. Notice how it looks a little odd butted up to the left margin? Correct this defect by inserting two "spaces" after the first quotation mark.

That's better! In fact, make it an operating procedure to always start with two spaces when you input. If you think the input statement would look better if it were lower, add a ":*PRINT*" to line 50. If you like that better, leave it. If you liked it the other way, lop off the last "*PRINT*" from line 50.

Now copy lines 50 and 60 in your notebook for reference. You will use it exactly as it is listed many, many times.

You may want to use the short form. If so, change line 60 to read:

```
60 PRINT:INPUT" PRESS ENTER";01
```

RUN it. Did you leave two spaces after the first quotation mark? If you would rather have it more to the right, just change the number of spaces to seven or eight instead of two. Either way, it looks good. Note the *PRINT* in line 60. It always looks better if you skip a row between previous lines and the *INPUT* statement.

Where do we go when you press *ENTER*? To the next page! If you do not have a new page key in:

```
70 CLS:PRINT:PRINT ' THIS CLEARS AWAY
THE TITLE PAGE AND SKIPS 2 LINES.
```

If you are printing text, you would skip one line, and after the second *PRINT*, add a quotation mark and two spaces.

Back to the title page! *CLEAR, RUN*. Suppose you want to write a short statement under your title? *LIST, ENTER*. Change line 50. Instead of skipping two rows, we will skip one line and use the second *PRINT* to begin our new paragraph.

```
50 PRINT:PRINT" THE RAINBOW MAGAZINE
IS THE"
```

```
52 PRINT"BEST MAGAZINE FOR NEWCOMERS
TO"
```

```
54 PRINT"THE WORLD OF COLOR COMPUT-
ING."
```

RUN it.

It looks neat and centered horizontally but it looks a bit off in the vertical direction. *LIST-50*. First, knock off a few of the blank rows from the top of the screen by changing the 5 to a 3 in line 10. *RUN* it and see what you have. That looks good! Maybe, we ought to move that "press enter" line down one row so it doesn't look like part of the paragraph. *LIST* and *ENTER*.

We can do one of three things:

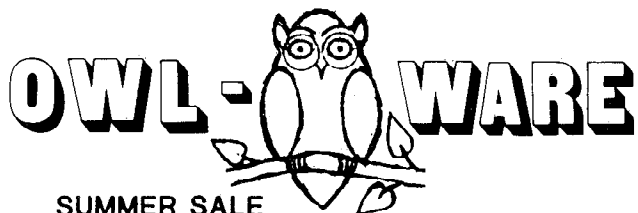
- 1) Add ":*PRINT*" to line 56
- 2) Insert line 58:
58 *PRINT*
- 3) Insert "*PRINT*:" before or after "*PRINT*" in line 60.

Take your choice! Notice that line 52 has two spaces to start a sentence, but that lines 54 and 56 butt right up to the left margin because they are a continuation of a sentence.

RUN your program one more time! Isn't that pretty good?

In the next article we will show you a better way to write lines 50 through 54.

I hope you had fun and learned a lot!



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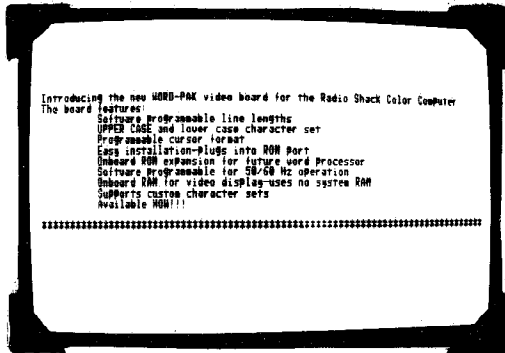
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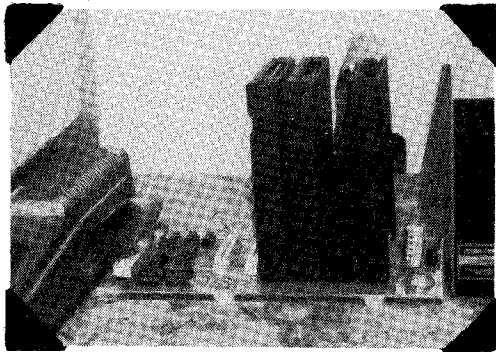
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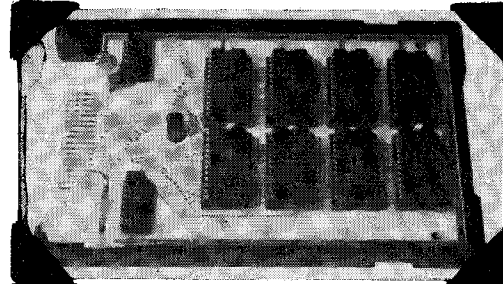
CoCo ALBUM



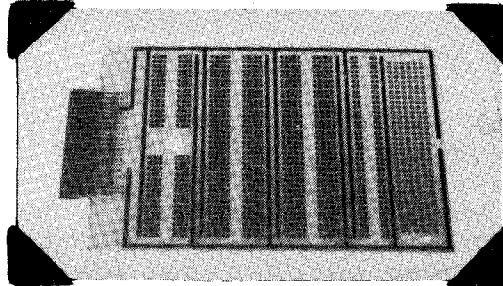
**WORD-PAK
DISPLAY**



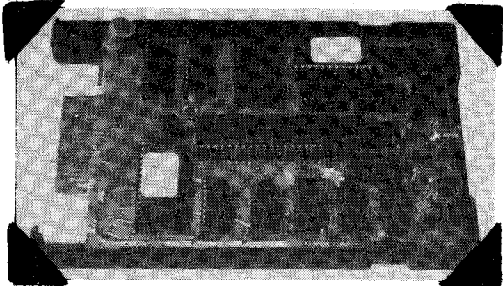
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MEM-PAK



PROTO - CoCo



WORD-PAK

WORD-PAK

80 column video board for the Radio Shack Color Computer. No longer do you have to sacrifice valuable memory and strained eyesight to expand the video display of your computer. The board features:

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The WORD-PAK produces a composite video signal and requires the use of a monitor capable of displaying 80 columns of text.

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Bloc Head Requires Skill, Concentration

After pumping more quarters than I care to mention into the arcade game, *Q-Bert*, I came across a Color Computer version called *Bloc Head*. After *CLOADMing* the game into my computer, I realized that it was very similar to the popular game that I had been enjoying for the past couple of months, spending lots of time and money on in the local arcade. Perhaps I was the "Bloc Head" for not discovering the home version sooner, but, at any rate, the game is addictive.

Bloc Head is a little, black, egg-shaped character with extended arms and legs. He sort of looks like Humpty Dumpty with bright green eyes and a glowing smile. The objective for this cute little creature is to change the color of the 27 cubes to the color indicated in the upper right corner of the screen. This is done simply by jumping from cube to cube, without going off the edge, in order to score as many points as possible. Each cube the *Bloc Head* successfully jumps on scores 25 points. Sounds easy, right? —Wrong!

Aside from the problem of getting accustomed to the direction of the joystick, there are also a number of strange monsters destined to destroy you as you are jumping on the cubes. Skill and concentration are required in order to achieve the objective.

The monsters of the game can either be rewarding or dangerous. The "Blue Egg" or the "Oops" monsters can be destroyed by jumping on them for 100 points. The additional colored monsters are deadly and should be avoided

whenever possible. When the black monster reaches the bottom of the screen, he changes into "the Spring" which is the deadliest monster of all. You must then try to persuade him to chase you towards the "blinking bus stops," which are located at the bottom of the screen. If "Spring" is following close enough behind you, as you jump on the bus stop, he will try to follow you, but will instead fall to his death, as the bus stop transports you back to the top of the screen. If this is done successfully, it is worth 500 points. Although I killed "Spring," at the same time, another monster was coming out of the top of the cubes, setting out to destroy me all over again. When all the cubes are changed, the award is 2500 bonus points and a new wave begins.

I found that it is a good idea to get familiar with the playing screen during the first two screens because the third screen is invisible at the beginning. The 27 blocks are unseen, and, when you jump on them the color and the block appear. A box in the upper right corner tells you how many blocks you have changed—if you have time to notice. This was the toughest and most challenging level of the game. I have only been able to play the invisible screen twice, because my skills did not allow me to go further than the first two screens.

Bloc Head has two skill levels, either EASY or TUFF. The only difference I found is that the TUFF level has extra monsters chasing you. You start the game with four Bloc Heads and an extra one is provided for every 10,000 points you accumulate. The game is over when you lose your last Bloc Head.

The instruction sheet is very informative and easy to understand. *Bloc Head* features good quality graphics and sound effects. The visual effects are great, too. I really felt as if the monsters were chasing me, so I became determined to "trick them off the edge." It takes a lot of practice for one to get used to the joystick. I "committed suicide" a number of times by making just one wrong move and falling off the edge, but after playing several times, I finally got the maneuvering of the joystick down pat.

Bloc Head requires 16K and one joystick, although you may need two—just in case the first one wears out. I highly recommend this game for both children and adults who want to put their skills to a test. Personally, there is no other computer game I have become more addicted to. *Bloc Head* is a very enjoyable game—and best of all—you don't need quarters!

(Computerware, Box 668, Encinitas, CA 92024, tape \$26.95, disk \$29.95 + \$2 S&H)

—Jutta Kapfhammer

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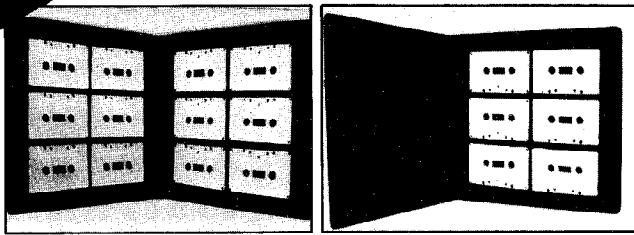
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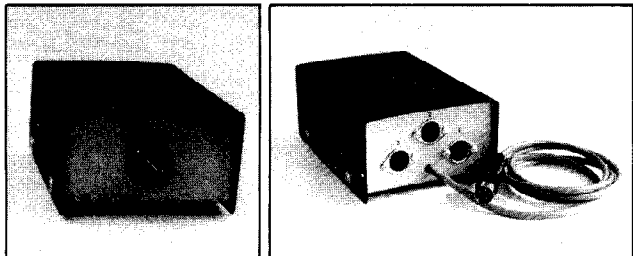


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CoCo-Writer comes with excellent documentation. The clearly written manual includes a table of contents and an index. A separate, sturdy, laminated card contains a summary of all commands for quick reference.

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TREASURES of the ENRAKIAN EMPIRE

By Ken Ostrer

I am among those who feel Adventures are the most entertaining and challenging games for microcomputers. They require skill, luck, common sense, curiosity and just about everything else. My friend Mike and I have played everything from *Zork* to *Adventureland*. I seem to be attracted to Adventures and I hope the attraction never wears off.

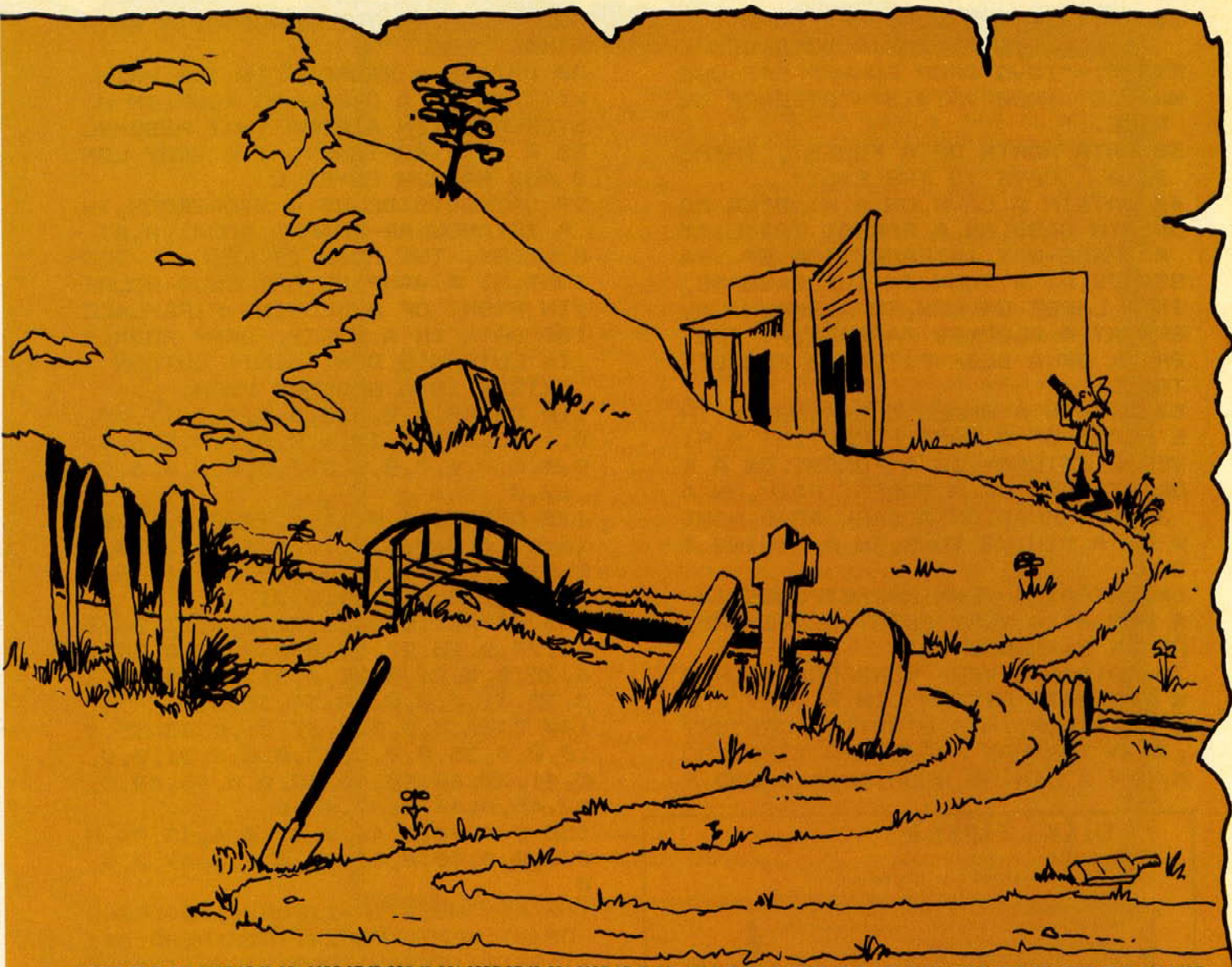
During the summer of 1982, we decided to write *Enrak*. It was quite a challenge for us but we have finally finished writing the game. It took nine months to program the game. In my opinion, it is the best program we have written for the Color Computer. Many hours of frustration were put into *Enrak*, but we think it has finally paid off.

As in most Adventures, there is an objective to achieve. This Adventure is no different. In *Enrak* your objective is to find the 10 treasures of the Enrakian Empire. This may seem like an easy task but it is not as easy as you think. A vulture and a gunfighter are only some of the obstacles that must be overcome. The game consists of 50 locations. Also, there are approximately 80 words that this Adventure understands. In some games of this type, the verbs are listed for the player's convenience. I am not going to do this because they can be found by looking at the listing of the program. If it's necessary to look at the list to help you find treasures or overcome obstacles, it's really not worth the trouble to continue playing the game. The reasons for Adventures are to challenge your skills and intelligence. If you have problems finding something, just use your common sense, skill, curiosity and experience. This particular Adventure is semi-difficult. It was made for the junior adventurer. On the other hand, it really is enjoyable and challenging for all ages!

Enrak accepts such commands as *GET*, *DROP* or *N* for north. In some places there are short pauses, but the pauses do not slow the game down very much. The game also consists of a saving feature. All you have to do is type *SAVE* and it will ask you for a filename. After entering the filename, press play and record on your tape recorder and then press *ENTER*. The saving feature is very useful in Adventure games. Some Adventures which I have purchased are rather expensive and do not have a save feature incorporated into the game. I find it necessary when playing long and complicated Adventures to use the saving feature many times.



M. KIBANAN



This game takes nearly all of my 16K. Adjusting or separating lines will bring nothing but trouble for you. This program has been debugged and played many times. The chance of an error arising in it is very slim. Mike and I wanted to add more rooms, tricks and traps but memory limitations would not permit us to do these things. Anyone who has 32K out there is extremely lucky!

If you would like the words to appear on the screen slower *POKE* 359,60, and to escape this mode *POKE* 359,0. This seems to add a nice touch to the program. If a friend happens to come over and wants to play this Adventure, it would be nice to stop him or her from looking at the listing of the program. If you would like the program to stop listing *POKE* 383,158. Some numbers may appear on the screen when you type *LIST*, but this is no problem. To escape this mode *POKE* 383,0.

We hope this program is as enjoyable for you to play as it was for us to program. If you would like help with this game, please write: Ken Ostrer, P.O. Box 61542, Vancouver, Wash., 98666. I would be happy to assist you in any way possible. Mike and I

(Ken Ostrer, a senior and honor student at Vancouver, Washington's, Hudson Bay High School, enjoys computers, rock music, and science fiction. He hopes to someday enter the field of computer science.)

have decided to give you a little hint before you begin the journey: "The key to success is a wide open experience." Good luck and happy Adventuring!

70.....0426	1100... 1C37
140.... 076F	1260... 2000
290.... 0A3E	1360... 2280
390.... 0EE5	1510... 24E2
580.... 1293	1610... 2760
680.... 16B3	1720... 2949
870.... 18F4	1830... 2C87
	END... 2EC9

```
10 CLEAR120:CLS:LT=500:DIMA$(50)
, RM(50,4), IT$(35), IT(35), JT$(35)
:PRINT@230,"ENRAK":PRINT@262,"BY
KEN OSTRER":PRINT@294,"MIKE SMI
TH":PRINT@326,"(C) MARCH 1983":P
RINT:DATANORTH,SOUTH,EAST,WEST
```


20 RT\$(3)="THE DUKE OF 'BONE'
 BORN 786 - DIED 835":
 RT\$(4)="IQVQ QRGP EQHHP CPF UOG
 NN VJG TQUG":RT\$(5)="SILENCE IS
 NICE.."
 30 DATA"NORTH OF A FOREST, THERE
 IS A CAVE TO THE EAST"
 40 DATAIN A CAVE,ON A WINDING MO
 UNTAIN PASS,ON A FOREST TRAIL,AT
 A THREE-WAY INTERSECTION OF PA
 SSAGES,AT A TURN IN THE PASSAGE,
 IN A LARGE CAVERN,IN A SMALL CAV
 ERN,AT A BLOCKED PASSAGE,AT THE
 BRINK OF A DEEP PIT,ON A FOREST
 TRAIL
 50 DATAIN A SMALL CLEARING,IN TH
 E HEART OF A DARK FOREST,AT A RI
 VER'S ESTUARY,IN A FOREST,ON A F
 OREST PATH,ON A FOREST PATH,ON A
 JAGGED ROAD,ON A DARK ROAD,NORT
 H OF A MINING TOWN,IN A MINING T
 OWN
 60 DATAAT A TOWN MARKETPLACE,IN
 A PUB,AT A VERY QUIET GRAVEYARD,
 AT AN ENTRANCE WAY
 70 DATAIN A VERY LONG CORRIDOR,I
 N THE MAIN LIBRARY,IN A VERY LON
 G CORRIDOR,IN A GIANT LABORATORY
 ,IN A TORTURE ROOM,IN A TIME ROO
 M.,IN A DINING ROOM,IN A SOUND P

ROOF ROOM,IN THE DUNGEON,IN AN A
 NIMAL CAGE.

80 DATAIN A BEDROOM,IN THE MAIN
 KITCHEN,IN A CIRCULAR ROOM,IN A
 STOREROOM,IN A ROOM THAT RESEMBL
 ES A MORTUARY,AT A VERY LON
 G AND NARROW FOYER,C

90 DATAOUTSIDE OF A STOREROOM,IN
 A TRIANGULAR-SHAPED ROOM.,B,AT
 A LEDGE. THE MOON IS FULL TON
 IGH,AT A VAMPIRE BAT CLUB HOUSE
 ,IN FRONT OF A GLOWING FIREPLACE
 100 DATA"IN A MUSTY, DARK ROOM."
 ,IN LUTARN'S DEN. HINT+ LUTARN
 EXISTS IN A GASEOUS FORM.

110 DATA0,4,2,3,0,5,0,1,1,11,15,
 0,1,13,0,0,2,10,6,0,0,7,0,5,6,9,
 8,0,0,9,0,7,8,0,0,7,5,0,0,0,3,19
 ,12,0

120 DATA0,14,0,11,4,14,0,0,13,0,
 16,12,0,0,0,3,0,17,0,14,16,0,0,1
 8,0,0,17,20,11,20,0,0,19,21,18,0
 ,20,23,22,0,0,24,0,21

130 DATA21,0,24,0,22,0,0,23,26,0
 ,0,24,0,25,27,29,0,0,0,28,0,30,2
 6,25,0,0,26,0,28,0,31,40,39,32,3
 3,30,31,0,0,0,38,34,35,31

140 DATA33,0,0,0,37,36,0,33,35,0
 ,0,0,0,35,0,0,0,33,0,0,0,31,0,0,
 0,41,30,42,40,46,48,0,0,43,40,0,
 42,45,0,44,0,47,43,0

150 DATA43,0,46,0,41,0,0,45,44,5
 0,0,0,49,0,41,48,0,0,0,47,0,0,
 0

160 D\$="NSEW":R=1:FORX=1TO4:READ
 D\$(X):NEXTX:FORX=1TO50:READ A\$(
 X):NEXTX:FORX=1TO50:FORY=1TO4:RE
 AD RM(X,Y):NEXTY,X:FORX=1TO35:RE
 AD IT\$(X),JT\$(X),IT(X):NEXTX:PRI
 NT"DO YOU WANT TO LOAD AN OLD GA
 ME FROM TAPE?"

170 A\$=INKEY\$:IFA\$="Y" THEN 1800
 ELSE IFA\$<>"N" THEN 170

180 A\$(45)="NEAR A CLOSED COFFIN
 "

190 A\$(42)="IN FRONT OF A LOCKED
 DOOR."

200 IFR>=26 AND AA=0 THEN CLSRND
 (8):PRINT"A COLORFUL DARK MIST C
 OVERS THE ROOM..":GOTO340

210 IFFG=-1 THEN IT\$(29)="AN EMP
 TY BEAKER"

220 CLS:PRINT"YOU ARE:":PRINTA\$(
 R)

230 PRINT:PRINT"OBVIOUS DIRECTIO
 NS ARE:"

240 FORY=1TO4:IFRM(R,Y)<>0 THEN
 PRINTD\$(Y);"->";:NEXTY ELSE NEX
 TY

250 PRINT:I=0:PRINT:PRINT"YOU SE

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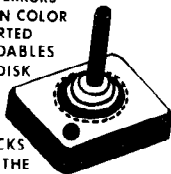
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```

E: ":IFR=2 THEN PRINT"OLD HERMIT
":I=1
260 IFR=21 AND ZZ<>-1 THEN PRINT
"GUNFIGHTER WITH THE MAGIC GLOVE
":I=1
270 FORX=1TO35
280 IFIT(X)=R THEN PRINTIT$(X):I
=1
290 NEXT
300 IF I=0 THEN PRINT"NOTHING"
310 IFYD=-1 THEN PRINT:PRINT"THE
POISON OF LUTARN WAS FATAL.":GO
TO1730
320 IFZZ<>-1 AND R=21 THEN GOSUB
1860
330 X=RND(35):IFRND(40)=1 AND IT
(X)=-1 AND X<>19 THEN PLAY"T3402
CCDDDEEEFFF":PRINT:PRINT"A GIAN
T VULTURE HAS CARRIED OFF YOUR..
??":IT(X)=RND(24):J=J-1
340 PRINT:LINEINPUT">";I$:IFAA=-
1 THEN LT=LT-1:IFLT=0 THEN PRINT
"YOUR LIGHT HAS RAN OUT.":GOTO1
730
350 IFLEFT$(I$,5)="MOVE " THEN 1
340 ELSEIFLEFT$(I$,4)="HELP" THE
N 1880 ELSE IFLEFT$(I$,4)="QUIT"
THEN END ELSE IFLEFT$(I$,4)="SI
NG" THEN 1920 ELSE IFLEFT$(I$,6)
="SHOOT " THEN 1820 ELSE IFLEFT$
(I$,6)="CRACK " THEN 1750 ELSE I
FLEFT$(I$,5)="WEAR " THEN1620
360 IFLEFT$(I$,6)="TOUCH " THEN
1650 ELSE IFLEFT$(I$,4)="DIP " T
HEN 1480 ELSE IFLEFT$(I$,4)="ASK
" THEN 1230 ELSE IFLEFT$(I$,4)=
"SAVE" THEN 1780 ELSE IFLEFT$(I$
,5)="CALL " THEN 1690 ELSE IFLEF
T$(I$,5)="GIVE " THEN 1310 ELSE
IFLEFT$(I$,5)="LOAD "THEN1940
370 IFLEFT$(I$,5)="SHOW " THEN 1
080 ELSE IFLEFT$(I$,5)="POUR " T
HEN 1580 ELSE IFLEFT$(I$,7)="UNL
OCK " THEN 1370 ELSE IFLEFT$(I$,
5)="OPEN " THEN 1180 ELSE IFLEF
$(I$,6)="THROW " THEN 1270 ELSE
IFLEFT$(I$,3)="DIG" THEN 1110
380 IFLEFT$(I$,5)="FEED " THEN 1
520 ELSE IFLEFT$(I$,5)="SCORE" T
HEN 1060 ELSE IFLEFT$(I$,7)="INS
ERT " THEN 1550 ELSE IFLEFT$(I$,
6)="SMELL " THEN 1150 ELSE IFLEF
T$(I$,6)="LIGHT " THEN 950
390 IFLEFT$(I$,5)="DROP " THEN 7
50 ELSE IFLEFT$(I$,1)="L" THEN 2
00 ELSE IFLEFT$(I$,1)="I" THEN 6
50 ELSE IFLEFT$(I$,4)="GET " THE
N 480 ELSE IFLEFT$(I$,4)="SAY "
THEN 1020 ELSE IFLEFT$(I$,4)="BU
Y " THEN 910 ELSE IFLEFT$(I$,5)=

```

```

"READ " THEN 860
400 IFRM(25,3)=0 AND I$="N" AND
R=25 THEN PRINT"THE COUNT IS IN
YOUR WAY.":GOTO340
410 FORX=1TO4
420 IFMID$(D$,X,1)=I$ THEN 450
430 NEXTX
440 PRINT"W-H-A-T ? ? ?":GOTO340
450 IFRM(R,X)=0 THEN PRINT"YOU C
AN'T GO THAT WAY":GOTO340
460 R=RM(R,X)
470 GOTO200
480 G$=RIGHT$(I$,LEN(I$)-4):G$=L
EFT$(G$,3)
490 IFR=49 AND G$=LEFT$(JT$(25),
3) OR R=49 AND G$=LEFT$(JT$(26),
3) THEN PRINT"IT CANNOT BE TAKEN
OFF OF THE WALL.":GOTO340
500 IFG$=LEFT$(JT$(19),3) AND R=
22 AND BU<>1 THEN PRINT"THE LANT
ERN COSTS MONEY.":GOTO340
510 IFG$=LEFT$(JT$(31),3) AND R=
50 AND IT(31)=50 OR G$=LEFT$(JT$
(22),3) AND R=20 THEN PRINT"THAT
IS NOT WITHIN YOUR POWER.":GOT
O340
520 IFUP<>-1 AND G$=LEFT$(JT$(8)
,3) AND R=10 THEN PRINT"A SEMI-F
ORCE FIELD IS GUARDING THE ROSE.

```

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```

."GOTO340
530 IFNF<>-1 AND G$=LEFT$(JT$(6)
,3) AND R=48 THEN PRINT"IT'S TOO
HOT..":GOTO340
540 IFG$=LEFT$(JT$(34),3) AND R=
35 AND AG<>-1 THEN PRINT"THE GOR
ILLA WON'T LET YOU TAKE IT..":G
OTO340
550 FORX=3TO34
560 IFX>8 AND X<19 AND IT(X)=33
AND R=33 AND G$=LEFT$(JT$(X),3)
THEN MS=MS-10
570 IFJ=6 THEN 850 ELSE IFLEFT$(
JT$(X),3)=G$ AND IT(X)=R THEN J=
J+1:IT(X)=-1:PRINT"OK":PLAY"TB05
CFE":GOTO340
580 NEXT
590 PRINT"I DON'T FEEL LIKE IT..
":GOTO340
600 DATACOUNT DRACULA,DRACULA,25
,THE TOWN DRUNK,DRUNK,23,BROKEN
TOMBSTONE,TOMBSTONE,24,A FADED S
IGN,SIGN,8,STONE TABLET,TABLET,0
,GLOWING EMBER,EMBER,48,WOODEN S
HOVEL,SHOVEL,15,ROSE BUD,ROSE,10
610 DATA**MAGIC OYSTER**,OYSTER,
46,**SILVER COMPASS**,COMPASS,0,
**DISK OF THE GODS**,DISK,38,**T
URQUOISE CROSS**,CROSS,7,**ANTIQ

```

```

UE CLOCK**,CLOCK,0,**SOME GLOWIN
G RUBIES**,RUBIES,0,**PERUVIAN E
MERALDS**,EMERALDS,0,**SPARKLING
PEARL**,PEARL,0
620 DATA**CROWN JEWELS OF BAVARI
A**,JEWELS,0,**SILVER BRACELET**
,BRACELET,0
630 DATALANTERN AND OIL,LANTERN,
22,GOLD NUGGETS,NUGGETS,0,DIAMON
D KEY,KEY,0,STRANGE LOOKING BOX,
BOX,20,HOLLOW STICK,STICK,24,WHI
SKEY BOTTLE,BOTTLE,0,EINSTEIN'S
PORTRAIT,PORTRAIT,49,NEWTON'S PI
CTURE,PICTURE,49,METAL STRAINER,
STRAINER,17
640 DATASOME ALGAE,ALGAE,14,BEAK
ER OF WATER,BEAKER,29,MAGIC GLOV
E,GLOVE,0,THE HIDEOUS LUTARN,LUT
ARN,0,LARGE EGG,EGG,0,REVOLVER,R
EVOLVER,0,A BULLET,BULLET,35,WAL
L SAFE,SAFE,0
650 PRINT"YOU ARE CARRYING:"
660 IFAA=-1 THEN LA$="LIT " ELSE
LA$="UNLIT "
670 IFIT(19)=-1 THEN PRINTLA$:IT
$(19):I=1
680 I=0:FORX=3TO34
690 IFIT(19)=-1 THEN I=1
700 IFX=19 THEN X=20
710 IFIT(X)=-1 THEN PRINTIT$(X):
I=1
720 NEXT
730 IF I=0 THEN PRINT"NOTHING"
740 GOTO340
750 G$=RIGHT$(I$,LEN(I$)-5):G$=L
EFT$(G$,3)
760 IFG$=LEFT$(JT$(19),3) AND IT
(18)=-1 THEN AA=0
770 IFG$=LEFT$(JT$(30),3) AND IT
(30)=-1 THEN PRINT"IT IS A PART
OF YOU NOW..":GOTO340
780 FORX=3TO34
790 IFX>8 AND X<19 AND IT(X)=-1
AND R=33 AND G$=LEFT$(JT$(X),3)
THEN MS=MS+10
800 IFIT(X)=-1 AND LEFT$(JT$(X),
3)=G$ THEN 830
810 NEXT
820 GOTO590
830 J=J-1:PRINT"OK":IT(X)=R
840 IFMS=100 THEN PRINT"YOU SOLV
ED THE ADVENTURE...":PLAY"ABCDEF
G04T5GFEDCBA":GOTO1780 ELSE 340
850 PRINT"YOU CAN'T CARRY ANYTHI
NG ELSE..":GOTO340
860 G$=RIGHT$(I$,LEN(I$)-5):G$=L
EFT$(G$,3)
870 FORX=3TO5
880 IFIT(X)=-1 AND G$=LEFT$(JT$(
X),3) THEN PRINTCHR$(34):RT$(X);

```

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```

CHR$(34):GOTO340
890 NEXTX
900 GOTO590
910 G$=RIGHT$(I$,LEN(I$)-4):G$=L
EFT$(G$,3)
920 IFR=22 AND BU=1 THEN PRINT"W
E'RE ALL OUT BUDDY..":GOTO340
930 IFG$=LEFT$(JT$(19),3) AND R=
22 AND IT(20)=-1 AND J<>6 THEN B
U=1:GOTO550
940 GOTO590
950 G$=RIGHT$(I$,LEN(I$)-6):G$=L
EFT$(G$,3)
960 IFIT(19)=-1 AND G$="ON" THEN
980 ELSE IFIT(19)=-1 AND G$="OF
F" THEN 1000
970 GOTO590
980 IFAA=-1 THEN PRINT"IT'S ALRE
ADY ON..":GOTO340
990 AA=-1:GOTO200
1000 IFAA=0 THEN PRINT"IT'S ALRE
ADY OFF..":GOTO340
1010 AA=0:GOTO200
1020 G$=RIGHT$(I$,LEN(I$)-4)
1030 IFRM(24,4)=0 THEN 1050
1040 IFR=24 AND G$="BONE" THEN R
M(24,4)=0:RM(24,3)=25:GOTO220
1050 PRINT"OK":PRINTCHR$(34);G$;
CHR$(34):GOTO340
1060 PRINT"OUT OF 100 POINTS YOU
HAVE          SCORED";MS;"POINTS."
1070 PRINT"LIGHT LEFT=";LT:GOTO3
40
1080 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1090 IFRM(25,3)=0 AND G$=LEFT$(J
T$(12),3) AND IT(12)=-1 AND R=25
THEN PRINT"THE COUNT FLIES AWAY
IN PAIN..":IT(1)=0:RM(25,3)=28:
GOTO340
1100 GOTO590
1110 IFIT(7)<>-1 THEN PRINT"NO S
HOVEL":GOTO340
1120 IFR=10 AND IT(31)=-2 AND IT
(32)=0 THEN IT(32)=10:GOTO220
1130 IFR=12 AND IT(21)=0 THEN IT
(21)=12:GOTO220
1140 PRINT"NOTHING HERE FRIEND..
":GOTO340
1150 G$=RIGHT$(I$,LEN(I$)-6):G$=
LEFT$(G$,3)
1160 IFIT(5)=0 AND G$=LEFT$(JT$(
8),3) AND R=45 AND OP=-1 AND IT(
8)=-1 THEN IT(5)=45:IT(10)=16:G
OTO200
1170 IFG$=LEFT$(JT$(8),3) AND IT
(8)=-1 THEN PRINT"AHHH!! WHAT BE
AUTY..":GOTO340 ELSE PRINT"MY NO
SE IS STUFFED UP..":GOTO340
1180 G$=RIGHT$(I$,LEN(I$)-5):G$=

```

```

LEFT$(G$,3)
1190 IFIT(13)=0 AND G$=LEFT$(JT$
(22),3) AND IT(23)=0 AND R=20 TH
EN IT(24)=20:IT(13)=31:IT(33)=20
:GOTO200
1200 IFIT(23)<>0 AND G$=LEFT$(JT
$(22),3) AND R=20 THEN PRINT"AN
ANGRY DOG IS GUARDING THE STR
ANGE BOX..":GOTO340
1210 IFOP<>-1 AND G$=LEFT$("COFF
IN",3) AND R=45 AND IT(21)=-1 TH
EN OP=-1:A$(45)="NEAR AN OPEN CO
FFIN":GOTO200
1220 GOTO590
1230 G$=RIGHT$(I$,LEN(I$)-4):G$=
LEFT$(G$,3)
1240 IFDS=-1 AND G$=LEFT$(JT$(2)
,3) AND R=23 THEN PRINTCHR$(34);
"ADD ONE LETTER TO EACH LETTER
IN THE PHRASE..";CHR$(34):GOTO3
40
1250 IFG$=LEFT$(JT$(2),3) AND R=
23 THEN PRINTCHR$(34);"FOR A BOT
TLE OF WHISKEY I COULD BECOME VE
RY TALKATIVE..";CHR$(34):GOTO340
1260 GOTO590
1270 G$=RIGHT$(I$,LEN(I$)-6):G$=
LEFT$(G$,3)
1280 IFIT(31)=50 AND R=50 AND IT

```

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(6)=-1 AND G$=LEFT$(JT$(6),3) AN
D IT(31)=50 THEN PRINT:PRINT"LUT
ARN BURNS FIERCELY. A VOICE SAY
S";CHR$(34);"GID TA TIP";CHR$(34
):FORI=1TO1500:NEXTI:IT(6)=50:IT
(31)=-2:J=J-1:GOTO220
1290 IFIT(23)=-1 AND G$=LEFT$(JT
$(23),3) AND R=20 THEN PRINT"THE
DOG RUNS FOOLISHLY AFTER THE
STICK..":IT(23)=0:J=J-1:GOTO300
1300 GOTO760
1310 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1320 IFDS<>-1 AND R=23 AND G$=LE
FT$(JT$(24),3) AND IT(24)=-1 THE
N PRINT"THE DRUNK TAKES THE BOTT
LE IMMEDIATELY..":DS=-1:IT(
24)=0:IT$(2)="THE HAPPY TOWN DRU
NK":J=J-1:GOTO340
1330 GOTO760
1340 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1350 IFIT(35)=0 AND G$=LEFT$(JT$
(25),3) AND R=49 THEN IT(35)=49:
GOTO200
1360 GOTO590
1370 G$=RIGHT$(I$,LEN(I$)-7):G$=
LEFT$(G$,3)
1380 IFIT(15)=0 AND G$=LEFT$(JT$

```

```

(35),3) AND IT(35)=49 AND R=49 T
HEN 1400
1390 GOTO590
1400 PRINTCHR$(34);"REFER TO BIR
TH DIGITS";CHR$(34);" SAYS AN EC
HOING VOICE.."
1410 FORI=1TO1000:NEXTI:CLS:FORX
=1TO3
1420 B$(1)="LEFT":B$(2)="RIGHT":
B$(3)="LEFT"
1430 PRINT@70,B$(X);" VALUE":INP
UTC(X)
1440 IFC(X)<=0 THEN 1430
1450 NEXTX
1460 IFC(1)=7 AND C(2)=8 AND C(3
)=6 THEN PRINT"THE SAFE CREAKS O
PEN..":FORH=1TO750:NEXTI:IT(14)=4
9:IT(15)=49:GOTO200
1470 PRINT"THE SAFE DIDN'T OPEN.
..":FORH=1TO750:NEXTH:GOTO200
1480 G$=RIGHT$(I$,LEN(I$)-4):G$=
LEFT$(G$,3)
1490 IFIT(20)<>0 AND R=14 AND G$
=LEFT$(JT$(27),3) AND IT(27)=-1
THEN GOTO1140
1500 IFG$=LEFT$(JT$(27),3) AND R
=14 AND IT(27)=-1 THEN IT(20)=14
:GOTO200
1510 GOTO590
1520 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1530 IFIT(16)=0 AND G$=LEFT$(JT$
(9),3) AND IT(9)=-1 AND IT(28)=-
1 THEN PRINT"THE OYSTER EATS THE
ALGAE.":PRINT"AND SOMETHING IN
IT DISAPPEARS":FORI=1TO750:NEXTI
:IT(16)=2:IT(28)=0:J=J-1:GOTO200
1540 GOTO590
1550 G$=RIGHT$(I$,LEN(I$)-7):G$=
LEFT$(G$,3)
1560 IFIT(17)=0 AND G$=LEFT$(JT$
(16),3) AND R=42 AND IT(16)=-1 T
HEN A$(42)="IN FRONT OF AN UNLOC
KED DOOR.":IT(17)=42:GOTO200
1570 GOTO590
1580 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1590 IFFG<>-1 AND R<>10 AND G$=L
EFT$("WATER",3) AND IT(29)=-1 TH
EN PRINT"YOU'RE ARE IN TROUBLE N
OW..":FORI=1TO500:NEXTI:FG=-1:GO
TO200
1600 IFFG<>-1 AND UP<>-1 AND IT(
29)=-1 AND G$=LEFT$("WATER",3) A
ND R=10 THEN UP=-1:FG=-1:PRINT"THE
FORCE FIELD IS DESTROYED":FOR
I=1TO500:NEXTI:GOTO200
1610 GOTO590
1620 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)

```

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1630 IFNF<>-1 AND G$=LEFT$(JT$(3
0),3) AND IT(30)=-1 THEN PRINT"N
ICE FIT..":NF=-1:GOTO340
1640 GOTO590
1650 G$=RIGHT$(I$,LEN(I$)-6):G$=
LEFT$(G$,3)
1660 IFG$=LEFT$("HERMIT",3) AND
R=2 AND NF=-1 THEN PRINT"YOU FEE
L DIZZY FOR A MOMENT":PH=-1:GOTO
340
1670 IFG$=LEFT$("HERMIT",3) AND
R=2 AND NF<>-1 THEN PRINT"YOU HA
VE JUST DIED..":GOTO1730
1680 GOTO590
1690 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1700 IFIT(31)<>-2 AND G$=LEFT$(J
T$(31),3) AND R=50 AND PH=-1 THE
N IT(31)=50:GOTO220
1710 IFG$=LEFT$(JT$(31),3) AND R
=50 AND PH<>-1 THEN YD=-1:IT(31)
=50:GOTO220
1720 GOTO590
1730 CLEAR:PRINT"DO YOU WANT TO
PLAY AGAIN?"
1740 A$=INKEY$:IFA$="Y" THEN GOT
010 ELSE IFA$="N" THEN END ELSE
1740
1750 G$=RIGHT$(I$,LEN(I$)-6):G$=
LEFT$(G$,3)
1760 IFIT(18)=0 AND G$=LEFT$(JT$
(32),3) AND IT(32)=-1 THEN IT(18
)=5:PRINT"SOMETHING FALLS OUT.."
:PRINT"THEN DISAPPEARS":FORI=1TO
500:NEXTI:GOTO220
1770 GOTO590
1780 INPUT"FILENAME";FI$:IFFI$="
" THEN 1780
1790 OPEN"O",-1,FI$:FORX=1TO35:P
RINT#-1,IT(X):NEXTX:PRINT#-1,IT$
(2),J,R,MS,DS,OP,RM(24,3),RM(24,
4),RM(25,3),A$(45),A$(42),LT,AA,
FG,UP,NF,BU,PH,ZZ,AG,LO,IT$(33):
CLOSE:PRINT"OK":IFMS=100 THEN 17
30 ELSE 340
1800 INPUT"FILENAME";FI$:IFFI$="
" THEN 1800
1810 OPEN"I",-1,FI$:FORX=1TO35:I
NPUT#-1,IT(X):NEXTX:INPUT#-1,IT$
(2),J,R,MS,DS,OP,RM(24,3),RM(24,
4),RM(25,3),A$(45),A$(42),LT,AA,
FG,UP,NF,BU,PH,ZZ,AG,LO,IT$(33):
CLOSE:GOTO200
1820 G$=RIGHT$(I$,LEN(I$)-6):G$=
LEFT$(G$,3)
1830 IFIT(33)=-1 AND LO=-1 AND Z
Z<>-1 AND G$=LEFT$("GUNFIGHTER",
3) AND R=21 THEN PRINT"YOU KILLE
D THE GUNFIGHTER..":IT(30)=21:FO
RI=1TO1000:NEXTI:ZZ=-1:IT$(33)="

```

```

EMPTY REVOLVER":GOTO200
1840 GOTO590
1850 END
1860 IFRND(10)=1 THEN PRINT:PRIN
T"THE GUNFIGHTER FILLED YOU FULL
OF LEAD..":GOTO1730
1870 GOTO340
1880 IFR=50 THEN PRINT"WITHOUT T
HE TOUCH, THE SIGHT OF LUTARN WI
LL KILL YOU..":GOTO340
1890 IFR=2 THEN PRINT"TOUCH THE
HERMIT ONLY WHILE THE GLOVE IS O
N..":GOTO340
1900 IFR=20 THEN PRINT"LUTARN LO
VES TO HEAR HIS NAME..":GOTO340
1910 PRINT"NOT NOW..":GOTO340
1920 IFAG<>-1 AND R=35 THEN PRIN
T"THE GORILLA FALLS ASLEEP..":AG
=-1:GOTO340
1930 PRINT"YOU'RE A LITTLE OFF T
UNE..":GOTO340
1940 G$=RIGHT$(I$,LEN(I$)-5):G$=
LEFT$(G$,3)
1950 IFLO<>-1 AND G$=LEFT$(JT$(3
3),3) AND IT(33)=-1 AND IT(34)=-
1 THEN PRINT"OK":LO=-1:IT$(33)="
LOADED REVOLVER":IT(34)=0:J=J-1:
GOTO340
1960 GOTO590

```

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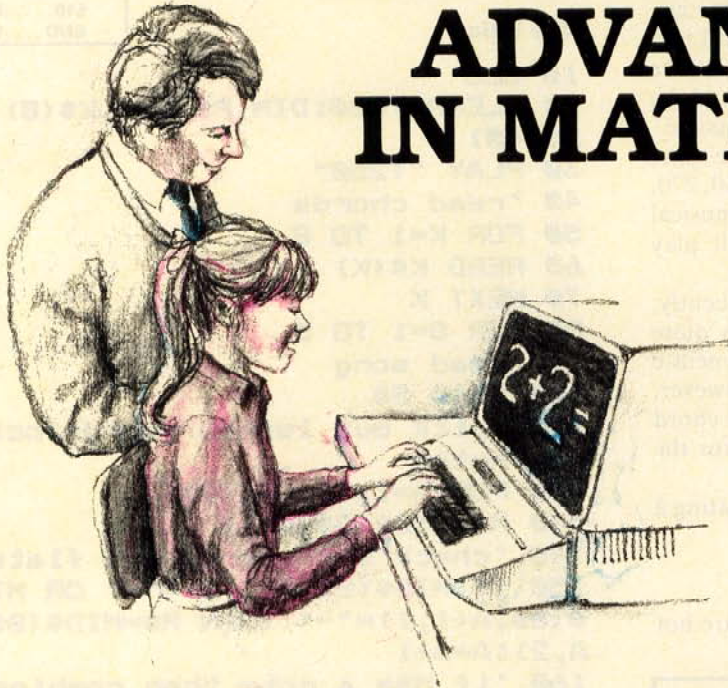
By
Dr. Charles H. Santee

This program merges chords and tunes (or melody and harmony) to give a unique musical effect for BASIC programs. Lines 400 through 470 are the "chords." Each chord is the last three notes of a guitar chord (get any beginning book of guitar music). Lines 500 through 590 are the "tunes." (Recognizable tunes selected from a beginning book of guitar music.) The tunes are identical to any string used with the *PLAY* statement with two exceptions. The letter "K" is used to indicate a change in the chord used in the tune. The number following the "K" indicates which of the eight chords is to be used. The letter "L" has a nearly identical effect as the usual command in the *PLAY* statement. However, the effect is achieved by repeating short bursts of a note and a chord until the length for the note desired. If you divide 24 by the value which follows "L" you get the number of repetitions. For example "L2" (a half note) would indicate $24/2$ or 12 repetitions of the "note chord" combination. When repeated fast enough this sounds somewhat like a half-note with an accompanying chord. The value of 24 was derived by experimentation.

The program first reads the eight chords. Then each "song" or "tune" is read. The components of the song are picked using the

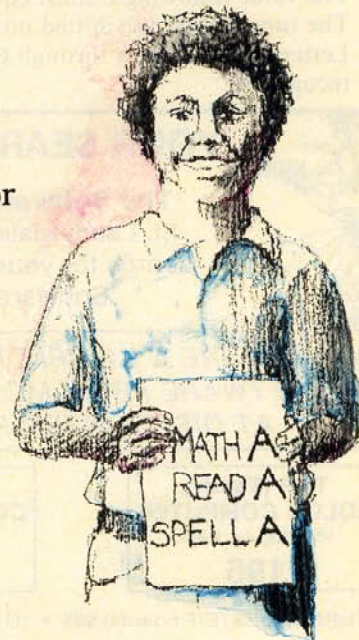


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MID\$ function. Each segment is checked to see if it is a "O," or Octave Marker (line 190), "K," or Chord Marker (line 210), "L," or Length Marker (line 230), or if the note is flat "-" or sharp "+" (line 150). If the string begins with a letter between "A" and "G," it is assumed to be a note, and the previously defined elements are combined with the number of repetitions defined by 24/ (value after the L). This note/chord combination is played for immediate verification. The created string is added to a string array that will compose the final musical product (PP\$(Z)=P\$). If the length of the element of the array exceeded 250 characters, the next element of the array is selected (Z=Z+1). Lines 300-360 plays the created song (chords and notes) at three different Tempos. The Tempos selected were found by experimentation to represent the range of effects possible.

Line 250 was added to create a visual effect while the tunes were being played. Any reference to P\$(in lines 250, 270, and 340) may be deleted without affecting the musical content. In fact, you will find that the tune will play somewhat more smoothly without printing graphics.

Because notes and chords are repeated frequently, creating all the strings needed for a given tune is quite memory consuming. An alternative is to simply generate and play the repetitions required for each note. However, unless you use machine language, the generation of chord notes may create too great a pause between notes for the desired effect.

There are some limitations you must follow in creating a turn. They include:

- 1) The value following L must equal 24 or less.
- 2) The tune cannot use dotted notes.
- 3) Letters other than A through G, L, K, and O are not recognized.

The strings generated by the program (P\$(Z)) can be saved and used in other programs.

(Dr. Santee has published poetry and curriculum as well as statistical and educational software (including CCM#3 for JARB Software). He is a recipient of several grants and awards for educational technology.)


✓ 160	....	0190
290	....	040E
510	....	0627
END	....	0976

The listing:

```

10 CLS
20 CLEAR 7000: DIM P$(40), K$(8), P$(40)
30 PLAY "T250"
40 'read chords
50 FOR K=1 TO 8
60 READ K$(K)
70 NEXT K
80 FOR S=1 TO 5
90 'read song
100 READ S$
110 'pick out length/chords/octaves/notes
120 FOR A=1 TO LEN(S$)
130 M$=MID$(S$,A,1)
140 'check for sharps and flats
150 IF MID$(S$,A+1,1)="-" OR MID$(S$,A+1,1)="-" THEN M$=MID$(S$,A,2):A=A+1
160 'if M$= a note then combine octaves/notes/and chords for L repetitions
170 IF LEFT$(M$,1)=>"A" AND LEFT$(M$,1)=<"B" THEN P$="":FOR B=1 TO L:P$=P$+O$+M$+K$:NEXT B:PRINT PP$:PLAY P$:P$=P$+"P$":IF LEN(P$)+LEN(P$(Z))>250 THEN Z=Z+1:P$(Z)=P$(Z)+P$ ELSE P$(Z)=P$(Z)+P$
180 'check for octave marker "O"
190 IF M$="O" THEN O$=MID$(S$,A,2):A=A+1
200 'check for chord markay "K"
210 IF M$="K" THEN A=A+1:K$=K$(VAL(MID$(S$,A,1)))
220 'check for length marker "L"
230 IF M$="L" THEN IF VAL(MID$(S$,A+1,2))>9 THEN L=INT(24/VAL(MID$(S$,A+1,2))):A=A+2 ELSE L=INT(24/VAL(MID$(S$,A+1,1))):A=A+1
240 'creat something to watch on screen while music is playing
250 PP$=CHR$(ASC(M$)+90+RND(5)*16)+PP$:PP$(Z)=PP$
260 NEXT A
270 PP$=""
280 IF RIGHT$(S$,1)="#" THEN 100
290 'play tune with 3 different tempos
300 FOR T=1 TO 3

```



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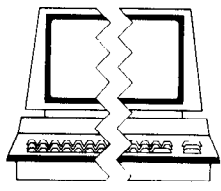
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```

310 PLAY"T4L4P1"
320 IF T=1 THEN T$="T25" ELSE IF
   T=2 THEN T$="T50" ELSE T$="T200
"
330 PLAY T$
340 FOR A=0 TO Z:PRINTPP$(A);:PL
AY P$(A):IF T=3 THEN P$(A)="
350 NEXT A
360 NEXT T
370 Z=0
380 NEXT S
390 'chords
400 DATA"03B04CE"
410 DATA"03B04G"
420 DATA"03B04F"
430 DATA"03A04CF+"
440 DATA"03A04CF"
450 DATA"03A04CE"
460 DATA"03A04DF"
470 DATA"03G+B04E"
480 '*****songs*****
490 'Shortnin
500 DATA"05L8K18EK2L4DK1L88EK2L4
DK1L88EK2DE04BK4AK20805K18EK2D04
BK1058EK2L4DK1L88EK2DE04BK4AK2L4
804L8804EDE04805EDE04K2805EDE04B
K4AK2L48L8805EDE04805EDE04805EDE
805DK2L48"
510 'We Three Kings
520 DATA"05K6L4AEL3AL8B05C04B05C
04A05L3EL8CL4DEK7L8FEDC04L4BK805
L4EK6L8DC04L8B05C04L4AEL3AL8B05C
04B05C04A05L3EL8CL4DEK7L8FEDCK6L
4C04K8BK6L3AK8L8BL4BB05K6C04L8BA
L4BK6CK2L3DL8CL4DK8EK604AL8B05CK
7DC04BAK6AG+EBL4BB05CK804L8BAL4B
K605CK2L3DL8CL4DK6EK7L8FEDC*"
530 DATA"K8L4C04BK6A04L3A"
540 'Bicycle Built for Two
550 DATA"05L3K18EC048L8AB05C04L4
A05C04K1L38805D8K1EK6CK404L8AB05
CL4DL8EK2L3D04L4D05L8EK3FEDL48L8
EK1DL4CCK2L8DK1L4EL8C04K5L4A05L8
CK104AL48K305F04L88K105L4CL8EK3D
L48K1CL8EK3DEFK18ECK3L4D05L8804K
1L3C05C"
560 'Camptown
570 DATA"05K2L8DD04B05DED04L4BK4
L8BL3AL8BL3AK205L8DD04B05DK2ED04
L4BK4L4AL8BAK2L3GL88B05DL48048K1
05L4EL88EK2L4D04B05L8DD04B05DED0
4L4BK4AL8BAK2L4805G"
580 'America
590 DATA"K103L4CK6CK7DK2L302B03K
1L8CK2L4DK1EEK3FK1L3EK8L8DK6L4CK
7DK1C02K3B03K1L1CL4888L38K3L8FK1
L4EK3FFFL3FK1L8EK2L4DK1EL8K5FK1E
K3DK1CL3EL8K3FK1L48K5L8AFK1L4EK3
DK1L3C04C05C"

```




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Planning your finances can be a very perplexing task. Things like an Individual Retirement Account, a mortgage, a certificate of deposit, and others, all have various different factors that must be taken into consideration. Sure, you could whip out your calculator and punch in the numbers, but why bother? CoCo can take on these problems with ease.

Time & Money is a program that will help you to evaluate the time value of your money. It will aid you in planning investments, loans, savings plans, and the like that involve compound interest. It is written in Extended BASIC, has machine language assists and requires 16K of memory.

When the program is run, you are presented with a choice of four types of calculations that can be performed, or a brief review of the operating instructions. The types of calculations that can be performed are as follows: *compound interest*, which involves a single deposit in an interest bearing account; *sinking fund*, which involves regular deposits into a savings plan; *loans*, which involves installment payments; and finally, a *lease* (or *annuity*), which involves payments (or withdrawals) until a specified ending balance is reached.

Each calculation selected, in turn, presents a "worksheet" screen, which allows for the entry of the appropriate figures. After you enter all of the "known" figures, the program will then calculate the "unknown" figure for you. Maybe I should explain this a little further. Let's say that you were to

deposit \$1,000 in a savings account that pays eight percent interest, compounded quarterly, and you want to leave the money in for 10 years. You would enter all of these "known" figures, and the program would then calculate the amount of money (the "unknown" figure) that would be in the account after the 10 years. Suppose now, that you wanted to have more money in the account, after the 10 years, than what was calculated. You could enter this amount, and make the interest rate or the initial deposit the "unknown" figure, and have the program calculate the interest rate or initial deposit required to achieve your goal.

Time & Money has several additional features that make using it very easy. Data can be entered as a simple mathematical expression. For example, the number of payments on a 25-year mortgage, can be entered as 12*25, instead of 300. In addition to calculating the "unknown" figures, it provides other information such as total payments, interest

Time & Money is an excellent financial planning tool. Since the program is in BASIC, I expected it to get bogged down at times, but it is remarkably swift. The documentation simply explains how to use the program, and includes several well thought out examples for you to follow. This made it very easy to get the most out of *Time & Money*, without having to spend a great deal of time studying the instructions. If you have ever spent hours slaving over a hot calculator, this program is for you. If it only had a print feature!

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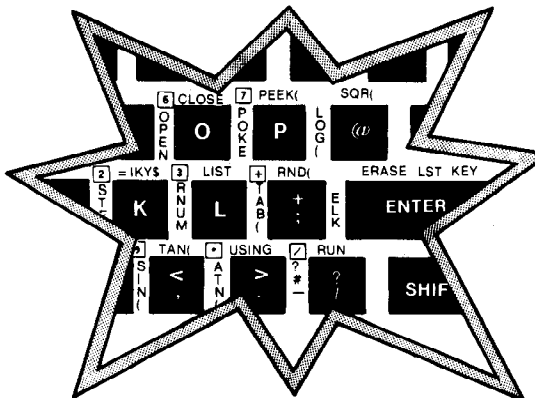
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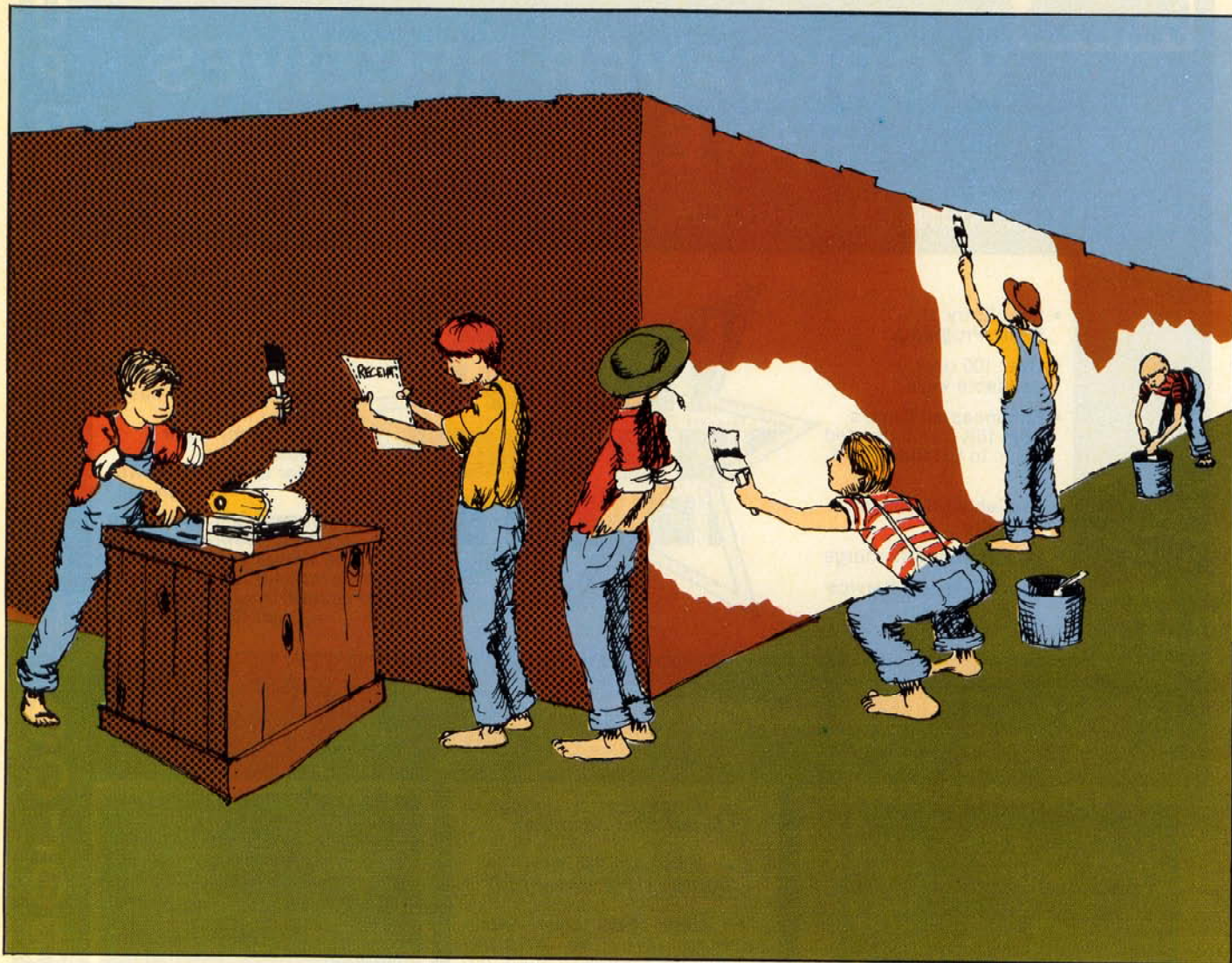
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UPGRADE YOUR COLOR COMPUTER



By Dennis H. Weide

(Dennis Weide is employed with AT&T and works in the 4ESS (#4 Electronic Switching System). He is an amateur computerist and teaches BASIC programming in the evenings to promote his hobby.)

One of my hobbies is making toys. Several years ago, my wife and I turned this hobby into a profitable part time business. When I bought my Color Computer, I decided to write some simple programs to help manage the business. *Sales Register* is a program that runs on a 16K Color Computer with Extended Color BASIC. Whether you sell toys, cosmetics, household products or some special service, you can modify this program to fit your needs.

What Does It Do?

Sales Register acts as an on-site cash register and sales recorder. It also does some minor inventory control.

When we sell our products at craft fairs, we use the program as a cash regis-

ter. It produces a customer sales receipt on the printer and a business record on the cassette. At the end of the day, I rewind the cassette and go home. Once home, I load and run the program and select the retrieve function. While I eat my dinner, the computer is compiling all the data for me and listing the totals. I then enter them in my ledger and save the cassette in a safe place.

During the Christmas season, we receive a lot of telephone orders. I usually keep the program loaded and running during the day while I am at work. When a customer calls and places an order, my wife enters it in the computer. When it comes time to make the toys, we run an inventory sales list. One look at the list tells us how many of each toy we must make. When delivery date rolls

TURN YOUR COMPUTER INTO A CASH REGISTER

around, I can either use the customers copy or retrieve another copy to have a record of the customer's name, address and order.

How The Program Works

A short explanation of the program will help you to understand it. Before you *CLOAD* the program, enter this statement first to clear all graphics memory: *POKE 25,6:NEW*.

When you run the program, a menu appears. You have three choices:

- 1) Compile sales data
- 2) Retrieve sales data
- 3) Read inventory data

Compile Sales Data

To compile sales data, enter a "1" when the menu appears. Each time you enter the compile mode, you will be asked to enter the date. You will also be asked if you want a printer copy or a magnetic tape copy. The printer copy can be used as a customer receipt or for your own records. The magnetic tape copy is a permanent record for you that can be used to analyze the data. If you choose a printer copy, be sure to turn the printer on. If you select a magnetic tape copy, be sure to load a blank cassette into your recorder and set it to record.

After you have answered these prompts, a sales form will appear on the screen. The cursor will be located next to "SOLD TO." Type the customer's name and *ENTER*. Then type the customer's address and *ENTER*. The cursor will move under the "ITEM" column. Type the name of the item sold as

it is listed in the inventory data (we will see how to enter inventory data later) and *ENTER*. The cursor then moves under the "QUAN" column. Type the quantity of this item that the customer is purchasing and *ENTER*. The cursor will move to the "PRICE EA." Type in the price of one item. When you press *ENTER* the program will multiply the price of one item by the quantity purchased and print the total under the "PRICE EA." column. Press *ENTER* one more time. The cursor will disappear. If your entries are incorrect, press *E*. This will erase the last line entered and set the program up for another

entry. If you should discover that you have made an error after you have pressed *ENTER*, keep pressing *ENTER* until the cursor disappears. Then press *E* to erase the entire line from the program. If your entry is correct, and you wish to make another, press *ENTER*. The cursor will move down one line and wait for the next entry. Press *CLEAR* if you are finished. When *CLEAR* is pressed, the program will compute and display the subtotal, sales tax and the total. Also, if you have chosen a magnetic tape copy or a printer copy, the program will generate those for you (see Figure 1 for a customer receipt sample).

Figure 1

Figure 1
Sample of Customer Receipt
D&M WOOD PRODUCTS

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ROY G. BIV
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4 JUNE 1983

SEDAN 1930	(2)	\$ 32.00
FORD VAN	(1)	\$ 7.00
LRG HELICOPTER	(1)	\$ 12.50

SUBTOTAL	4	\$ 51.50
SALES TAX		\$ 2.06

TOTAL		\$ 53.56

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After all this is finished, a prompt will tell you to press *ENTER* to continue. When you do, the screen will clear and a new sales form will appear with the cursor positioned next to "SOLD TO." You are now ready to make another sale.

Some Handy Options

If you type "MENU" next to "SOLD TO," the program will return to the main menu and allow you to pick another program function. If you type "TOTAL" next to "SOLD TO," the program will display the total amount of sales and taxes for this run of the program. In addition, if you have retrieved any data from cassette before the run, the totals for that data will be added to the current total.

For the first entry of the day, enter "START" next to "SOLD TO." For the last entry of the day, enter "END" next to "SOLD TO." These two keywords are used by the program to locate the start and end of the daily sales. They are also good points of reference when you retrieve the data for analysis.

The program will accept returns and refunds. Just enter "RETURN" or "REFUND" (for your own information) next to "SOLD TO" and enter the quantity as a negative number. The program will compute everything for you.

Retrieving Data

To retrieve data, rewind the cassette and press "PLAY." Then type "2" when the menu appears. The program will ask if you want a printer copy or an inventory list. The printer copy (see Figure 2) shows the date, customer's name and address, and the items sold. It also shows the total of that sale as well as the daily total up to and including that sale. This is done in case of multilined data on the cassette. If one sales record is lost, the total will still be displayed on the next good record.

A crosshatch (#) printed next to the item sold indicates that this item did not match anything in the inventory.

The inventory list (see Figure 3) will print each item of the inventory, the price of that item, the quantity sold and the total earned from each item. At the end, it will total all the sales for both the matched and mismatched data. You will have to adjust the inventory manually for the mismatched data. This is done for all entries between "START" and "END." Analyzing this data can show which items are the profit makers.

Reading Inventory Data

To read inventory data, enter "3" when the menu is displayed. Again, you

Figure 2
Sample of Retrieved Data

```

*****
1 MARCH 1983
START OF DATA

*****
1 MARCH 1983
SOLD TO JOHN DOE
ADDRESS 1500 E. ANYPLACE ST.

ITEM SOLD      QUANTITY      PRICE EA.      TOTAL PRICE
-----
SEDAN 1930      2              $  8.00        $ 16.00
FORD VAN        1              $  7.00        $  7.00
LRG HELICOPTER * 1              $ 12.50        $ 12.50
DAILY SUBTOTAL  $ 35.50        SUBTOTAL       $ 35.50
DAILY TAX       $  1.42        TAX            $  1.42
DAILY TOTAL    $ 36.92        TOTAL          $ 36.92

*****
1 MARCH 1983
SOLD TO MARY SMITH
ADDRESS 8501 W. SOMEPLACE AVE.

ITEM SOLD      QUANTITY      PRICE EA.      TOTAL PRICE
-----
T-28 PLANE      1              $  8.00        $  8.00
DAILY SUBTOTAL  $ 43.50        SUBTOTAL       $  8.00
DAILY TAX       $  1.74        TAX            $  0.32
DAILY TOTAL    $ 45.24        TOTAL          $  8.32

*****
1 MARCH 1983
END OF DATA

```

have the option of a printer copy. This copy (Figure 4) simply shows you the entire inventory list for reference and editing. It can also be used as a price list. The program will read all data statements and list a line number, the item and its price. This is useful for adding or deleting items in the inventory data statements. After all inventory items have been read, the program returns to the main menu.

Entering Your Own Inventory

Entering your own inventory is simple. Use data statements to list the item and price. In my program listing, the first data statement is at line 24400. The first item is a toy Cessna 172 airplane which sells for \$18.50. The second item is a toy Stearman airplane which sells for \$22.50. As you can see, the inventory is entered as ITEM,PRICE EACH, ITEM,PRICE EACH,etc. The data statements can be up to 255 characters per statement but I find it easier to keep them relatively short. You can add as large an inventory as memory will permit. This program listing runs in 16K with a little room left over.

The last line of the program should be 24800 DATA END,0. Line 3800 reads this line to determine when it reaches the end of the inventory. When you use this program, delete lines 24400 through 24700 and add your own inventory at this point. You can increment your line numbers as you wish (i.e., 24400, 24401, etc.)

I have limited all item names to 15 characters in length so that they can be displayed easily on the screen. You can use longer names if you do not care about the screen display but it will require more memory. Also, the program matches the item you type in to the inventory list so keeping it short makes the job easier all the way around.

Control Codes

This program was written for a Line Printer VII. However, I have used control codes for the printer functions so that if you have a different printer, you can change the codes and the program will run on your printer. Here are the codes:

PI\$ prints 32 "#" on the screen

P2\$ prints 32 blank spaces on the screen

P3\$ sends a line feed to the printer

P4\$ sets LINE PRINTER VII to large font

P5\$ sets LPVII to small font (normal)

P6\$ prints 80 dashes across paper

P7\$ prints 40 cross hatches across paper (large font)

Changing Variables

Line 2400 sets the name of your business. Replace the letters inside the quotation marks with the name of your business.

Line 2800 sets the state gross receipts tax (sales tax). If your state sales tax is 4.5 percent then line 2800 should look like this: 2800 TX=.045

Line 3200 sets the business telephone number and line 3300 sets the final message that you want printed on the customer's receipt. Again, just change the letters inside the quotes to indicate your business phone number or any message you might wish to appear on your sales receipt.

Some Final Notes

When compiling sales data, the program allows ten line entries per customer. If you want to increase the number of line entries, you must dimension ISS.

Figure 3

Sample of Inventory List INVENTORY SALES LIST

INVENTORY ITEM	PRICE EA.	QUANTITY SOLD	TOTAL PRICE
CESSNA 172	\$ 18.50	0	\$ 0.00
STEARMAN	\$ 22.50	0	\$ 0.00
F-86 SABRE	\$ 5.00	0	\$ 0.00
C-130 HERCULES	\$ 14.00	0	\$ 0.00
T-28 PLANE	\$ 8.00	1	\$ 8.00
BIPLANE W/PROP	\$ 14.00	0	\$ 0.00
DC-8 JET	\$ 14.00	0	\$ 0.00
LRGE BIPLANE	\$ 30.00	0	\$ 0.00
LRGE C-130	\$ 25.00	0	\$ 0.00
SESA BIPLANE	\$ 16.00	0	\$ 0.00
LRGE HELICOPTER	\$ 12.50	0	\$ 0.00
SM HELICOPTER	\$ 10.00	0	\$ 0.00
FORD VAN	\$ 7.00	1	\$ 7.00
TRUCK STKBD	\$ 10.00	0	\$ 0.00
SFCAR MGR	\$ 8.00	0	\$ 0.00
SEDAN 1930	\$ 8.00	2	\$ 16.00
COUPE 1930	\$ 8.00	0	\$ 0.00
SEDAN 1940	\$ 8.00	0	\$ 0.00
BLAZER	\$ 7.00	0	\$ 0.00
JEEP	\$ 7.00	0	\$ 0.00
TR-7 CAR	\$ 7.00	0	\$ 0.00
BLAZER W/BOAT	\$ 14.00	0	\$ 0.00
JEEP W/CAMPER	\$ 14.00	0	\$ 0.00
SCHOOLBUS	\$ 7.00	0	\$ 0.00
TRUCK DMP	\$ 14.00	0	\$ 0.00
TRUCK SEMI	\$ 14.00	0	\$ 0.00
TRUCK TINKR	\$ 14.00	0	\$ 0.00
TRUCK LOG LRGE	\$ 22.50	0	\$ 0.00
LRGE DOLL	\$ 15.00	0	\$ 0.00
SMALL DOLL W/NG	\$ 14.00	0	\$ 0.00
DOLLBED W/BLK	\$ 13.50	0	\$ 0.00
DOLL CRADLE	\$ 30.00	0	\$ 0.00
LRGE CANNON	\$ 4.00	0	\$ 0.00
SM CANNON	\$ 2.50	0	\$ 0.00
DEC PILLOW	\$ 4.00	0	\$ 0.00
CAT STFD	\$ 3.00	0	\$ 0.00
PLAQUE/CAR	\$ 4.00	0	\$ 0.00
ANIMAL CTS	\$ 1.25	0	\$ 0.00
PLAQUE/GUN	\$ 25.00	0	\$ 0.00
MISMATCHED SALES			\$ 12.50
INVENTORY SALES			\$ 31.00
TOTAL SALES			\$ 43.50

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IPS and IQS to the maximum number of line entries you want. Also, delete lines 7800 and 8500 and replace the *PRINT@* statements with *PRINTTAB* statements.

You can delete *REM* statements if you wish to save more memory. If your prices are printed with a percent sign (%) in front of them, it means that the *PRINTUSING* statements are too small. Add a crosshatch (#) to the statements as needed.

In line 1500, the first *POKE* is used to set the printer comma width. The second *POKE* is used with the *SCREEN* command to change the color of the screen if you use a black and white TV.

Once you get the program working properly, you can delete the *REMARKS* and all spaces from the program to increase the amount of free memory.

I have included a Table Of Variables (Table 1) to assist you in modifying the program for your needs. Although the program is slow (because of the LP VII and cassette), I find that the amount of time saved in figuring my orders and profits as well as having a permanent record makes this program useful.

Figure 4
Sample of Inventory Data

INVENTORY ITEM	PRICE EA.
1 CESSNA 172	\$18.50
2 STEARMAN	\$22.50
3 F-86 SABRE	\$ 5.00
4 C-130 HERCULES	\$14.00
5 T-28 PLANE	\$ 8.00
6 BIPLANE W/PROP	\$14.00
7 DC-8 JET	\$14.00
8 LRGE BIPLANE	\$30.00
9 LRGE C-130	\$25.00
10 SESA BIPLANE	\$16.00
11 LRGE HELICOPTER	\$12.50
12 SM HELICOPTER	\$10.00
13 FORD VAN	\$ 7.00
14 TRUCK STKBD	\$10.00
15 SFCAR MCA	\$ 8.00
16 SEDAN 1930	\$ 8.00
17 COUPE 1930	\$ 8.00
18 SEDAN 1940	\$ 8.00
19 BLAZER	\$ 7.00
20 JEEP	\$ 7.00
21 TR-7 CAR	\$ 7.00
22 BLAZER W/BOAT	\$14.00
23 JEEP W/CAMPER	\$14.00
24 SCHOOLBUS	\$ 7.00
25 TRUCK DMP	\$14.00
26 TRUCK SEMI	\$14.00
27 TRUCK TNKER	\$14.00
28 TRUCK LOG LRGE	\$22.50
29 LRGE DOLL	\$15.00
30 SMALL DOLL W/NG	\$14.00
31 DOLLBED W/BLK	\$13.50
32 DOLL CRADLE	\$30.00
33 LRGE CANNON	\$ 4.00
34 SM CANNON	\$ 2.50
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Table of Variables
(Numeric Variables)

B	reads numeric data statements
CT	daily total charges without tax
E1-E2	FOR-NEXT loop or error subroutine
F1-F2	program flags
I	used for any insignificant prompt inputs
IQ	quantity of item sold for customer receipts
IS(X)	quantity of item sold for inventory sales list
IT	total sales for inventory sales list
L	determines length of string variables
LP	loop values for reading data statements
MO	total amount of sales compiled in retrieve mode
MM	total mismatched sales for inventory sales list
TC	total charge per sale without tax
TQ	total quantity sold
TT	total sales tax per day
TX	state sales tax
T1-T9	screen tab settings
X,Y,Z	used in FOR-NEXT loops

Table of Variables
(String Variables)

A\$	used to read string data
AD\$	customer address
BN\$	your business name
CC\$	input for cassette copy prompt
DAS	date entered in compile mode or read in retrieve mode
IS	input for insignificant prompts
IL\$	input for inventory list prompt
IP\$(X)	price of item sold
IQ\$(X)	quantity of item sold
IS\$(X)	name of item sold
PC\$	input for printer copy prompt
P1\$-P7\$	screen and printer codes
NO\$	message for bottom of customer receipt
SP\$	customer name
TN\$	your business phone number

4600	....	030A
6800	....	055B
8400	....	07A0
11000	...	0AB6
13300	...	0D85
16800	...	11AB
20000	....	1527
22500	....	1817
END	....	1CF9

The listing:

```

1000 ' SALES REGISTER
1100 ' BY DENNIS H. WEIDE
1200 ' COPYRIGHT 1983
1300 '
1400 CLS: CLEAR 1000
1500 POKE 153,23:POKE 359,13:SCR
EEN 0,1
1600 '
1700 ' CONTROL CODES
1800 '
1900 P1$=STRING$(32,"*"):P2$=STR
ING$(32,32):P3$=CHR$(10):P4$=CHR

```

```

$(31)
2000 P5$=CHR$(30):P6$=STRING$(80
,"-"):P7$=STRING$(40,"#")
2100 '
2200 ' BUSINESS NAME
2300 '
2400 BN$="D&M WOOD PRODUCTS"
2500 '
2600 ' STATE GROSS RECEIPTS T
AX
2700 '
ISTER
1100 ' BY DENNIS H. WEIDE
1200 ' COPYRIGHT 1983
1300 '
1400 CLS: CLEAR 1000
1500 POKE 153,23:POKE 359,13:SCR
EEN 0,1
1600 '
1700 ' CONTROL CODES
1800 '
1900 P1$=STRING$(32,"*"):P2$=STR
ING$(32,32):P3$=CHR$(10):P4$=CHR
$(31)
2000 P5$=CHR$(30):P6$=STRING$(80
,"-"):P7$=STRING$(40,"#")
2100 '
2200 ' BUSINESS NAME
2300 '
2400 BN$="D&M WOOD PRODUCTS"

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```

2500 *
2600 * STATE GROSS RECEIPTS T
AX
2700 *
2800 TX=.04
2900 *
3000 * BUSINESS PHONE NUMBER
3100 *
3200 TN$="PH 505+293-5228"
3300 NO$="WE GUARANTEE YOUR SATI
SFACTION"
3400 *
3500 * DETERMINE INVENTORY LI
ST LENGTH
3600 *
3700 READ A$,B:X=X+1
3800 IF A$="END" THEN LP=X-1 ELS
E 3700
3900 DIM IS(LP)
4000 *
4100 * DISPLAY MENU
4200 *
4300 CLS:PRINT P1$;:PRINTTAB(9)"
SALES RECORD "
4400 PRINTTAB(7)"BY DENNIS H. WE
IDE"
4500 PRINTTAB(9)"COPYRIGHT 1983"
4600 PRINT P1$
4700 PRINT:PRINTTAB(10)"PROGRAM
MENU"

```

```

4800 PRINT:PRINTTAB(5)"1. COMPIL
E SALES DATA"
4900 PRINTTAB(5)"2. RETRIEVE SAL
ES DATA"
5000 PRINTTAB(5)"3. READ INVENTO
RY DATA"
5100 PRINT:PRINTTAB(9)"";:INPUT"
WHICH ONE";I
5200 CLS
5300 ON I GOTO 5900,12900,21100
5400 CLS:GOSUB 18500:GOTO 4300
5500 PRINT IS$(Y),IP$(Y),IQ$(Y)
5600 *
5700 * COMPILE SALES DATA
5800 *
5900 INPUT "ENTER TODAY'S DATE";
DA$
6000 PRINT:INPUT"PRINTER COPY (Y
/N)";PC$
6100 PRINT:INPUT"MAG TAPE COPY (
Y/N)";CC$
6200 CLS:IF PC$="Y" THEN 6300 EL
SE 6400
6300 PRINT:PRINTTAB(1) "TURN PRI
NTER ON AND SET PAPER":PRINT
6400 IF CC$="Y" THEN 6500 ELSE 6
700
6500 PRINTTAB(10)"LOAD CASSETTE"
6600 PRINT:PRINTTAB(4)"PRESS <PL
AY> & <RECORD>"
6700 GOSUB 19900
6800 CLS:X=1:TQ=0:TC=0:PRINTTAB(
1)"SOLD TO"
6900 PRINTTAB(1)"ADDRESS":PRINT
P1$;
7000 PRINTTAB(1)"ITEM";TAB(15)"Q
UAN";TAB(23)"PRICE EA":PRINT P1$
7100 PRINT@10,"";:LINE INPUT SP$
7200 IF SP$="START" AND PC$="Y"
THEN 7300 ELSE 7400
7300 PRINT#-2,P4$;P7$;"START OF
DATA";P5$:GOTO 9600
7400 IF SP$="END" AND PC$="Y" TH
EN 7500 ELSE 7600
7500 PRINT#-2,P4$;P7$;"END OF DA
TA";P5$:GOTO 9600
7600 IF SP$="TOTAL" THEN 19100 E
LSE IF SP$="MENU" THEN 4300
7700 PRINT@42,"";:LINE INPUT AD$
7800 T1=161:T2=184:T3=177
7900 PRINT@T1,"";:LINE INPUT IS$
(X):PRINT@T3,"";
8000 LINE INPUT IQ$(X):PRINT@T2,
"";:LINE INPUT IP$(X)
8100 PRINT@T2-2,USING"#####.##";
VAL(IP$(X))*VAL(IQ$(X))
8200 I$=INKEY$:IF I$="" THEN 820
0
8300 IF I$="E" THEN PRINT@T1,P2$

```

RAINBOWfest Seminar Talks Available On Tape

Copies of all seminars given at RAINBOWfest are now available on audio tape.

In addition, a tape is available of the keynote breakfast speech given by Don Inman. Seminars were given by Fred Scerbo of IMB on educational software; E.R. Bailey of Micrologic on faster Basic; Dr. Hal Snyder of the Northern Illinois Color Computer Club on assembly language techniques; Tom Nelson of Nelson Software on legal aspects of software marketing; Steve Bjork of Datasoft on assembly language graphics; Charles Roslund of Elite Software on machine language utilities and a cooperative session for CoCo clubs with Lonnie Falk of *the Rainbow*. Each session lasted over an hour.

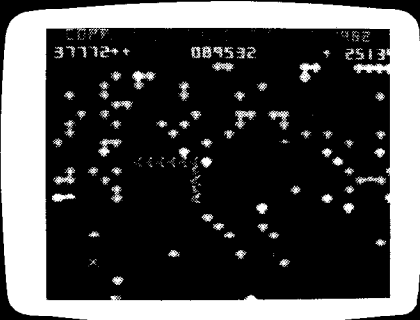
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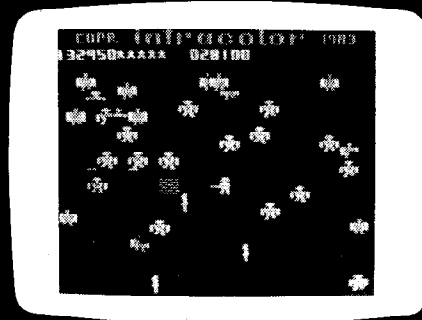


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:GOTO 7900
8400 TC=TC+(VAL(IP$(X))*VAL(IQ$(X))):TQ=TQ+VAL(IQ$(X))
8500 T1=T1+32:T2=T2+32:T3=T3+32
8600 IF ASC(I$)=12 THEN 8700 ELSE X=X+1:GOTO 7900
8700 PRINTTAB(22) "-----":PRINTTAB(12) "SUBTOTAL";TAB(22) "";
8800 PRINTUSING"#####.##";TC
8900 PRINTTAB(12) "TAX";TAB(22) ""
:PRINTUSING"#####.##";TX*TC
9000 PRINTTAB(22) "-----":PRINTTAB(12) "TOTAL";TAB(22) "";
9100 PRINTUSING"#####.##";TC+(TX*TC):PRINT:PRINT
9200 TT=TT+(TC*TX):CT=CT+TC
9300 '
9400 ' CASSETTE COPY OF DATA
9500 '
9600 IF CC$="Y" THEN 9700 ELSE 10300
9700 OPEN"O",#-1,"DATA"
9800 PRINT#-1,X,SP$,AD$:FOR Y=1 TO X:PRINT#-1,IS$(Y),IP$(Y),IQ$(Y):NEXT
9900 PRINT#-1,DA$,TC,TT,CT:CLOSE
-1
10000 '
10100 ' PRINTER COPY OF SALES
10200 '
10300 IF PC$="Y" THEN 10400 ELSE 12400

```

```

10400 IF SP$="START" OR SP$="END" THEN 12400
10500 PRINT#-2,P4$:L=(40-LEN(BN$))/2
10600 PRINT#-2,TAB(L);BN$;P3$;P3$
10700 L=(40-LEN(TN$))/2:PRINT#-2,TAB(L);TN$;P3$;P3$
10800 L=(40-LEN(SP$))/2:PRINT#-2,TAB(L);SP$
10900 L=(40-LEN(AD$))/2:PRINT#-2,TAB(L);AD$;P3$;P3$
11000 L=(40-LEN(DA$))/2:PRINT#-2,TAB(L);DA$;P3$;P5$
11100 FOR Y=1 TO X
11200 PRINT#-2,TAB(20) IS$(Y);TAB(40);"(";VAL(IQ$(Y));")";TAB(50)"";
11300 PRINT#-2,USING"#####.##";VAL(IP$(Y))*VAL(IQ$(Y)):NEXT Y
11400 PRINT#-2,TAB(41) "----";TAB(50) "-----"
11500 PRINT#-2,TAB(20) "SUBTOTAL";TAB(41);TQ;TAB(50) "";
11600 PRINT#-2,USING"#####.##";TC
C
11700 PRINT#-2,TAB(20) "SALES TAX";TAB(50) "";:PRINT#-2,USING"#####.##";TC*TX
11800 PRINT#-2,TAB(50) "-----"
11900 PRINT#-2,TAB(20) "TOTAL";TAB(50) "";
12000 PRINT#-2,USING"#####.##";TC+(TC*TX)
12100 PRINT#-2,P3$;P3$;P4$
12200 L=(40-LEN(NO$))/2:PRINT#-2,TAB(L);NO$;P5$
12300 PRINT#-2,STRING$(5,10)
12400 FOR Y=1 TO X:IP$(Y)="" :IS$(Y)="" :IQ$(Y)=""
12500 NEXT Y:X=0:GOSUB 19900:GOTO 6800
12600 '
12700 ' RETRIEVE DATA
12800 '
12900 CLS:PRINT:INPUT"PRINTER COPY (Y/N)";PC$
13000 PRINT:INPUT"INVENTORY LIST (Y/N)";IL$
13100 CLS:IF PC$="Y" THEN 13200 ELSE 13300
13200 PRINT#-2,P3$;P3$;P4$:PRINT#-2,TAB(15);"SALES DATA";P3$;P3$;P5$
13300 OPEN"I",#-1,"DATA"
13400 INPUT#-1,X,SP$,AD$
13500 IQ=0:FOR Y=1 TO X
13600 INPUT#-1,IS$(Y),IP$(Y),IQ$(Y):IQ=IQ+VAL(IQ$(Y))

```

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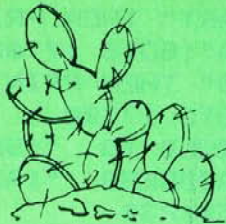
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```

13700 NEXT Y: INPUT#-1, DA$, TC, TT,
CT: CLOSE-1
13800 MO=0: PRINT: PRINT "SOLD TO "
SP$: PRINT: FOR X=1 TO Y-1
13900 PRINT TAB(2); VAL(IQ$(X)); TA
B(5); IS$(X); TAB(24);
14000 PRINT USING "####.##"; VAL(IP
$(X))*VAL(IQ$(X))
14100 MO=MO+(VAL(IP$(X))*VAL(IQ$
(X))): NEXT X
14200 PRINT TAB(24) "-----": PRIN
TTAB(15) "SUBTOTAL"; TAB(24) "";
14300 PRINT USING "####.##"; MO
14400 PRINT TAB(15) "TAX"; TAB(24) "
";
14500 PRINT USING "####.##"; MO*TX
14600 PRINT TAB(24) "-----"
14700 PRINT TAB(15) "TOTAL"; TAB(24
) "";
14800 PRINT USING "####.##"; MO+(MO
*TX): PRINT
14900 IF IL$="Y" THEN GOSUB 2030
0
15000 IF PC$="Y" THEN 15400 ELSE
17800
15100 '
15200 ' PRINTER COPY OF DATA
15300 '
15400 PRINT#-2, P4$; P7$; P3$: PRINT

```

```

#-2, DA$; P3$
15500 IF SP$="START" THEN PRINT#
-2, "START OF DATA": GOTO 17700
15600 IF SP$="END" THEN PRINT#-2
, "END OF DATA": GOTO 17700
15700 PRINT#-2, "SOLD TO "; SP$
15800 PRINT#-2, "ADDRESS "; AD$
15900 PRINT#-2, P5$; P3$
16000 IF LEFT$(SP$, 5)="START" OR
LEFT$(SP$, 3)="END" THEN 16100 E
LSE 16200
16100 PRINT#-2, SP$: GOTO 17800
16200 PRINT#-2, " ITEM SOLD", "QU
ANTITY", "PRICE EA.", "TOTAL PRICE
"
16300 PRINT#-2, P6$
16400 FOR Y=1 TO X-1
16500 PRINT#-2, IS$(Y), : PRINT#-2,
USING "####"; VAL(IQ$(Y)), : PRINT#-
2, "",
16600 PRINT#-2, USING "#####.##"; V
AL(IP$(Y)),
16700 PRINT#-2, "", : PRINT#-2, USIN
G "#####.##"; VAL(IP$(Y))*VAL(IQ$(
Y))
16800 NEXT Y
16900 PRINT#-2, , , , "-----"
17000 PRINT#-2, "DAILY SUBTOTAL",
: PRINT#-2, USING "#####.##"; CT,
17100 PRINT#-2, , "SUBTOTAL", : PRIN
T#-2, USING "#####.##"; TC
17200 PRINT#-2, "DAILY TAX", : PRIN
T#-2, USING "#####.##"; TT,
17300 PRINT#-2, , "TAX", : PRINT#-2,
USING "#####.##"; TX*TC
17400 PRINT#-2, , "-----", , "----
-----": PRINT#-2, "DAILY TOTAL",
17500 PRINT#-2, USING "#####.##"; T
T+CT, : PRINT#-2, , "TOTAL",
17600 PRINT#-2, USING "#####.##"; T
C+(TC*TX)
17700 PRINT#-2, P3$; P3$; P3$; P3$
17800 IF LEFT$(SP$, 3)="END" THEN
PRINT: GOTO 18000
17900 GOTO 13300
18000 IF IL$="Y" THEN GOSUB 2240
0
18100 GOSUB 19900: CLS: GOTO 4300
18200 '
18300 ' ERROR SUBROUTINE
18400 '
18500 FOR E1=1 TO 5
18600 CLS: PRINT@233, "ILLEGAL ENT
RY"
18700 SOUND 100, 5: CLS: FOR E2=1 T
O 50: NEXT E2, E1: CLS: RETURN
18800 '
18900 ' DISPLAY TOTALS
19000 '
19100 CLS: PRINT: PRINT TAB(5) "TOTA

```

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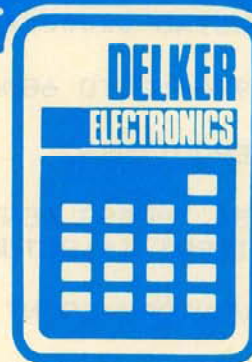
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```

L SALES FOR TODAY":PRINT:PRINT
19200 PRINTTAB(5)"TOTAL SALES  "
;:PRINTUSING"#####.##";CT
19300 PRINT:PRINTTAB(5)"TOTAL TA
X   ";;:PRINTUSING"#####.##";TT
19400 PRINT:PRINTTAB(5)"GRAND TO
TAL  ";;:PRINTUSING"#####.##";CT+
TT
19500 GOSUB 19900:GOTO 6800
19600 '
19700 '   SUBROUTINES
19800 '
19900 PRINT@450,"PRESS <ENTER> T
O CONTINUE";:INPUT I$:RETURN
20000 '
20100 '   INVENTORY COUNT
20200 '
20300 FOR Y=1 TO X-1:RESTORE:F2=
0:FOR Z=1 TO LP:READ A$,B
20400 IF A$=IS$(Y) THEN IS(Z)=IS
(Z)+VAL(IQ$(Y)):F2=1
20500 NEXT Z
20600 IF F2=0 THEN IS$(Y)=IS$(Y)
+P4$+" #"+P5$:MM=MM+VAL(IP$(Y))*
VAL(IQ$(Y))
20700 NEXT Y:RETURN
20800 '
20900 '   DATA STATEMENT PRINTO
UT

```

```

21000 '
21100 CLS:F1=0:PRINT:INPUT"PRINT
ER COPY (Y/N)";PC$:CLS
21200 IF PC$="Y" THEN 21300 ELSE
21500
21300 PRINT#-2,P4$;P3$;P3$:PRINT
#-2,TAB(13)"INVENTORY DATA";P3$;
P5$
21400 PRINT#-2,P3$;P3$:PRINT#-2,
"INVENTORY ITEM",,"PRICE EA.":PR
INT#-2,P6$
21500 RESTORE:FOR X=1 TO LP:READ
A$,B
21600 PRINTA$,;:PRINTUSING"
###.##";B
21700 IF PC$="Y" THEN 21800 ELSE
22000
21800 PRINT#-2,X;A$,,"";:PRINT#-
2,USING"###.##";B
21900 F1=F1+1:IF F1=5 THEN PRINT
#-2,P6$:F1=0
22000 NEXT:RESTORE:PRINT:PRINT:G
OSUB 19900:CLS:GOTO 4300
22100 '
22200 '   INVENTORY PRINTOUT
22300 '
22400 RESTORE:IT=0:PRINT#-2,P3$;
P3$;P4$

```

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22500 PRINT#-2,TAB(8)"INVENTORY
SALES LIST";P3$;P3$;P5$
22600 PRINT#-2," INVENTORY","
PRICE","QUANTITY"," TOTAL"
22700 PRINT#-2," ITEM"," EA
.," " SOLD"," PRICE"
22800 PRINT#-2,P6$
22900 F1=0:FOR X=1 TO LP:READ A$
,B
23000 PRINT#-2,A$,:PRINT#-2,USIN
G"$###.##";B,:PRINT#-2,""
23100 PRINT#-2,USING"#####";IS(X
),:PRINT#-2,""
23200 PRINT#-2,USING"$###.##";B
*IS(X)
23300 F1=F1+1:IF F1=5 THEN PRINT
#-2,P6$:F1=0
23400 IT=IT+(B*IS(X)):IS=IS+IS(X
)
23500 NEXT X:PRINT#-2,P6$
23600 PRINT#-2,,,"MISMATCHED SAL
ES",:PRINT#-2,USING"#####.##";MM
23700 PRINT#-2,,,"INVENTORY SALE
S",:PRINT#-2,USING"$###.##";IT
23800 PRINT#-2,,,"-----"
23900 PRINT#-2,,,"TOTAL SALES",:
PRINT#-2,USING"$###.##";MM+IT
24000 RETURN
24100 '

```

```

24200 ' DATA STATEMENTS
24300 '
24400 DATA CESSNA 172,18.50,STEA
RMAN,22.50,F-86 SABRE,5.00,C-130
HERCULES,14.00,T-28 PLANE,8.00,
BIPLANE W/PROP,14.00,DC-8 JET,14
.00,LRGE BIPLANE,30.00,LRGE C-13
0,25.00,SE5A BIPLANE,16.00
24500 DATA LRGE HELICOPTER,12.50
,SM HELICOPTER,10.00,FORD VAN,7.
00,TRUCK STKBD,10.00,SPCAR MGA,8
.00,SEDAN 1930,8.00,COUPE 1930,8
.00,SEDAN 1940,8.00,BLAZER,7.00,
JEEP,7.00,TR-7 CAR,7.00
24600 DATA BLAZER W/BOAT,14.00,J
EEP W/CAMPER,14.00,SCHOOLBUS,7.0
0,TRUCK DMP,14.00,TRUCK SEMI,14.
00,TRUCK TNKER,14.00,TRUCK LOG L
RGE,22.50,LRGE DOLL,15.00,SMALL
DOLL W/NG,14.00,DOLLBED W/BLK,13
.50
24700 DATA DOLL CRADLE,30.00,LRG
E CANNON,4.00,SM CANNON,2.50,DEC
PILLOW,4.00,CAT STFD,3.00,PLAQU
E/CAR,4.00,ANIMAL CTS,1.25,PLAQU
E/GUN,25.00
24800 DATA END,0

```

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By Steve Blyn



Young children are often confused by the concepts of up-down, near-far, over-under, and the like. It brings to mind an incident I experienced with one of my children. He came to me (age two), arms raised, and said, "Pick me down." I laughed, lifted him, and said, "You mean, 'pick me up.'" Then, as now, he was a kid with a mind of his own. He gave me a dirty look, pointed to the floor, and said, "Put me up!" Needless to say, he has since mastered the concepts of up and down. Perhaps if we had the Color Computer back in the early '70s the two of us could have had some fun viewing this concept graphically displayed on the screen.

The learning of concepts in children has always fascinated me. Because I am both a parent and a teacher, I am always anxious to use the computer to help children develop childrens' reasoning abilities.

The thinking process has been described as ranging from concrete to abstract. This means that thinking begins as ideas pertaining to highly specific, tangible events, and moves toward ultimate thought on abstract properties of classes of events and experiences.

Becoming aware of the relationships of objects in the world around him is a slow task for a child. Let's consider the concept of "right and left." This apparently simple concept for adults really passes through three distinct and rather lengthy stages in each child's life.

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

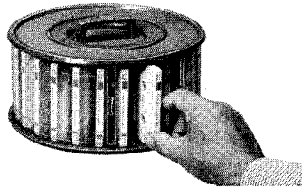


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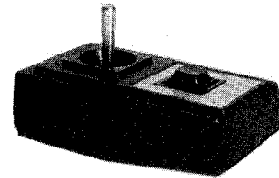
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During the first stage (ages five—eight), directions are considered only from the child's own point of view. Right and left can only be considered as right and left of himself. This is called ego-centricity. In the second stage, (ages eight—11), left and right are also considered and understood in relation to another person or object. In the final stage (ages 11—12), right and left are also considered from the viewpoint of things themselves.

The above general description is applicable to the growth of many concepts in children. The Color Computer can especially be an aid to children in concept formation. The graphics, colors and sounds can help them to visualize many concepts with unique presentations.

The program that follows gives the young child practice in developing the concepts of near-far, over-under, and in-out. The child playing this game decides whether the topics are merely examples of what can be done. You may decide to only use one concept at a time. Many other concepts can be worked on with other pictures and words. Left-right, north-south, big-bigger-biggest and small-smaller-smallest are other possibilities. Shapes can also be taught in a similar manner.

Lines 60-110 choose a random position for the bird to appear each time. Lines 130 to 450 draw the pictures and words. Lines 460-490 wait for the child's response. Lines 500-560 draw the response number the child pressed on the keyboard.

Lines 570-640 check the response. A correct response gets a happy sound and the next example begins. Incorrect responses get another turn at the same question. The child can keep guessing until he is correct. The fact that he can keep guessing repeatedly and there is no time limit or score

are purposeful. I see no reason to impose any limits or constraints on a preschool child in this type of situation. The idea is to get the concepts across to him. We can make him a better game player some other time.

Lines 650-940 create strings to draw the letters and numbers needed in this program.

I can't overemphasize the importance of the teaching of such seemingly easy concepts as in and out. It is imperative that children be properly motivated if they are to retain the knowledge of these concepts. The Color Computer is certainly a means to achieving this end. Your children will grasp and maintain these concepts, and perhaps more importantly, they will have great fun in doing it. Can you imagine—learning and having fun at the same time!

280.... 02E0
500.... 0586
680.... 07F1
END.. 0ADD

The listing:

```

10 REM"BIRD"
20 REM <C> STEVE BLYN,COMPUTER
ISLAND,N.Y. 1983
30 CLEAR1000
40 TM=RND(-TIMER):REM"THIS GETS
A TRUE RANDOM FOR THE COCO"
50 A=RND(5)
60 REM"RANDOMLY CHOOSE THE BIRD'
S POSITION EACH TIME AND LOCATE
THE COORDINATES"
70 IF A=2 THEN X=-8:Y=135
80 IF A=1 THEN X=30:Y=100
90 IF A=3 THEN X=X+15:Y=Y-10
100 IF A=4 THEN X=X+60:Y=Y+30
110 IF A=5 THEN X=X+205:Y=Y+115
120 GOTO 660:REM"READ THE NUMBER
S AND LETTERS"
130 PMODE 3,1:PCLS5:SCREEN1,1
140 COLOR2
150 CIRCLE(55,60),45,2,.6
160 CIRCLE(55,60),46,2,.6
170 CIRCLE(55,60),47,2,.6
180 PAINT(60,60),2,2
190 CIRCLE(7,120),40,2,2,.93,.10
200 CIRCLE(99,120),40,2,2,.41,.5
9
210 LINE(36,163)-(68,163),PSET
220 PAINT(55,160),2,2
230 REM"DRAWING THE BIRD"
240 COLOR3:CIRCLE(10+X,160-Y),5
250 CIRCLE(18+X,165-Y),8
260 PAINT(18+X,165-Y),3,3
270 LINE(24+X,160-Y)-(36+X,157-Y
),PSET
280 LINE-(20+X,169-Y),PSET
290 LINE-(20+X,176-Y),PSET
300 CIRCLE(20+X,176-Y),2
310 FORT=1 T05:PLAY"05L200BCB;L2
50;G-;L100;C":NEXTT
320 LINE(5,1)-(250,20),PSET,BF

```

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```

330 DRAW "C1A0S4BM20,16"+W$+H$+E
$+R$+E$
340 DRAW SP$+I$+S$
350 DRAW SP$+T$+H$+E$
360 DRAW SP$+B$+I$+R$+D$+SP$+Q0$
370 REM"PRINT THE WORDS**IN, OVER
, UNDER, NEAR, FAR FROM THE TREE"
380 DRAW"C4BM130,40"+A1$+SP$+I$+
N$
390 DRAW"BM130,60"+A2$+SP$+O$+V$
+E$+R$
400 DRAW"BM130,80"+A3$+SP$+U$+N$
+D$+E$+R$
410 DRAW"BM130,100"+A4$+SP$+N$+E
$+A$+R$
420 DRAW"BM120,120"+A5$+SP$+F$+A
$+R$+SP$+F$+R$+O$+M$
430 LINE (135,130)-(240,130),PSET
440 COLOR 3:LINE(106,163)-(125,1
47),PSET,BF
450 DRAW"BM145,140"+T$+H$+E$+SP$
+T$+R$+E$+E$
460 JJ$=INKEY$
470 FOR T= 1 TO 200: NEXT T
480 COLOR2:LINE(106,163)-(125,14
7),PSET,BF
490 IF JJ$="" THEN 460
500 IF JJ$="1" THEN KK$=A1$
510 IF JJ$="2" THEN KK$=A2$

```

```

520 IF JJ$="3" THEN KK$=A3$
530 IF JJ$="4" THEN KK$=A4$
540 IF JJ$="5" THEN KK$=A5$
550 REM"DRAW CHILD'S RESPONSE #"
560 DRAW "C0BM112,159"+KK$
570 JJ=VAL(JJ$)
580 IF JJ<1 OR JJ>5 THEN 460
590 IF JJ$="1" AND A=1 THEN 600
ELSE IF JJ$="2" AND A=2 THEN 600
ELSE IF JJ$="3" AND A=3 THEN 60
0 ELSE IF JJ$="4" AND A=4 THEN 6
00 ELSE IF JJ$="5" AND A=5 THEN
600 ELSE 620
600 FOR T=1 TO 5:PLAY"04;L250;GE
FBAG":NEXTT
610 RUN
620 REM"WRONG RESPONSE ROUTINE"
630 FOR T=1TO3:SOUND10,4:NEXTT
640 DRAW"C3A0S4BM140,170"+L$+O$+
O$+K$+SP$:DRAW A$+G$+A$+I$+N$:GO
TO460
650 REM"THE DIRECTIONS TO DRAW L
ETTERS AND NUMBERS NEEDED"
660 A$="U8R8D4L8BR8D4BR4"
670 B$="U8R6F2D2L8BR8D2G2L6BR12"
680 D$="U8R6F2D4G2L6BR12"
690 E$="U8R8BD4L8BD4R8BR4"
700 F$="U8R8BD4L8BD4BR12"
710 G$="U8R8BD4L4BR4D4L8BR12"
720 H$="U8BR8D8BU4L8BD4BR12"
730 I$="BU8R8BL4D8BL4R8BR4"
740 K$="U8BR8G4L4BR4F4BR4"
750 L$="U8BD8R8BR4"
760 M$="U8F4E4D8BR4"
770 N$="U8F8U8BD8BR4"
780 O$="U8R8D8L8BR12"
790 P$="U8R8D4L8BD4BR12"
800 R$="U8R8D4L8BR4F4BR4"
810 S$="BU4U4R8BD4L8BR8D4L8BR12"
820 T$="BU8R8BL4D8BR8"
830 U$="U8BR8D8L8BR12"
840 V$="BU8D4F4E4U4BD8BR4"
850 W$="U8BR8D8H4G4BR12"
860 E0$=E0$
870 QQ$="BR1H1U1E1R3E2U1H2L5
880 A1$="BR2R4L2U8G2BD6BR10"
890 A2$="BR1H1U1E1R5E2U1H2L4G2BD
6BR1R7BR4"
900 A3$="BR1HBU6E1R6F1D2G1L4R4F1
D2G1L6BR11"
910 A4$="BU4U4BR4BD1D3R4L8R4D4BR
8"
920 A5$="BR1H1BU2U4E1R6F1BD2BL1L
6G1BD4BR1R6E1U3H1BD5BR5"
930 SP$="BR12":REM "SPACER"
940 AQ$="BENR3HER2U2":REM "?"
950 GOTO 130

```

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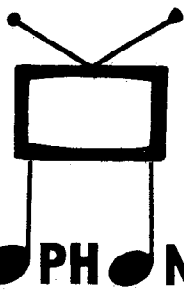
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Dynacalc Is Highly Sophisticated Spreadsheet

Radio Shack has some tough competition in the electronic spreadsheet market. *Dynacalc*, by Computer Systems Center, is a second generation *Visicalc* program available for the CoCo. First of all, let me say that there is no way you can give a program of this caliber the credit due in a review. I would classify *Dynacalc* as sophisticated business software. Don't let that scare you. I guess the proper perspective is the reality that software formerly available only on minis and business systems is hitting the hobby market. Personally, I am glad to see it. I can visualize someone using a CoCo for a small business, but I can also see the need for this type of program in the home.

Dynacalc is designed to operate under the *Flex* disk operating system, therefore, it requires 64K and at least one disk drive. Two drives are recommended, but as the manual states, if you are used to operating with one drive you will have no more difficulty than usual. A 51 x 24 screen is used for all output, therefore, you must have a late version of *Flex*. Use of a printer is optional, but any printer that will

work with *Flex* will also work with this program. The program is supplied on a nonprotected disk and it is recommended that the master only be used to make working copies. An updated version is available from CSC if you return the diskette within 90 days with proof of purchase. The documentation is excellent and well structured for the beginning user. Several example programs are included for familiarization. Three utility programs are also included for customizing printer/textfile parameters as well as disabling the HELP messages. The HELP messages are necessary for beginners but consume memory for advanced users.

Dynacalc simulates a 256 row by 256 column accounting type worksheet. Stop. How can a 64K computer hold a 256 x 256 worksheet? It can't. Under normal operation the program has approximately 30K of workspace, or close to 3000 cells. A memory indicator is on line 2 of the screen. A cursor indicates which cell (row, column) is in use. The cursor can be moved by the arrow keys or a *GOTO* command for longer moves. The cursor address always appears in the top left hand corner of the worksheet. Three types of data can be stored in any cell, values (numeric constants), expressions (mathematical operations) or labels (messages). You can edit the value of a cell at any time. In addition to data, there is a command structure of single letter entries that can be accessed by a /X entry while in the ready mode. These commands are called "Attributes." Rather than explain each command, a list of Functions and Commands is included for familiarization. A few of the more powerful commands will be highlighted.

@INDEX and @LOOKUP—Compare a supplied value with a value in the table. @INDEX looks for an exact match. @LOOKUP checks for a "greater than" condition. These functions allow sorting and are fast. An example program is provided to illustrate their operation.

@STDDEV—Calculates the standard deviation.

@NPV—Net present value.

@AVERAGE—Average or arithmetic mean.

@CHOOSE—Select a value from a list of two or more values.

@ROUND—Reduce the precision of values.

/FS—Represent values in dollars and cents.

/FP—Plot horizontal graphs on your worksheet.

/?—Help command.

Well, we could go through the whole list but that's what the 46 page instruction manual is for. One interesting command allows *Flex* to be accessed while still using *Dynacalc* for commands such as PROT, CAT, NEWDISK, etc., as long as the command does not use low memory.

For those of you with *Visicalc* experience, a command cross reference table is included in the manual. Also several reference books are recommended with comments on specific strong points.

As I mentioned earlier a complete description of all of the features is impractical in a review. I am impressed with the operation and excellent instructions of this package. No bugs were encountered in the program. Several examples were called and executed. They were very helpful and well structured for the beginning user. My own budget program was executed with ease after the initiation. The cost of this program is a little above normal for home use but as they say, "You get what you pay for."

(Computer Systems Center, 13461 Olwe Blvd., Chesterfield, MO 63017, \$200)

—Dan Downard

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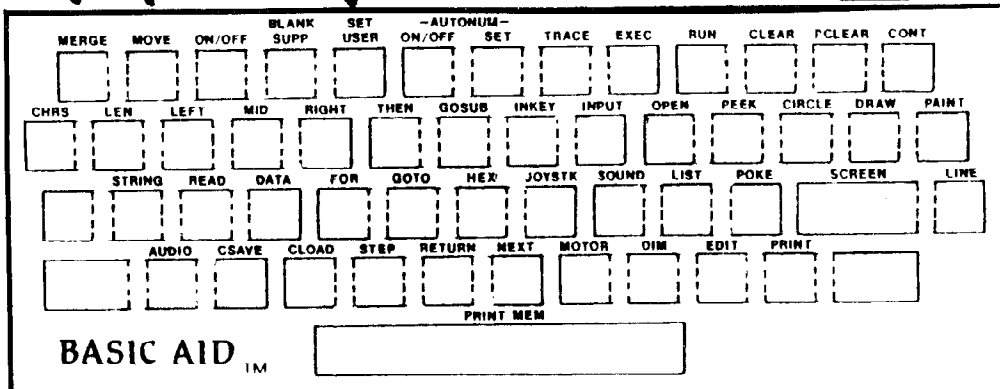
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DYNACALC CHARTS

Functions

ABS(x)	absolute value
ACOS(x)	arccosine
ASIN(x)	arcsine
ATAN(x)	arctangent
AVERAGE(x . . . y)	average value
CHOOSE(n,x . . . y)	value of the nth cell
COS(x)	cosine
COUNT(x . . . y)	number of cells
ERROR	>ER< error message
EXP(x)	e to the x power
INDEX(n,x . . . y,z)	value next to match
INT(x)	smallest integer
LN(x)	natural logarithm
LOG(x)	common logarithm
LOOKUP(n,x . . . y,z)	value next to match
MAX(x . . . y)	greatest value
MIN(x . . . y)	smallest value
NA	not available
NPV(r,x . . . y)	present value
PI	3.141 . . .
ROUND(d,x)	x rounded to nearest d ($10e-9 < d < 10e9$)
SIN(x)	sine
SQRT(x)	square root
STDDEV(m,x . . . y)	standard deviation
SUM(x . . . y)	sum of cells
TAN(x)	tangent

Attributes

(B)ell
 (D)eg.
 (G)raph
 (H)elp
 (L)abel
 (M)od.
 (O)rder
 (P)rint
 (B)orders
 (L)ines/page
 (P)agination
 (S)pacing
 (W)idth
 (?)
 (R)ecalc
 (S)ize
 (T)ype
 (W)idth
 (C)olumn
 (W)indow
 (?)

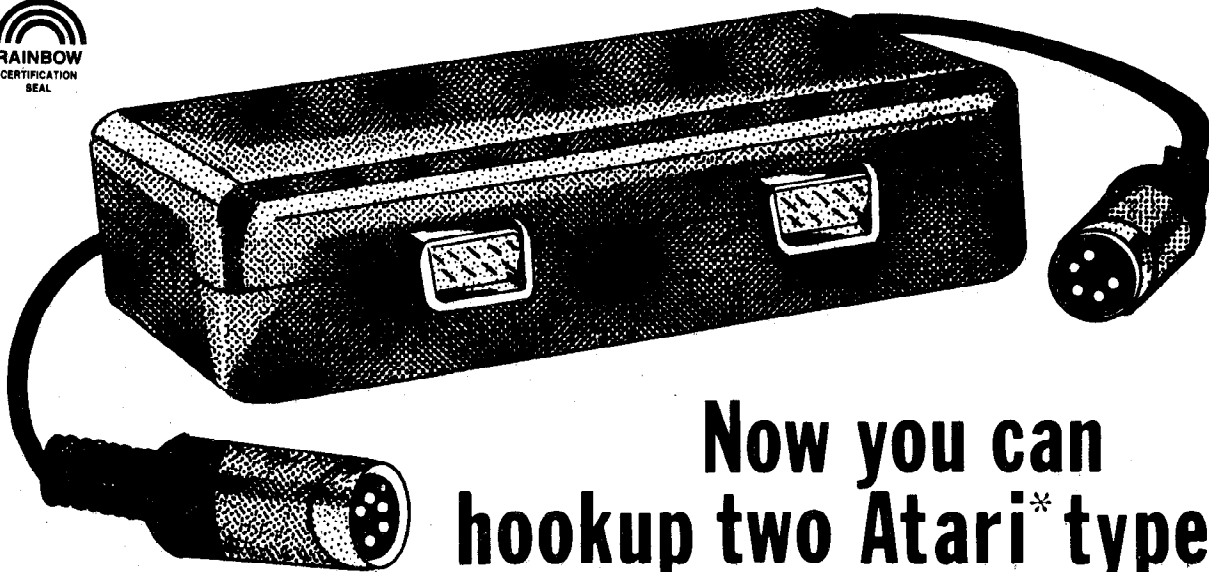
Commands

(B)lank Cell
 (C)lear worksheet
 (D)elete
 (D)elete
 (C)olumn
 (R)ow
 (?)
 (E)dit Cell
 (F)ormat Cell
 (C)ontin.
 (D)efault
 (G)eneral
 (I)nteger
 (L)eft justify
 (P)lot
 (R)ight justify
 (S)dollar
 (?)
 (I)nsert
 (C)olumn
 (R)ow
 (?)
 (M)ove column or row
 (A)scending
 (D)escending
 (M)anual
 (?)
 (O)utput to textfile
 (P)rint on system printer
 (Q)uit
 (F)lex
 (S)leep
 (?)
 (R)eplicate
 (S)ystem
 (L)oad
 (S)ave
 (X)ecute
 (#)data
 (L)oad
 (S)ave
 (?)
 (?)
 (T)itles
 (B)oth
 (H)oriz.
 (N)one
 (V)ert.
 (?)
 (W)indows
 (D)isplay
 (F)ormat
 (H)oriz.
 (N)one
 (S)ync.
 (U)nsync.
 (V)ert.
 (?)
 (?) help

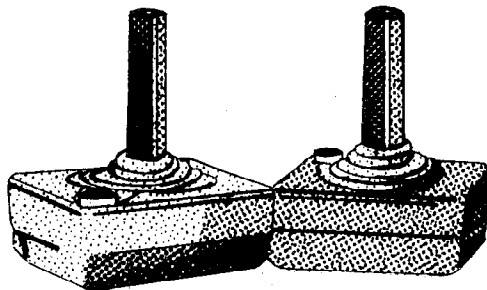
* "BREAKING ALL
* SALES RECORDS"
* Bob Rosen

* "Recommend to
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* RAINBOW Review,
* March 1983

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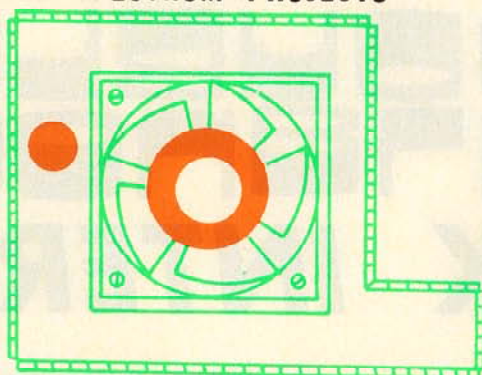
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COLOR CABLES +

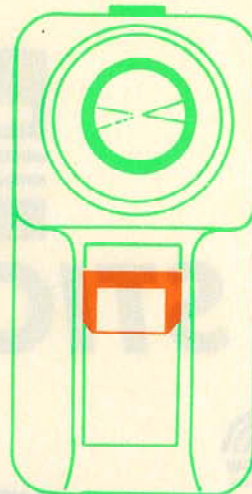
from SPECTRUM PROJECTS



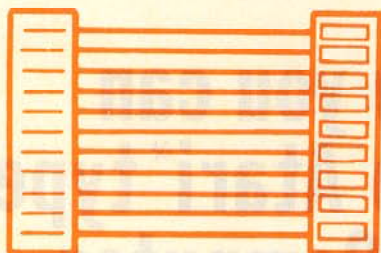
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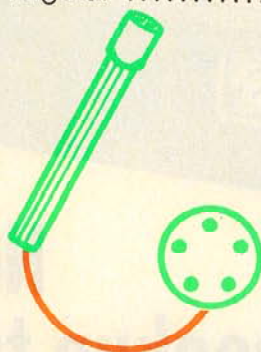
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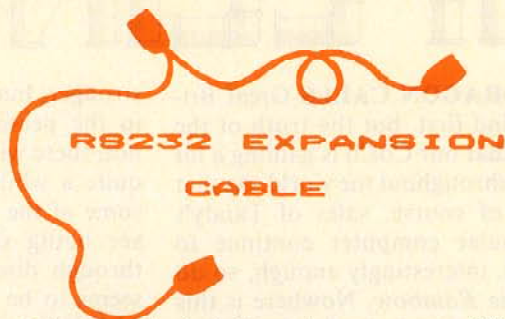
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PIPELINE

THE DRAGON CALLS Great Britain to mind first, but the truth of the matter is that our CoCo is gaining a lot of friends throughout the world. As that happens, of course, sales of Tandy's most popular computer continue to climb and, interestingly enough, so do sales of *the Rainbow*. Nowhere is this more evident than in England, which is blessed not only with the Color Computer, but with the Dragon-32 as well. With the exception of Australia, CoCo sales — based on *Rainbow* sales — were better in the British Isles than anywhere else. Now, of course, with Dragon, England is far and away the number one non-North American market for *the Rainbow* and, we suspect, the Color Computer, too.

That isn't to say that there isn't a good market elsewhere. No, we are not privy to Tandy's sales figures, but we can guess. And, we see some real strides in a number of places outside the United States. Canada, of course, is number one. One of the main advantages there is that the electricity is the same — which means there are no "special" needs that require different manufacturing for CoCo. Australia seems to be the "second" market with a number of other places — such as Mexico and Israel — close behind. Yet, we ship *the Rainbow* to some 40-odd countries each month. So, if you happen to be going abroad, check in at a Radio Shack (there are lots of them all across the world) and see if you can't find a fellow CoCo user. When you do, let us know. We'd like to share your impressions with others.

COMPUSENSE OF ENGLAND has come up with a new utility called *DECODE* which allows BASIC programs to be cross-loaded between a CoCo and a Dragon-32. The machine language program is contained in a ROM Pack that will convert any program of 16K or smaller, so long as they do not use *POKE* or keyboard *PEEK* commands. It also does not work with disk. Information on this program can be obtained by writing to 11 Bury New Road, Prestwich, Manchester, England, M25 8JZ.

According to reports we've been hearing, the CoCo market keeps getting

stronger, but there is a shakeout ahead in the personal computer field. Fear not, there will be a Color Computer for quite a while yet — but don't bet on some of the other computers you may see being sold in chain stores and through discount houses. The reason seems to be a fight centering on price — and not everyone will be able to keep that going. With some of the marginal products now on the market (or ready to come to market) price was just about their only attraction. We do hope it won't end up being a cut-throat situation like that which existed in the digital watch field several years ago. No one came off as the winner in that one and very few will come off as winners in a personal computer price war, either.

As always, one of the big questions will be in the area of support. Tandy seems to recognize that one company alone cannot properly support *any* computer system. That just isn't so for many of the others and, while a point-of-sale display may look nice in a K-Mart for a computer like the VIC-20, the fact is that what you see is just about all there is available for that particular computer. Tandy has done some excellent marketing work on programs and other things for CoCo, but look where the market would be if that was all there was. We're sure that is why Tandy has established a support program for its computers. It is a wise move.

And, finally, suppose you *do* buy a Timex computer at a K-Mart or Walgreen's. Is the salesman in "Housewares" going to be able to explain a *FOR/NEXT* loop?

Even if you never plan to program, some of the ready-to-run programs *do* need to be explained. Because Radio Shack is able to get those explanations for you (at least when it is their own software), you can bet Radio Shack will be a force in computers for a long time to come.

CHROMASETTE, THE FOLKS who came up with the first tape magazine for the CoCo, now will be doing it with disks, too. Disks go for \$95 a year which appears to be just enough to cover the cost of the medium itself. Let's hand it to Dave Lagerquist, intrepid editor, too, for that little dash of humor that's

always present in a Chromasette product. How do you get the menu? Just type in *RUN "AWAY"*! Orders can be sent to P.O. Box 1087, Santa Barbara, CA 93102 or phoned to (805) 963-1066.

THE FOLKS AT ELITE Software have really been turning the old crank. For all practical purposes, Elite was contracted to write software for another firm until a couple of months ago. Then, on their own, they came out with *ZACK-SUND*, followed with *ELITE*CALC* and now, we hear, they have some 20 more programs that will be ready for sale by summer.

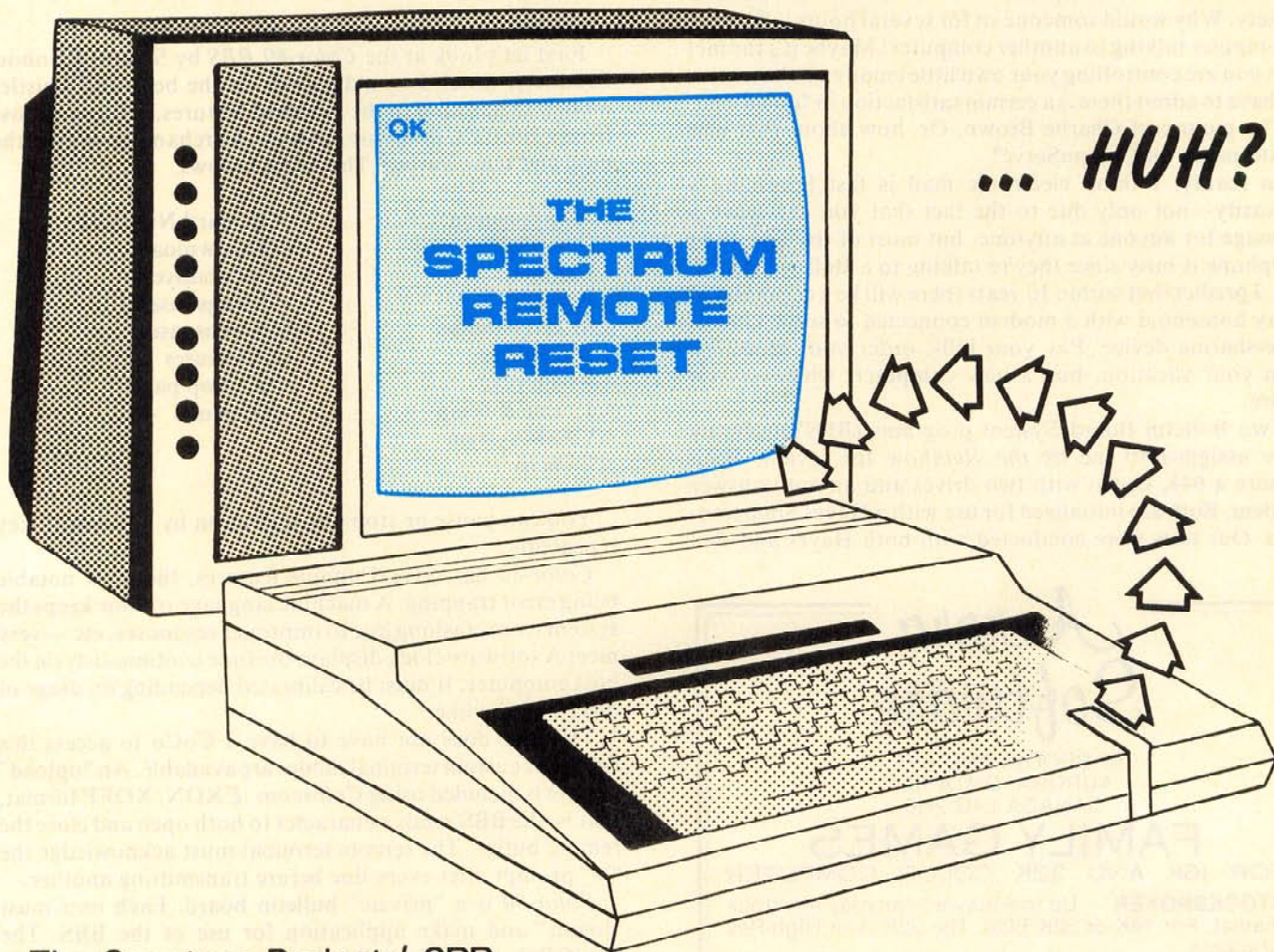
WE THINK IT IS a breakthrough, of sorts. A new program available from Computer Shack now allows you to transfer Model I, III and IV programs and data files to a CoCo disk. And, the reverse is true: You can transfer from CoCo to the Models I, III and IV. The program is called *CHH* and can be ordered for \$24.95 from Computer Shack, 1691 Eason, Pontiac, MI 48054.

AND SPEAKING OF breakthroughs, a cooperative effort between *the Rainbow* and AM Varityper Inc. now makes it possible to typeset ASCII files directly from a CoCo (or a Model 100 Portable Computer) to a Comp/Edit 5900 typesetting machine. "Normal" software is used on both ends of the connection, which uses a simple intelligent terminal program on CoCo and a telecommunications option available from AM.

A GOOF on our part last month — left out the information that Linda Nielson, author of the probability program in July's issue, is vice president of Moreton Bay Laboratory. Sorry, Linda.

BY THE TIME YOU read this, we hear, a new wonder from Radio Shack will be appearing on the scene. Our understanding is that it will be a hardware device that allows several ROM Paks to be connected to CoCo at the same time and easily switched in and out. According to our sources, one of the primary reasons for developing this "expansion" device was to be able to use disk drives and the X-Pad at the same time. Price: We hear in the \$170 range.

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Only The SYSOP Can Kill Messages

One of these days I would like to see a psychological study of the effects of computer bulletin boards on modern society. Why would someone sit for several hours in front of a computer talking to another computer? Maybe it's the fact that you are controlling your own little empire on the screen. I'll have to admit there is a certain satisfaction in "downloading" a picture of Charlie Brown. Or, how about that new BASIC patch on CompuServe?

In reality, I think electronic mail is fast becoming a necessity—not only due to the fact that you can leave a message for anyone at anytime, but most of the time their telephone is busy since they're talking to a Bulletin Board, too. I predict that within 10 years there will be a computer in every household with a modem connected to some kind of time-sharing device. Pay your bills, order your groceries, plan your vacation, buy a new computer, whatever you desire.

Two Bulletin Board System programs (BBS's) recently were assigned to me by *the Rainbow* for review. Both require a 64K CoCo with two drives and an auto-answer modem. Both are initialized for use with a Hayes Smartmodem. Our tests were conducted with both Hayes and Bell

modems and both worked. There were differences between the two systems, but several similarities. Both are initialized for 300 Baud operation and use machine language drivers for real time I/O. Several utilities are included in the packages for such necessities as making bulletins deleting messages, editing graphics and maintaining a log of users. Electronic mail is the main common feature of both Bulletin Boards. Either can send pictures to the user and have a database of programs for downloading. Both offer help commands for new users and a chat mode for talking to the "SYSOP" (SYStem OPERator) if he or she is available.

Color-80

First let's look at the *Color-80 BBS* by Silicon Rainbow Products, which I would classify as the bells and whistles model. In addition to the standard features, you can choose from editorials, nonsense, rumors, merchandise or even the time and temperature. The menu follows:

<A>pplication	oard Numbers
<C>onfigure	<D>ownload
<E>-mail	<G>oodbye
<H>elp	<L>ogs (users)
<M>erchandise	<N>onsense
<O>pinions	<P>ictures
<R>umors	<S>ysop page
<T>ime & temp	<U>pload
<V>iew system	
<?>-help	

You can pause or stop any operation by hitting any key repeatedly.

Color-80 has several unique features, the most notable being error trapping. A machine language routine keeps the system from crashing due to improper responses, etc.—very nice! A software clock displays the time continuously on the host computer. It must be calibrated depending on usage of disks and the like.

The user does not have to have a CoCo to access this board, as custom terminal modes are available. An "upload" section is included using *Colorcom EXON/XOFF* format, that is, the BBS sends a character to both open and close the remote buffer. The remote terminal must acknowledge the ">" prompt after every line before transmitting another.

Color-80 is a "private" bulletin board. Each user must "logon" and make application for use of the BBS. The SYSOP then must initialize the user on the system by assigning him a user number by means of a private message. I could not find any reference to the total number of users permitted on the system.

A total of up to 60 messages occupy a semi-circular file and can be killed by the user/originator or the SYSOP. A special menu is available for the SYSOP for remote control of the system.

The source code for machine language is available for an extra charge.

There were some small corrections necessary in the software as this apparently was an early release, but nothing major that would impair operation.

The documentation makes the assumption that everything is going to work fine. It gives a step-by-step method of initialization of the BBS, but lacks a lot when it comes to customization or "what to do if." Customization is very tedious for a new SYSOP. In some cases, the program has to be rewritten to change files such as in downloading. I think

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32K TRS 80 COLOR Version \$24.95.

Adds a second level with dungeons and more Questing.



WIZARDS TOWER — This is very similar to Quest (see above). We added wizards, magic, dragons, and dungeons to come up with a Quest with a D&D flavor. It requires 16k extended color BASIC. 13k VIC, Commodore 64, TRS-80 16k Extended BASIC, TI99/A extended BASIC. \$14.95 Tape, \$19.95 Disk.

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ZEUS — It's fast and furious as you become the WIZARD fighting off the Thunderbolts of an angry ZEUS. Your Cone of Cold will destroy a thunderbolt and your shield will protect you — for a while. This is the best and highest speed arcade action we have ever done. Difficulty increases in wave after wave, providing hours of challenging fun and a game that you may never completely master. Commodore 64, Vic20 (16k expander), and 16k TRS-80 Color Computer. (ALL MACHINE CODE!) \$19.95 tape \$24.95 disk. (Tape will not transfer to disk.)



ADVENTURES!!!

The Adventures below are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer, commands like "Look in the Coffin" and "Light the torch.")

Adventuring requires 16k on Sinclair, and TRS-80 Color. They require 8k on OS1 and 13k on VIC-20. Now available for TI99. Any Commodore 64.

\$14.95 Tape — \$19.95 Disk.

ESCAPE FROM MARS

(by Rodger Olsen)

This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

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Dungeons of Death — This is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. 16k Extended TRS-80 Color, 13k VIC, Commodore 64. At the normal price for an Adventure (14.95 tape, \$19.95 disk), this is a give-away.

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improvements could be made in the documentation and the file structure.

CoCo Board II

Lee F. Blitch has refined an earlier program and is now marketing *CoCo Board II*. I would classify this version as the "color" BBS because not only can you download graphics, but several graphic prompts are used during normal operation. Receiving color graphics requires *Colorcom/E*, *Videotex* or an 8-bit receive routine. *Super "Color" Terminal* seems to work fine. Upon entering the BBS, you are given a choice of which terminal software you are using. If you are not using an 8-bit routine, none of the graphics are transmitted.

CoCo Board is a "public" bulletin board in that once you sign on and determine your own five letter password your name is entered into the user log. Up to 102 users are stored in the users log, with the newest user overwriting the oldest if necessary. The first two entries are protected for the SYSOP.

The main menu follows:

ulletin	<C>hat
<D>atabase	<E>nter message
<G>oodbye	<I>nfo
<N>ulls	<Q>uick summary
<R>etrieve messages	<S>ummary
<U>ers log	<?>-help

Messages are organized in a first-in/first-out structure with a maximum of 100. Message format can be private or public. After each <G> command, you are asked if you wish to leave a private message for the SYSOP. This message is recorded on a cassette for retrieval using a supplied utility. Only the SYSOP can kill messages.

A very nice utility is provided for editing graphics. This program is user friendly and provides the SYSOP with a method of customizing prompts, etc., with a combination of graphics and alphanumeric.

Very few problems were encountered using this BBS. The less frills, the less chances of something going wrong. Why didn't Murphy say that?

Again, the documentation needs some work. For a program of this complexity, four pages just isn't enough. At the same time, due to the structure of the programs, additions to the database seem to be easy to implement. An uploading command would be nice.

Summary

Both BBS's are very fun to play with and should fill a void that exists in communication among CoCo users. I would suggest that if you are planning a project for your users' group this would be a fine way to spread the word. It doesn't take long for word of mouth to travel about the new BBS.

The BBS's reviewed provided a dilemma as to which one to use. Each has its strong points. *Color-80* has many more features, but lacks the simplicity of operation of *CoCo Board II*. Maybe someone will combine the two into *Color CoCo Board 82* for the perfect BBS.

(*Color-80*, Silicon Rainbow Products, 663 S. Bernardo Avenue, Suite 225, Sunnyvale, CA 94087, \$115. *CoCo Board II*, Lee Blitch, 507 Emory Circle N.E., Atlanta, GA 30307, \$110)

—Dan Downard

COLOR COMPUTER SOFTWARE

★ UNIVERSAL PROGRAM 1(UP-1) ★

Known as the Program Stacker, UP-1 allows several programs to be loaded until the memory is filled. Quickly jump from one program to another or compose new programs while retaining the old ones. Programs are included for patching damaged programs. Allows data or machine language programs to be stored and retrieved from a cassette. Programs are included for writing values or characters to memory, and displaying memory contents. Blocks of memory can be relocated. UP-1 can be used as a Word Processor by allowing text to be stored in memory and printed on the screen or an external printer. UP-1 Cassette \$14.95.

★ DISASSEMBLER-ASSEMBLER (DISASM) ★

Using English mnemonics and Decimal Locations, DISASM is an easy way to learn to assemble machine Language Programs or Subroutines. Subroutines can be used with Basic Programs and called by either *USR* or *EXEC* commands. For CC compatibility, all locations are given in Decimal Values eliminating the confusion associated with using HEX. All commands are Menu oriented and the user provides the particulars for the commands without having to remember command formats. The Disassembler can be used to Analyze Machine Language Programs as well as the Basic and Extended CC ROMS. Example programs are included. Cassette \$19.95.

★ TERMINAL PROGRAM (DYTERM) ★ new

DYTERM is designed to convert a Color Computer into a terminal. Use it to send and receive information from another computer, another terminal, or use it to provide the software needed for sending and receiving information over telephone lines with a MODEM. DYTERM is a BASIC program with Machine Language Subroutines. Cassette \$14.95.

EXTENDED BASIC is not REQUIRED. All programs require a 16K Computer and are DISC compatible.

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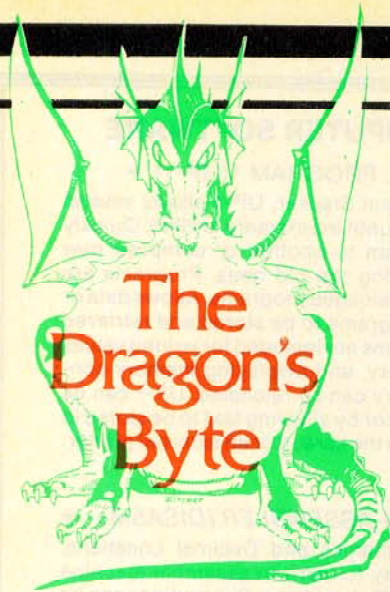
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Programming The Combat System

By Bill Nolan
Rainbow Contributing Editor

Last month, for those of you who missed my column (heaven forbid!), I talked about some problems with the *RND* function not being reliably random until you fix it up a bit. We also began to lay the groundwork for a computerized combat system to use with fantasy games. If you have not seen the July column you may want to look it over, because we will be continuing on from that point this month.

If you aren't familiar with fantasy games, I want to point out that we aren't talking about computer games. We are talking about the many role playing games available in any toy or game store (*Dungeons and Dragons*, *Runequest*, *Tunnels and Trolls*, etc.) These are very complex games, with the rules taking up as much as five books. What we talk about in this column are ways to use the computer to simplify the play of these games as much as possible. The programs presented here are not games themselves, but rather aids to the play of the fantasy games.

It may interest some of you to know that an estimated five million Americans play these games regularly, and a survey done by a large fantasy gaming magazine indicated that enjoyment of computers and fantasy games go hand in hand. Over 90 percent of the fantasy gamers surveyed had a personal computer!

As we indicated in last month's column, the combat systems in these games are an attempt to simulate, by rolling dice, the outcome of a battle between various creatures and humans. To be realistic, a combat system must consider as many of the strengths and weaknesses of the combatants as possible. Because of this, more and more factors are considered. I have seen a battle that would have taken five minutes of actual time require 45 minutes to work through, and that is definitely a job for our friend the computer.

What we are not going to do here is write a program to put an existing combat system on the computer. To start with, the various combat systems are copyrighted by the game

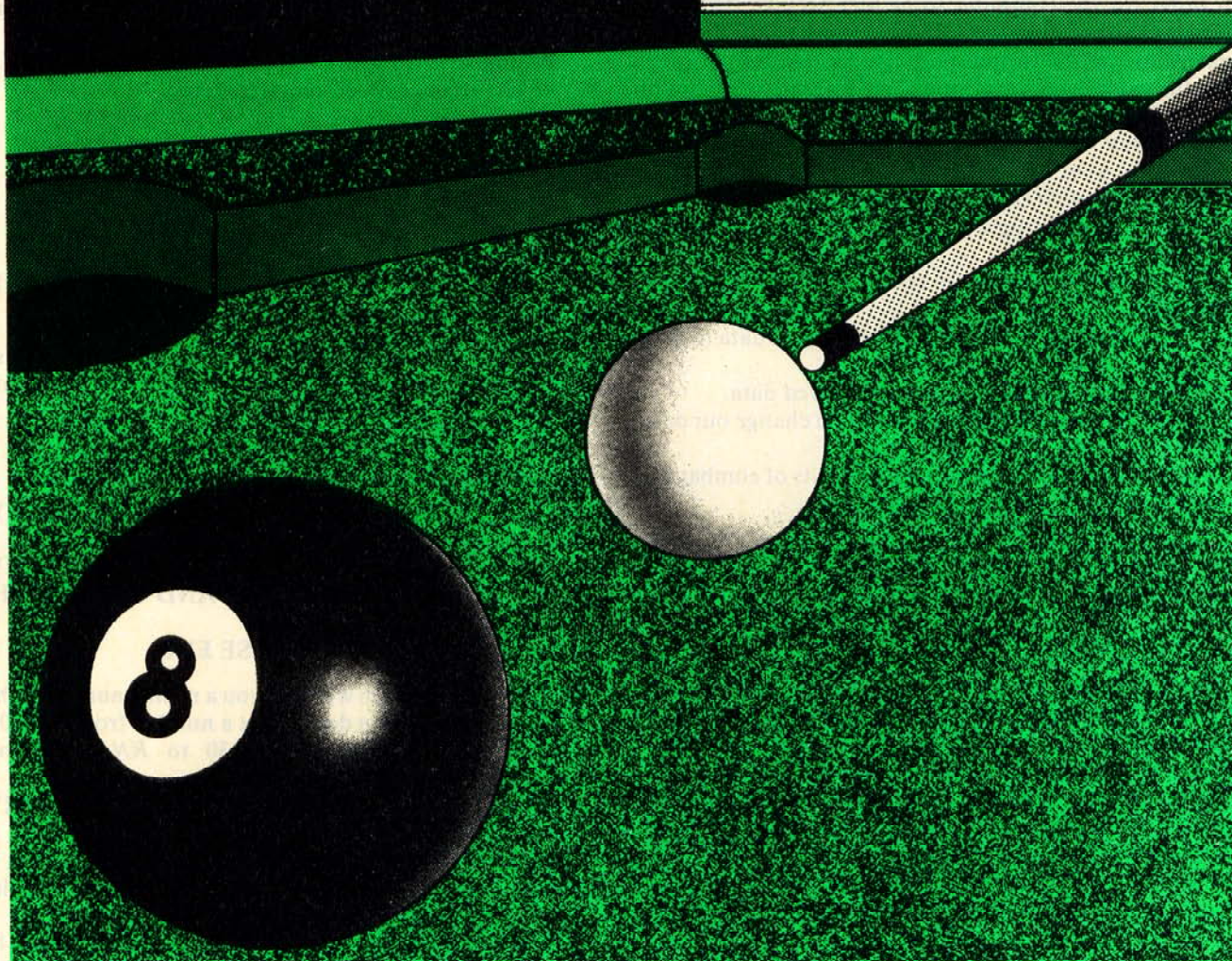
publishers, and in addition to that, I think we can do better by designing a system that takes full advantage of the strong points of the computer. So, if you should notice that the combat system isn't the same one you are used to using, give it a chance, anyway. You may well like it better. After all, we can keep track of lots more things on a computer.

First things first. Before we can begin we will need to make a list of things that can affect a combat situation.

- 1) Weapons—these can be swords, axes, teeth, claws, spears, daggers, etc., and we must consider that some do more damage than others, and some are faster than others to use.
- 2) Armor—here we must consider both artificial armor such as plate mail and natural armor like dragon scales. Either one makes a telling blow harder to land. In addition to making it harder to land a blow, the armor will also reduce the damage suffered, but almost no existing combat systems take this into account.
- 3) Strength—this not only will affect damage done, but also will have to be considered with regard to effectiveness of armor.
- 4) Speed—as any boxer will attest, this can be all important!
- 5) Multiple attacks—some people fight with a weapon in each hand, and a dragon can bite you, claw you twice and beat you with its wings all at the same time.
- 6) Skill level—this may be the most important item of all. Some people are expert swordsmen, and then there's me.
- 7) Initiative—Who has the advantage? Who gets off the first blow? This may be related to speed and surprise.
- 8) Constitution—How tough are these people or critters, and how much damage does it take to snuff them?
- 9) Magic spells—these can make weapons and armor work better, or make them work worse, or myriad other effects.
- 10) Type of person—a magician or thief won't be as good with weapons as a fighter of the same level.

In any combat system, the number one thing to determine is who swings first, so we will have to roll that right away.

(Bill Nolan is a principal in Prickly-Pear Software and teaches "Programming in BASIC" at Pima College in Tucson, Arizona.)



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The next thing is to find out whether the blow landed or the arrow found its mark. This is the real heart of any combat system, and before any of the above listed special conditions can be applied, we must have a starting point to work from. This starting point is usually the number that a beginning fighter (just out of basic training?) would have to roll to land a blow.

In our new system we will assume that our neophyte warrior is using a die with 30 sides, and that he (or she) has a 50 percent chance of striking a normal unarmored opponent. In this case then, our sword wielder must roll a 16 or larger to be successful. This is generally called the "base chance," and is changed to reflect the influence of the various factors above. In many systems, damage is calculated by a separate roll of dice, but we are going to base it upon a combination of weapon type and the difference between the roll needed to hit and the actual roll. In fact, we are going to use the same roll to see whose blow struck first.

In order for the computer to be able to take the many modifiers into account, we will have to input the fighting characteristics of the various participants. This can be done before the game even starts, and since there may be a lot of characters and monsters to be considered, we will want to have some way to save a game in progress.

I prefer to write a program in several sections called modules, and then *GOTO* the desired module from a menu of choices. In this program we will need the following modules:

- 1) *INPUT* section where we enter the data about the combatants.
- 2) *SAVE* section where we can save our entered data to tape or disk.
- 3) *LOAD* section to retrieve previously saved data.
- 4) *EDIT* section where we can examine and change our data as desired.
- 5) *COMBAT* section where the actual results of combat are calculated and data updated as necessary.

Those five will be the main portions of the program, and the combat portion will be the longest by far.

By the way, I intend to incorporate full fumble and critical hit tables into the program. If these terms are new to you, a "fumble" happens when a player rolls a 1. This is taken as an indication that something worse than a simple miss has occurred. The warrior may have dropped his weapon, slipped and fallen, broken his weapon or actually hit himself with his own weapon. (Try swinging a mace as hard as you can, and see what happens when you miss completely.) "Critical hits" happen on a roll of 30 in my system and indicate that the blow has been exceptionally effective in some way. It may have done extra damage, severed an extremity or killed the opponent outright. (These games can be bloody at times.)

The basic way the system will work will be like this: Let's suppose I am fighting some evil Knight. I need a base 16 to hit him, but I'm second level, so I need only a 15. Also, I'm exceptionally strong (really?), so I get a bonus of 2 for that. Now I need 13. In addition, my magical sword is +2 to hit and I was recently blessed by a devout cleric (+1 to hit) so I really need only a 10. Unfortunately, my opponent is wearing plate mail, which is 7 armor classes better than no armor at all, so I'm back up to a 17 needed to hit him. He's a better fighter than I am (not hard), and with all adjustments taken into consideration he needs only a 12 to hit me.

When combat starts, I roll a 26 and he rolls a 19. It appears that both blows landed, but in what order? That

could be important, because if my blow landed first and killed him, his blow would never land at all. Well, my 26 is 9 higher than I needed to hit him, while his 18 is only 7 higher than he needed to hit me, so my blow landed first. The damage done will be based upon the same thing—the difference between the number needed to hit and the actual roll. Damage will also have to be effected by the weapon used, and each weapon will have a multiplier (usually a number smaller than 1). The difference will be multiplied by the weapon multiplier to determine the damage done.

Since the factors of strength, speed, level, armor of opponent, etc., were used to calculate the chance to hit, they will all play an automatic part in damage calculation. For instance, if my sword were not magical then my number needed to hit would have been two higher and the difference would have been two smaller, thus effecting both the damage done and the determination of whose blow landed first.

To make this system work, we will have to give the computer the following information about each participant in the melee:

- Name
- Class (fighter, thief, magician, etc.)
- Level
- Weapon(s) used (including magical adjustments)
- Armor type (including magical adjustments)
- Strength adjustments
- Speed adjustments
- Number of attacks
- Hit points (a measure of damage absorbing ability)
- Magic spells currently having an effect

We may well think of other things, but for now let's see a nice method for rolling the dice on the screen. Remember, we want a roll of from 1 to 30.

```
10 CLS:X=RND(-TIMER):P$="T255L255O5AB"  
20 PRINT @ 166,"DICE ROLL = "  
30 X=RND(30):PRINT @ 178,USING "##";X:PLAY P$  
40 IF INKEY$="" THEN GOTO 30  
50 PRINT @ 356,"GO AGAIN? (Y/N)":K$=INKEY$  
60 K$=INKEY$:IF K$<"Y" AND K$<"N" THEN  
60  
70 IF K$="Y" THEN 10 ELSE END
```

This little program will give you a rolling number right on the screen, and if you don't want a number from 1 to 30 just change the *RND(30)* in line 30 to *RND(some other number)*. Or better yet, add this line.

```
15 PRINT @ 66,"ENTER HIGHEST NUMBER"; :  
INPUT Z
```

Now make the *RND(30)* in line 30 into *RND(Z)*. You now have a little program that will simulate the roll of a single die having any number of sides you want it to have!

That's about it for this month. Next month we will have the entire program in the column, along with a section by section commentary and full instructions for use. I hope a lot of you are changing these programs to suit your own needs. With this one, I will try to show you where to change any parameter of the program you find hard to live with. As most of you fantasy gamers already know, these games are very flexible, and almost no two groups play by exactly the same rules. In fact, I know some groups with a notable disregard for any rules at all, but they still enjoy the game.

Remember, if you have suggestions or comments, write to me or call me at Prickly-Pear Software. I can't put what you want into my column unless I hear from you.

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Kid CoCo Is No Lightweight

Little Brother to the Color Computer is not only a tough competitor, but has the ability to grow.

By Dan Downard
Rainbow Technical Editor

Question: What's 8½ x 7 x 2 inches, weighs 29½ ozs. and has Microcolor BASIC for \$119.95?

Answer: The MC-10 PoCo CoCo, Radio Shack Cat. No. 26-3011. As you probably noticed in last month's issue of *Rainbow*, Radio Shack has gone after the Sinclair/-Commodore beginners group with its new venture into the Color Computer family. The new unit has color graphics, sound, RS-232, a cassette port, BASIC and 4K of RAM, with provisions to add an additional 16K. No joystick ports are included.

The screen format is the familiar 32 x 16 inch produced by the Motorola 6847 VDG. The most radical departure is in the use of a Motorola 6803 as the MC-10's central processor. Other than the 6803 and memory map, which has radically changed, the MC-10 is essentially a smaller version of the popular CoCo. For those of you who are having trouble finding information on the 6803, try the 6801. The 6803 is actually a 6801 processor running in Mode 2. More on that later.

The MC-10 is one step ahead of the competition in that it has a real keyboard, something that the people at Radio Shack are very proud of, and rightfully so. The keyboard has the same type of keys as the CoCo, although considerably smaller. Keys have dual functions with the use of a "control" key that allows the use of "keywords" or in CoCo terminology, built-in "Master Control."

What about Microcolor BASIC? Immediately after turning on the MC-10 you notice the Microsoft/Tandy logo informing you of the new operating system. Micro-Color BASIC 1.0 is an 8K ROM interpreter that, in a nutshell, is the same as color BASIC with several welcomed additions, such as math functions and a new BASIC command for saving arrays.

Packaging

The shipping package for the MC-10 contains the following:

- The MC-10
- Antenna switch
- Cable from MC-10 to TV set
- Wall plug with in-line power supply
- Operation and Language Reference Manual
- Quick Reference Card

The 133-page reference manual is clear and concise, somewhat in the fashion of all Radio Shack manuals, and the 8½ x 6 inch size is very convenient for bookshelf storage. The Quick Reference Card lives up to its name by providing a summary of all operations and commands.

The MC-10 has a built-in RF modulator and is compatible with any bw/color TV operating on channels 3 or 4. Channels are switch selectable on the bottom of the case. The TV screen was clean and RF free as the modulator has been completely redesigned for this model.

Cassette and Serial I/O connectors are the same as those used for the CoCo for compatibility with existing Radio Shack peripheral devices.

A 34-pin expansion port is centered on the rear of the cabinet for future RAM expansion. Preliminary information indicates a 16K RAM module will be available within 90 days for around \$50, upgrading the total user memory to

"For those of you interested in energy conservation, the computer draws 16 watts at 120 volts. At today's cost of electricity this means that it costs approximately one-tenth of a cent per hour to operate. Not Bad!"

20K. No ROMpacks are planned at present. Several cassette programs are in the works. Hopefully, one of the first will be a Videotex program for modem communications.

The power supply is in-line with the AC cord and delivers 8.0 VAC at 1.5 Amps. An On/Off switch on the right hand side of the case actually switches the low voltage AC within the computer. For those of you interested in energy conservation, the computer draws 16 watts at 120 volts. At today's cost of electricity this means that it costs approximately one-tenth of a cent per hour to operate. Not bad!

Microcolor BASIC 1.0

Table I contains a complete list of commands available in the BASIC ROM. As you can see it is an impressive list considering the size of the ROM. In addition to the standard

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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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Table 1
BASIC COMMANDS

BASIC Statements:

CLEAR*n* — Reserves *n* bytes of string storage space (0-3142).

CLOAD - Loads a BASIC program file from cassette. Only the first 8 characters of the file name are used.

CLOAD* — Loads numeric data into an array from cassette file which has been created using **CSAVE***. Array name must be specified.

CLS(*c*)— Clears the display to the color (*c*) specified. If *c* is omitted, green is used.

CONT— Continues execution of program after **BREAK** or **STOP**.

CSAVE — Stores resident program on cassette tpe. Only the first 8 characters of the file name are used.

CSAVE* — Saves the contents of a numeric array on cassette tape for later use by **CLOAD***. Array name must be specified.

DATA — Stores data to be accessed by a **READ** statement.

DIM — Dimensions one or more arrays.

END — Ends program execution.

FOR . . . TO . . . STEP/NEXT — Opens program loop.

GOSUB — Transfers program control to the specified subroutine.

GOTO — Transfers program control to the specified line.

IF . . . THEN — Tests conditional expression.

INPUT — Inputs data from the keyboard.

LIST — Lists program lines to the video display.

LLIST — Lists program lines to the line printer.

LPRINT — Prints an item or list of items on the printer.

NEW — Erases program from memory; initializes all variables.

ON . . . GOSUB — Multi-way branch to specified subroutines.

PRINT — Prints an item or list of items on the display at current cursor position.

PRINT@n — Prints beginning at *n*, *n* = 0-511.

PRINT TAB — Moves the cursor to specified column position.

READ — Reads value(s) from a **DATA** statement.

REM — Remark; instructs computer to ignore rest of line.

RESET(*x,y*) — Turns off graphics block at specified location.

RESTORE — Resets data pointer to first item in the first data line.

RETURN — Returns from subroutine to next statement after **GOSUB**.

RUN — Executes resident program or portion of it.

SET(*x,y,c*) — Turns on graphics cell to specified color (*c*) at specified locations *x*(horizontal) = 0-63; *y*(vertical) = 0-31. See **CLS** for colors. If *c* = 0 cell is unchanged or set green (if in character mode.)

SKIPF — Positions cassette tape at end of next file.

SOUND(*f,d*) — Sounds the frequency (*f* = 1-255) and duration (*d* = 1-255) specified.

STOP — Stops execution of a program.

Functions:

ABS(*x*) — Computes absolute value.

ASC(*str*) — Returns ASCII code of first character of string.

CHR(*c*) — Returns character for ASCII, control, or graphics code.

COS(*numeric*) — Returns cosine of an angle given in radians.

EXP(*numeric*) — Returns natural exponential of number (*E_{number}*).

INKEY — Gets keyboard character if available.

INT(*x*) — Returns largest whole number not greater than *x*.

LEFT(*str,c*) — Returns left portion of string.

LEN(*str*) — Returns the number of characters in a string.

LOG(*numeric*) — Returns natural logarithm.

MEM — Finds amount of free memory.

MID(*string,pos,len*) — Returns a substring of another string. If length option is omitted, the entire string right of *pos* is returned.

PEEK(*n*) — Gets value in location *n* (*n* = 0 to end of memory).

POINT(*x,y*) — Tests whether specified graphics cell is on or off, *x* (horizontal) = 0 - 63; *y* (vertical) = 0 - 31. The value returned is -1 if the cell is in the character mode, 0 if it is off, or the color code if it is on. See **CLS** for color codes.

RIGHT(*str,c*) — Returns right portion of string.

RND(*n*) — Generates a "random" number between 1 and *n* if *n* > 1, or between 0 and 1 if *n* = 0.

SGN(*x*) — Returns sign component: -1, 0, 1, if *x* is negative, zero, positive.

SIN(*x*) — Computes sine; angle must be in radians.

STR(*x*) — Converts a numeric expression to a string.

SQR(*numeric*) — Returns the square root of a number.

TAN(*numeric*) — Returns tangent of angle given in radians.

VAL(*str*) — Evaluates a string as a number.

BASIC commands of Color BASIC we are treated to the math functions of **COS**, **TAN**, **EXP** and **LOG**. I think these are valuable additions, especially for educational use. Two new commands are implemented:

CLOAD* Loads numeric data into an array from a cassette file which has been created using a **CSAVE*** statement.

Example: **CLOAD*A,DATAFILE**

CSAVE* Saves contents of a numeric array on cassette for later use by **CLOAD***.

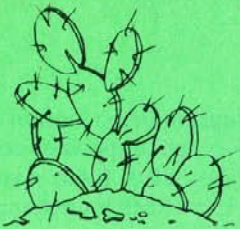
Example: **CSAVE*A,DATAFILE**

Since all cassette file information is handled through the above commands, gone are the tedious **OPEN**, **CLOSE** and **FOF** commands encountered by every beginning programmer. I wish we could add these commands to Extended

Color BASIC.

There are no commands for executing machine language programs such as **EXEC** or **USR**. Machine language programs are apparently not supported in Microcolor BASIC 1.0. The 6803 command set is a subset of the 6809 instructions; therefore, machine language programs should not be entirely compatible anyway, but the 6803 is upward compatible with the 6800 and I'm sure a method will be devised for ML program execution.

Pressing the Control key along with another key enables designated keywords, or BASIC commands, to be input with only two keystrokes. Graphics characters can be generated by a combination of the Shift and certain alphanumeric keys. The keyboard has a few editing commands built in such as full cursor control and line delete. Figure 1 shows a



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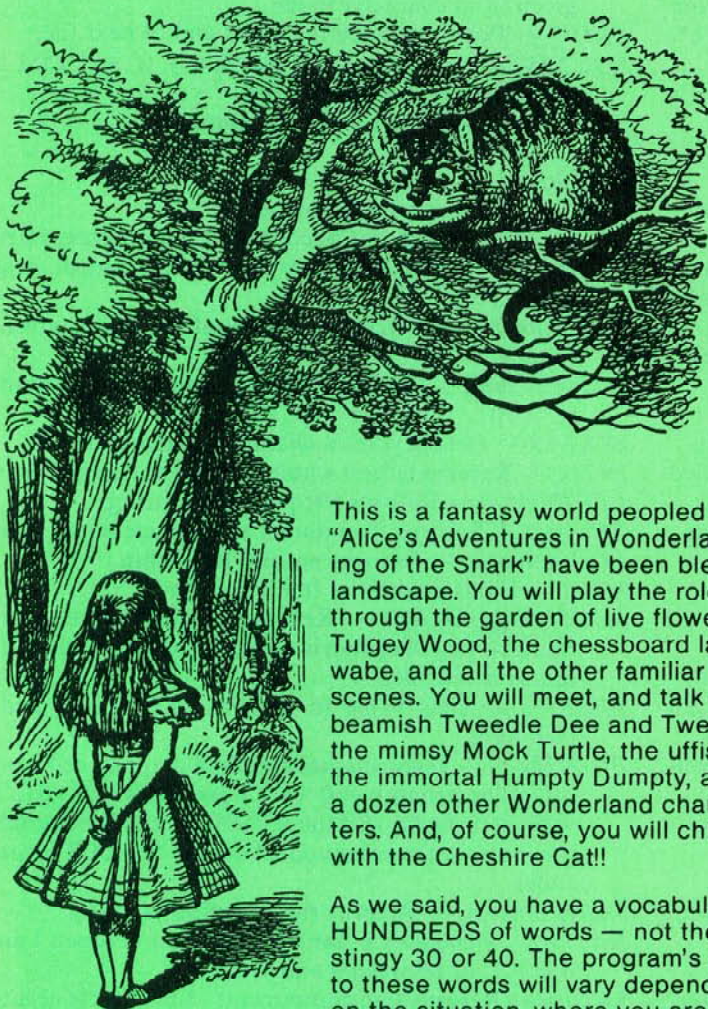
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As we said, you have a vocabulary of HUNDREDS of words — not the usual stingy 30 or 40. The program's response to these words will vary depending on the situation, where you are, who you

are talking with, what you have said in the past, and the way in which the words are combined. Your task is to become Queen, save Wonderland from the Snark, and manage to return home. You may feel completely trapped in certain places in Wonderland, but there is always a way out . . . in fact, there are always (at least) three exits from each trap. An open mind, a pure heart, and a touch of Wonderland madness will keep you from despair!!

This is not an easy adventure, and will provide ample challenge for the most experienced adult players, but you will have so much fun conversing with the denizens of Wonderland that you may not want to leave anyway. We want to repeat what we said above, because we really mean it. WE BELIEVE THIS TO BE THE VERY BEST ADVENTURE EVER WRITTEN FOR THE COLOR COMPUTER. After you have tried it, you'll think so too! 100% machine language — Fully 32K long. **Tape - \$24.95; Disk - \$29.95**

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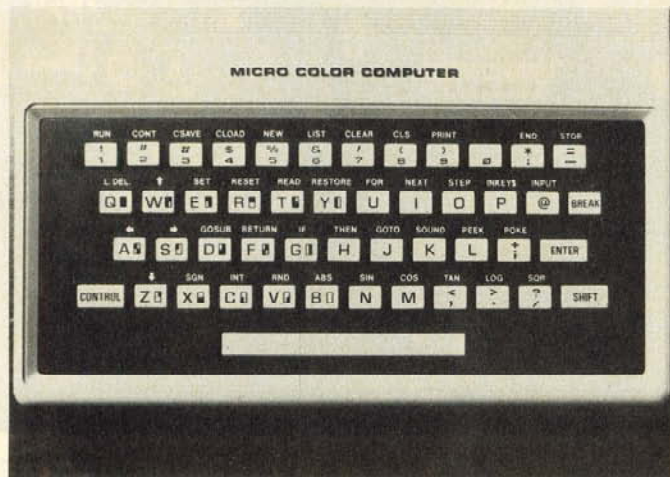
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picture of the keyboard. The only inconvenience was the location of the Control key. I hit it several times mistaking it for the Shift key. After a little use this does not seem to be a major problem.

Microcolor BASIC 1.0 supports two modes of operation, a green background 32 x 16 inch alphanumeric display mode, and a 64 x 32 inch resolution 8-color graphics mode (Semi-graphics 4). Other modes are programmable by *POKE* statements but are limited to *SET/RESET* commands for pixel control. A *POINT* command is available to examine the state of a particular graphic element.

**Figure 1
KEYBOARD PHOTO**



Cassette Interface

A 1500 Baud cassette interface with a standard 5-pin DIN plug is on the left rear of the case. Cassette format is similar to the CoCo with one notable exception. BASIC tokens are different in Microcolor BASIC. This means that tape programs from a CoCo will load but will not execute. This is not as serious as it sounds. First, most BASIC programs written for the CoCo will execute on the PoCo (MC-10). You will initially have to type them in manually. At the same time, we will leave it to our readers to come up with a scheme of converting BASIC tokens to a PoCo format. After conversion I would see no reason why tapes for the PoCo could not be generated by a CoCo.

No cassette relay is included in the interface. Starting and stopping of the recorder must be done manually.

RS-232 Interface

Also, on the left rear of the case is a 4-pin DIN plug for connection of an RS-232 serial printer or modem. The format is fixed at 600 Baud, 7 bit, no parity and, as in other Radio Shack devices, assumes that the printer generates a line feed after carriage return. Software reverts to the Model I format by the use of *LPRINT* for all output to this port. No mention is made of how to input data from this port in the documentation. At the same time, those readers familiar with the 6803 will remember that the processor has built-in serial I/O and this data can be examined using one of the external registers. More on that in a minute.

External Cartridge Port

A 34-pin PC board connector is available on the rear of the case for future expansion. At present the only expansion in the works is a 16K RAM cartridge. For those readers with different ideas the pinouts of this connector are given in Table 2. As you can see, all of the necessary bus information

is present for most peripheral interfaces and memory expansion. As we mentioned earlier, it seems that Radio Shack has opted to go with a cassette-based system leaving the ROM option for the CoCo user.

**Table 2
Expansion Connector**

Pin 1—Ground	Pin 2—Ground
Pin 3—D0	Pin 4—D1
Pin 5—D2	Pin 6—D3
Pin 7—D4	Pin 8—D5
Pin 9—D6	Pin 10—D7
Pin 11—Read/Write	Pin 12—A0
Pin 13—A1	Pin 14—A2
Pin 15—A3	Pin 16—A4
Pin 17—A5	Pin 18—A6
Pin 19—A7	Pin 20—A8
Pin 21—A9	Pin 22—A10
Pin 23—A11	Pin 24—A12
Pin 25—A13	Pin 26—A14
Pin 27—A15	Pin 28—E/Clock
Pin 29—Cart Select	Pin 30—Reset
Pin 31—NMI	Pin 32—+5V
Pin 33—Ground	Pin 34—Ground

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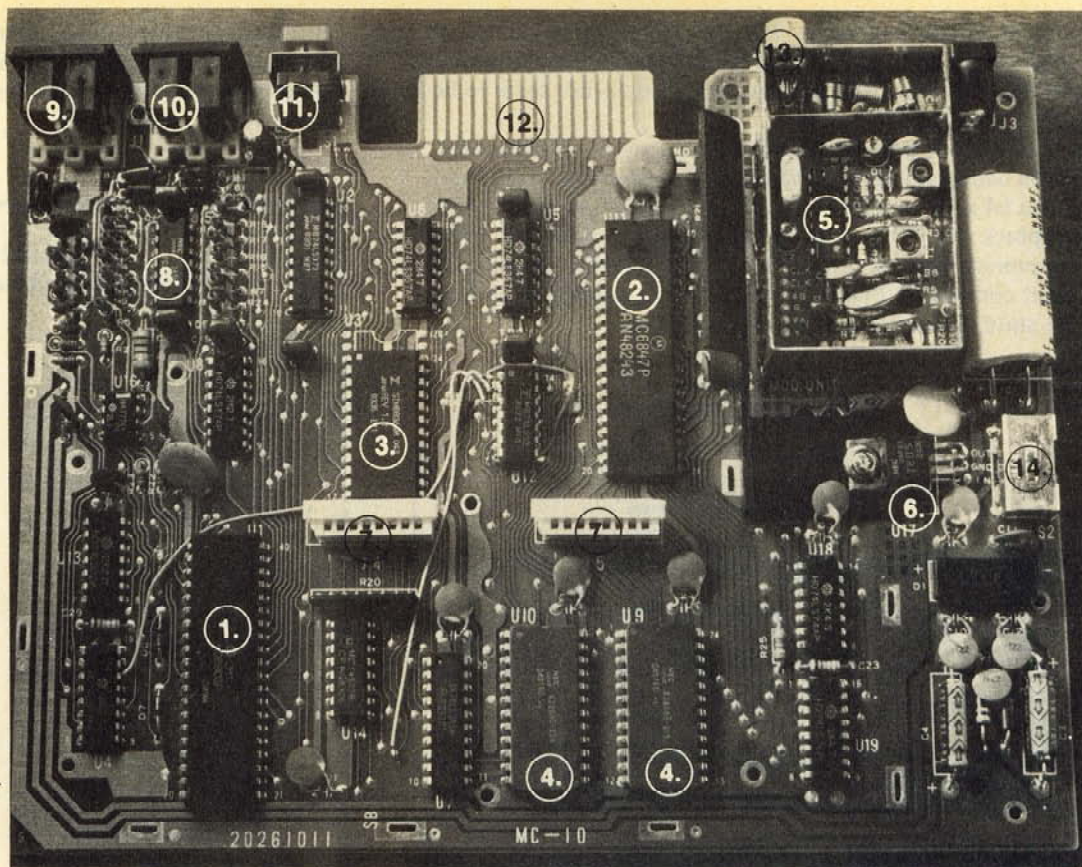
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Figure 2
CIRCUIT BOARD

1. Microprocessor
2. Video Display Generator (VDG)
3. Read Only Memory (ROM)
4. Random Access Memory (RAM)
5. R.F. Section
6. Power Supply
7. Keyboard Plugs
8. RS-232 and Cassette
9. Cassette Plug
10. Serial I/O Plug
11. Reset Button
12. Expansion Connector
13. T.V. Connector
14. On/Off Switch



Hardware

Figure 2 shows the inside top view of the circuit board with the keyboard and RF shield removed. As you can see, the unit is very compact and of a no frills variety when it comes to design. The main components are identified in the photo and can be subdivided as follows: Microprocessor, ROM, RAM, VDG, RF Modulator, Serial and Cassette I/O and Address Select hardware.

Microprocessor

A 6803 microprocessor is the heart of the MC-10. The 6803 is a 6801 without internal ROM running in Mode 2. Mode 2 is the Motorola terminology for the configuration of memory and ports. The 6803 contains 128 bytes of on-chip RAM, a built-in serial I/O and programmable timer. The processor has 21 internal control registers, of which four are not used and four are unavailable for use. Two of the internal registers are used to make a 16-bit counter/timer that is incremented during each clock cycle. The clock is derived from a 3.57 MHz color burst crystal that is part of the VDG/RF circuit. The actual clock speed of the processor is $3.57/4$ or .895 MHz.

Port 1 (pins 13-20) becomes the column strobe for the keyboard. Port 4 (pins 22-29) becomes the upper eight bits of the address (A8-A15). Port 3 (pins 30-39) in combination with a 74LS373 Latch provides the lower address and data lines along with the read/write signal.

Port 2 (pins 8-12) is multifunctional. Bit 1 is the RS-232/Cassette output signal. Bit 2 is another column strobe for the keyboard dedicated to the Shift/Break/Control keys. Bit 3 is the RS-232 input signal. Bit 4 is the Carrier Detect (CD) input from the RS-232 port. Bit 5 is the cassette input.

Without going into great detail on each of the 6803 registers we might mention a few that will be of great interest to the hobbyist. The Rate and Mode Control Register is

located at \$10, the Serial Rx Data Register is located at \$12 and the Serial Tx Data Register is located at \$13. For the 6803 these registers are memory mapped and can be examined by the user. Bits 0 and 1 of the RMCR control the baud rate of the serial I/O. By reading and writing to the Serial RxTx Registers we can input and output data to the RS-232 port. In all, these registers occupy locations \$00-\$15 of the memory map.

ROM and RAM

Microcolor BASIC 1.0 is provided by means of an 8K x 8 ROM. The identification on ours was 8364. Two D4016D RAM chips provide 4K on-board user memory that has to be shared with the display and BASIC housekeeping. Ceramic memory chips were used throughout. All memory chips and the microprocessor are shielded by means of a metal cover that is soldered to the main circuit board.

VDG/RF Modulator

As in the CoCo the screen output is determined by a 6847 Video Display Generator (VDG) chip driving a 1372 RF Modulator. No SAM chip is included for memory management. Memory contention between the VDG and CPU is handled by a clock synchronization circuit along with some discrete chips. Two 74LS367 and a 74LS245 IC provide bus isolation for writing to the video display. Although used as a video mixer in the CoCo, the 1372 also contains a complete video RF modulator section which is used in the MC-10. A varactor-tuned FM oscillator produces a sound carrier.

As previously mentioned, only the Alphanumeric Internal and Semigraphics 4 Modes are supported by Microcolor BASIC 1. For those of you who care to experiment with different graphic resolution modes Table 3 contains the connections of the control pins on the 6847 VDG along with the sound output bit located at 32768 on the memory map. A POKE32768,XX will bring interesting results.

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Table 3
VDG PORT

Address: \$8000

Bit 2—VDG EXT and GM2

Bit 3—VDG GM1

Bit 4—BDG GM0

Bit 5—VDG A/G

Bit 6—VDG INV

Bit 7—Sound

Memory Map

Figure 3 shows a coarse memory map of the PoCo. Only a few comments are necessary. The screen display memory begins at \$4000(16384) and continues to \$41FF. All 6803 vectors occupy the addresses from \$4200 to \$4212 and contain RTI instructions. BASIC program space immediately follows. The BASIC restart vector points to \$F72E so if you want to try a disassembly, this would be a good place to start.

Figure 3
MEMORY MAP

	MC-10 USAGE	6803 USAGE	
\$FFFF		INTERRUPT VECTORS	65535
		-----SFFF0-----	65520
\$DFFF			57343
	BASIC ROM		
\$C000			49152
	KBD/VDG I/O		
\$8000		EXTERNAL RAM	32768
	SYSTEM/USER RAM		
\$4000			16384
	UNUSED		
\$00FF		INTERNAL RAM	00255
	INTERNAL RAM	INTERNAL RAM	
\$0080			00128
	UNUSED	EXTERNAL RAM	
\$001F			00031
	INTERNAL REGISTERS	INTERNAL REGISTERS	
\$0000			00000

Summary

Radio Shack has obviously put their resources to the task to compete in the low priced market and, as far as we can see, they have risen to the challenge. Hopefully, by a favorable initiation into the world of microprocessors for a reasonable price, Tandy will introduce the user to its fine line of advanced products and peripherals. I would recommend this model to any beginning user for one reason. I predict that software will be abundant due to the similarity and family ties to the Color Computer. Where else can you buy a computer with a real keyboard, cassette and RS-232 ports and color graphics for \$119.95?

STAR—KIBBITS

I'd like to thank all of you who stopped by our booth at the Color Computer show in Chicago in April. I certainly enjoyed meeting so many old friends and new customers, and had a delightful time. We even managed to liven up the last day of the show by raffling away a TV set and holding a Dutch auction. Sure hope there's another show soon!

If you have a disk system, I'd like to urge you to use the verify option. Before saving to the disk, type VERIFY ON (or include it in a program). After the disk system writes to the disk it reads the data back to make sure it was written properly. While this really slows everything down, it's a worthwhile precaution to help guard against loss of programs or data. (Quite common in other systems, too.)

Several customers have asked about our update policy. It's fairly simple: within 90 days of purchase, an update is free — just return the original disk or cassette. After 90 days an update costs \$10 (to make things interesting, we will also accept one pre-1965 silver dollar.)

We also have a liberal policy on software upgrades. If you now own HUMBUG or STAR-DOS, we will give you full credit toward the 64K versions. That means that 64K HUMBUG will cost you just \$20 more, while 64K STAR-DOS will cost you just \$25 more.

What, you say, is so special about the 64K versions? Quite a bit. STAR-DOS 64, for example, provides upper and lower case display with 40, 51, or 64 characters per line; it can be used with 35-, 40- or 80-track drives, single-or double density, single- or double-sided. But, aside from the fact that it provides a simple, straightforward interface to the disk, a very interesting aspect is its compatibility with other 6809 operating systems. For example, many programs written for FLEX™ (a trademark of Technical Systems Consultants Inc.) will also work with STAR-DOS 64. We are using TSC's text editor and macro assembler with STAR-DOS right now. They work just fine, but the big difference is that their disk format is compatible with other software for the Radio Shack disk system.

As to 64K HUMBUG, that's an interesting story too. This HUMBUG runs as a utility under either STAR-DOS 64 or Flex (that's right, the same HUMBUG runs with either — it even runs on bigger systems using Flex.) That makes HUMBUG unique — it is the only monitor that runs under Color Computer Flex. HUMBUG provides all the facilities that are needed for machine and assembly language programming and debugging in a 64K environment. You can start and stop programs, insert breakpoints, even single-step through programs. There is just no other way to do these things in a 64K Color Computer!

One of the problems with a monthly column is keeping up with publishing deadlines. As you probably noticed last month, I have already fallen behind. But at least there is one consolation — the sooner you fall behind, the more time you have to catch up. See you next month.

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This ML Adventure Can *CSAVE* Your Life

I've been wandering these passages for hours now. There are three exits here: North, South and West. Northward, then! Hurrah, here is the Oracle that was foretold. O great Oracle what may you tell me of this accursed labyrinth? The old one calls out, "The secret to the Light ring is the Power ring, Crom and the Tailsman!" and with a flash of light he is gone. So, the pendant is one of the Keys, but what is Crom and where is the Power ring? The walls are shaking! What trick of the dark lords is this! Zeus' beard! It's a cave-in. My last thoughts are regret and pain as a great block of granite crashes down.

A horrible death, but *don't worry*, in Radio Shack's adventure *Madness and the Minotaur* your alter ego is easily reincarnated, *if* you have saved the data for this particular set-up that is. If not, you can always start a completely fresh game.

This is a machine language adventure that is different *every* time it is started from scratch. Solving most adventures requires several attempts before completion and this one is no different. So, what do you do when every game is different? Just use the game save feature included at the beginning (just in case you meet a quick death) and, then later, if you are still alive and doing pretty good, make another save from that point. Saves take very little tape space and don't take much time. Starting again is simply a

QUASAR ANIMATIONS

regrets any inconvenience we may have caused **WILLIAMS ELECTRONICS** for improper use of their name in last month's ad.

matter of loading in the program and then the data and you're right where you left off.

Another nice feature of this game is the QUIET command which allows you to pause a game in progress and come back later as long as your CoCo is on (excellent for "pit stops," snack breaks or when the wife threatens to beat you severely if you don't give her some attention). This feature is also good for another important aspect of the game, even though I don't think the programmer(s) intended it, and that is map making. In this game, if you sit still for very long at all, the walls start shaking, followed very shortly by a cave-in. So to facilitate mapping, I type QUIET as soon as I enter a new room and note any features of interest and exit directions. This is especially important when starting a fresh game because, even though there is a core of rooms that don't change, there are portions that are randomized along with the other variables. QUIET is also the mode from which the saves and loads are done.

Motion commands are single letter (U, D, N, S, etc.) and other commands are generally two-word in the familiar verb/noun format. One exception to this is the BACK command which is used if you enter a room with exits that are already blocked . . . *if* you are quick! Another appreciated feature is the SCORE command (also done automatically on death or completion) which lets you know how well you are doing as you go along. It can also help you determine if the objects you find are really treasures or not. By the way, I tried using AD-DICT (*Rainbow*, February, 1983) on this game and only got a little help since quite a bit of info seems to be in non-ASCII format, possibly due to the "randomness." But, there are a few tidbits of interest.

The documentation is the familiar Radio Shack booklet, eight pages in length, three of which have to do with actual game playing (scoring, spells, a FEW hints, etc.). The rest of the booklet more than adequately describes the features I have mentioned and a few more. If the name of this program sounds familiar, a look at the copyright page will show you that this is the same game from Spectral Associates, only now it's under license to Tandy Corporation.

The "random" feature has its pluses and minuses. The number of things randomized can lead to some games that are almost unbeatable and some that are relatively easy (darn few!). But, it keeps this from being a "solve-it-and-put-it-away" type adventure if you don't mind the data saves.

All in all, I give it a hearty recommendation, especially for the price.

(Radio Shack, nationwide, Cat. No. 26-3313, \$14.95 on tape)

—Bruce E. Sterling

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MONEY MINDER II is the cassette version of **DISK MONEY MINDER**. Reviewed in April 1982 Rainbow and improved since then!

Requires 16K but does NOT require Extended Basic

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PIE-CHART is a unique graphing program. It allows you to enter data such as monthly bills, yearly expenditures, etc. This data may be entered as percentages or in its "raw" state. Data entered raw will be converted to percentages by the program. The resulting **PIE-CHART** can be saved to tape or the data itself can be saved to tape for later use. By using a screen print program (not supplied) you can make printouts of the pie-charts. One unique feature of the program allows you to save a large number of pie-charts or other hi-resolution screens to tape and reload and display them one at a time by "flipping" through them quickly much as you might do with a slide show presentation. This feature would be great for a sales presentation, club meeting or retail display. Other features—automatic screen writing i.e. designations—up to 20 entries possible per pie-chart—keyboard toggle of "raw" vs percentage data entry.

PIE-CHART needs 16K and Extended Basic

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AMORT asks you to input the amount of a loan, the term of the loan and it's interest rate. The program will print to screen and/or to your printer and will give you: 1—a running total of principal still to be paid. 2—The amount of the monthly payment applied to principal. 3—The amount of the monthly payment applied to interest. 4—The total monthly payment. 5—The total amount paid into principal to date. 6—The total amount paid into interest to date. 7—The total amount payed out to date.

Requires 16K and Extended Basic

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COLORHYTHM is a biorhythm program for your Color Computer. It plots in High-Resolution graphics (PMODE3) and color a 15 day biorhythm chart displaying your Intellectual, Emotional & Physical biorhythms. Reviewed in August 1982 Rainbow.

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*** EDUCATIONAL ***

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A lot of fun for 16K and Extended Basic

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PRE-SCHOOL PAK consists of two programs for preschooler learning fun. **ALPHABET** drills the child in alphabet recognition and rewards a correct answer. **COUNTER** drill the child in counting to 10. Both use Hi-Resolution graphics and sound. Reviewed in September 1982 Rainbow

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MATHWAR is an educational game. In the game the player must jump one space-fighter over another checkers style, until only one fighter remains. Each time a move is selected the program will not complete the move until a math problem is answered correctly. The player selects addition or subtraction and one of four difficulty levels. Level 1 is problems with numbers up to 19 but no carrying or borrowing is required. Level 2 is the same as Level 1 but numbers up to 99 are allowed. Level 3 uses numbers up to 19 but allows carrying and borrowing problems. Level 4 is the same as Level 3 with numbers up to 99. No negative responses to wrong answers and the math score is displayed at the end of the game.

Requires 16K and Extended Basic

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Software Review

Desert Golf: Good Graphics But Still A Bogey

When I received this game in the mail I quickly opened it, eagerly anticipating a fun game of computer golf. I have seen some of Spectral's other game such as *Ghost Gobbler* and *Planet Invasion* and was quite impressed by their quality. Besides, it was a cold day and I would much rather spend it inside than on the links.

The documentation is brief but adequate. The premises of the game is that it is the final round of a major golf tournament and you are among the leaders with nine holes left to play. Text screen displays are used to show available clubs, standings (leader board), and review of scores (your score-card). A text screen is also used to display your current status including length of hole, distance to green, distance of shot, and a menu to get you to the above mentioned screens and two graphic views of the hole. All the text screens are nicely formatted and include some color graphic block borders. The two graphic screens are done in PMODE 3 to make use of four colors. One shows an overhead view of the hold and the other shows a view from the tee and even includes the mountains in the background. These graphics are extremely well done.

At this point I was ready to play the game and it was here that a severe case of disappointment set in. The graphics are not used for the play of the game. It is a text type game that could be played all the way through without ever looking at those beautiful graphics! To play, you select a club and enter. You can then sit and watch the distance from hole counter run down while the length of shot counter runs up. A request to display the overhead view of the hole shows the same screen we saw at the start. Ball position is not shown. Club selection is also a disappointment—you get three woods, the 3, 5, 7, and 9 irons, and SW. They are not good for the same distances a standard club would be. I learned this when I selected a seven iron for a 130 yard shot. A message displayed "solid hit" and the distance counter ticked off 45 yards—certainly not a "solid hit" for someone in a major tournament. When I finally made it to the green, putting was as unexciting as the rest of the play. You are shown the distance from the cup in text and asked to pick a putting strength of 1-15. I quickly learned that a strength of from one-half to one-third of the distance to the hole usually resulted in sinking the putt.

Another disadvantage of this game is that it always plays the same nine holes. I'm sure the reason for this is the excellent graphics; it would be almost impossible to randomize the holes and still maintain the same quality within 32K. Finally, this is a one-player game. You can't invite the boys over on a snowy evening to enjoy a round of indoor gold.

I also have the Tom Mix game which *does* use the graphics to show the play of the game and, although the Spectral game has superior graphics, the Tom Mix game is definitely more fun to play.

Desert Golf requires 32K and Extended BASIC.

(Spectral Associates, 141 Harvard Avenue, Tacoma, WA 98466, \$8.95)

—James G. Kriz



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Refreshing *Trapfall* Requires Quick Thinking, Luck

Mention the words jungle survival to any soldier and his face will usually register a considerable amount of distaste. But now, thanks to Tom Mix Software and Ken Kalish, you can feverishly work your way through a tough jungle survival course without ever leaving the comfort of your computer room.

This program is similar in name and appearance to a popular arcade game. You must maneuver your man over the course running from screen to screen and avoiding obstacles and dangers. The right joystick controls direction and pressing the fire button makes your man jump. The obstacles include pits into which you can fall, rolling logs, ponds full of alligators, quicksand pits which appear and disappear, snakes and, just to keep things nice and creepy, scorpions in the underground caverns.

There's even the odd native campfire, its flames still flickering. (Wonder what they've been cooking?!) Some of the screens require you to jump to catch a swinging vine in order to cross a hazard and, believe me, jumping at just the right time is no small feat. It's particularly interesting when you hit a stretch of three or so of these screens in a row. If you time it just right, you get the feeling of swinging from vine to vine.

The action is fast and furious and there is little time to stop and catch your breath. Thankfully, our little "Indiana Jones" never seems to get tired. He continues to run fast and jump high no matter how breathless the player gets.

Colors and animation are very good and control is responsive. Scoring in *Trapfall* is a little different; you begin the game with 2,000 points and a time allotment of 20 minutes to find as many treasures as you can. Being hit by any of the rolling logs or falling into any of the pits costs you points only. Sinking into quicksand, being eaten by alligators, being bitten by a snake or being stung by a scorpion costs you a man, of which you have three. The only way to score points is to find the treasures. My high score to date is 27,300 points in a game in which I found five or six treasures.

On screen scoring, display of the highest score in the current session and number of men remaining are provided, as well as a digital clock which counts down your time remaining. I haven't as yet survived long enough to run out of time, but I imagine things could get a little crazy if you were trying to find one last treasure before time runs out. The sound effects are good and do not slow down play at all.

Documentation is only enough to get you started; it's up to you to enter the jungle and discover its secrets on your own—which, after all, is the way it should be.

One other thing about this program I like is that it is entirely controllable with the joystick. After your last man has sunk out of sight in a mire of quicksand, all you have to do is press the fire button and you are at the title screen; press it again and you are off on a new game. This lets you sit back in your favorite armchair and play game after game without ever having to lean forward to press any keys after each game. (Okay, so I'm a little lazy.)

Trapfall requires 16K and is written in machine language. On a 16K machine you must do a *CLEAR 8* in command mode before loading the program, but this isn't necessary with 32K.

I enjoy this game; it demands quick thinking and fast reaction time. A little luck comes in handy also. The graphics are very good and *Trapfall* is a refreshing change from space games. I think it would be a great addition to any game library. This one is a must.

(Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, \$27.95 tape and \$30.95 disk)

—David Johnson

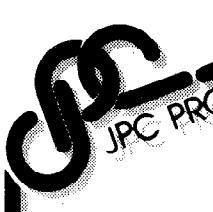
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Dear Kids,

Last Thursday morning, I heard a terrific commotion underneath the front porch—a howling and snorting and scruffling around like you couldn't imagine. I crawled under there, and lit a match. What do you think I saw? Dust every which way, and dirt flying around. Ben's two hind legs flapping backwards and his tail whipping back and forth like crazy. I grabbed one of his legs and pulled backwards until we both fell back into a bunch of legs and ears. Clamped at the end of Ben's nose was a turtle. I pried the turtle loose, Ben ran into the woods, and I took the poor creature inside the house.

I had been thinking about turtle graphics, so I thought I'd try it out for real. I spread a big sheet of paper on the floor, tied a pen to the turtle, and let him loose. He struggled along for a while in a straight line, and drew a straight line behind him. Then I changed his direction, and he drew another straight line. I changed his direction again, and he drew a third straight line. I was hoping for a triangle, but got something else. I put a new sheet of paper down, tried again, but still no triangle. I put down a third sheet of paper, and tried again with a little better luck. Well, that was entertaining, but I realized why some of these people have been putting turtles onto computers: a turtle without numbers won't get you very far. Also, real turtles really are slow.

I went down to my Color Computer in the den, and thought I would try triangles on that. I got the thing going, pressed "R" which put me into the turtle's "run" room. Next, I tried to reproduce what I had done with the turtle. First I ran this (pressing *ENTER* after every line):

```
FD 40
RT 90
FD 40
RT 90
FD 40
```

Next I ran this (having *CLEAR*'d the screen):

```
FD 40
RT 80
FD 40
RT 190
FD 40
```

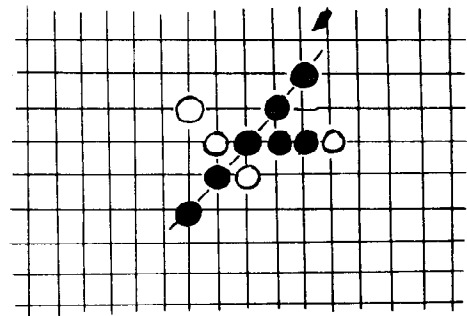
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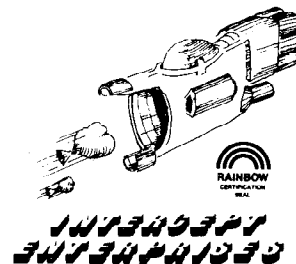
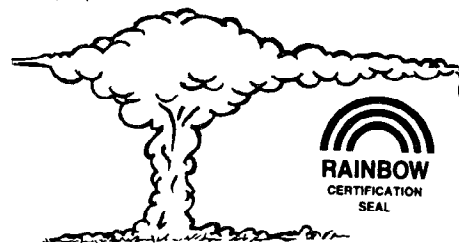
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Finally, I ran this:

FD 40
RT 130
FD 40
RT 130
FD 40

That last one was a triangle of sorts, although those extra legs sticking out bothered me a little. I smoked my pipe and thought that things might be easier to figure if I just tried very carefully to make the simplest possible triangle: a triangle with three equal sides and three equal angles.

Next, I thought this: "I've only been giving instructions for two of the three angles, because the third is automatically formed. But if I'm trying to draw a triangle of three equal sides and three equal angles, I ought to define that third angle—and then check out my guess by having the turtle draw out an extra line from the third angle."

I tried the following:

FD 60
RT 110
FD 60
RT 110
FD 60

It wasn't a triangle. "What do I learn from adding one more angle and an extra, double-checking side?" I asked myself.

RT 110
FD 60

That fourth side that I just added should really be tracing over the first side—if I had really drawn the triangle properly. Now it comes to me! Eureka! I know already that a complete turn of the turtle is a 360-place, or position or degree, turn. If that fourth side is supposed to be tracing the first side, that means that by the time we get to that fourth side, the turtle should have already gone in a 360 degree turn. That means that, if the turtle is going to be making a total of three turns (in a three-angled, or three-turned figure), the three turns should add up to 360—otherwise that extra checking-up line won't overlap the first side. Let me try using three turns worth 120 each and see what happens:

FD 60
RT 120
FD 60
RT 120
FD 60
RT 120

That looks pretty good. Add the overlapping side just to check (add another FD 60), and presto! It works. A quick examination shows that this works no matter what the size of the sides are—so long as I keep them equal in length.

Well, that all makes sense. I already know that in order for the turtle to spin around once and return to its original position I have to tell it to spin 360 units of spin (or degrees), that is, to "RT 360" or "LT 360." Maybe any closed figure of any number of angles and sides would have to give me a total of 360 degrees of turn. (Note: My spics tell me that this will only be true of closed convex geometric figures—in other words, as long as every time the turtle turns to make an angle, it turns in the same direction, instead of meandering this way and that all over the place.) That makes sense, too.

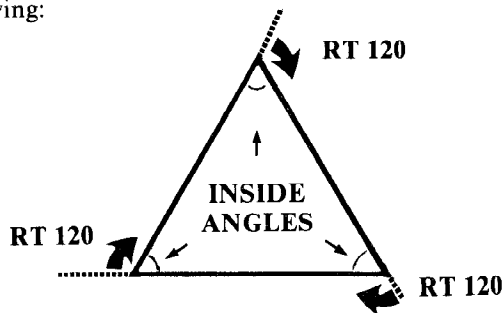
To test out my idea, I try a four-sided (equal-angled, equal-sided) figure. First, to find the degrees of turn, I divide 360 by 4. That gives me 90. Then I choose sides of equal length.

FD 50
 LT 90
 FD 50
 LT 90
 FD 50
 LT 90
 FD 50

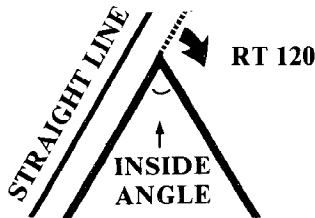
I add an extra "LT 90" and "FD 60" just to check everything, and indeed it does work out. Next, I take the same principle, and move onto more challenging territory. I try a ten-angled, ten-sided figure—and start by figuring maybe the degrees of turn should each be $360/10$, or 36 each. Yes indeed, it works (and works easily, if the sides are of equal length).

I'm sure this all is old hat to most, maybe all of you—especially you, Tad and Andrew!—but you have to remember that when I was in school it was a long time ago, and I slept a lot. Anyhow, I was so proud of myself for figuring these things out, I made the mistake of showing Bertha. She's been speaking to me lately. "That's nice, but what are your angles?" she asked. "Angles?" I asked back. "The inside angles of your figures," she said. Having crushed my self-confidence, she waddled away.

Back to the drawing board. I couldn't stretch my turtle thinking any further right then, so I took out a pencil and paper, and drew an equal-sided, equal-angled triangle. Next, I thought about how my turtle was moving and what my instructions for turning really meant. I came up with the following:



Now, if I added together one inside angle with an angle of "turtle turn," it came out to a total angle that was really like a straight line.



I seemed to have a vague memory somewhere near the back of my head that an angle opening into a straight line was represented by 180 degrees. I tried it out with the turtle, and sure enough, 180 degrees made a straight line. That meant, it seemed to me, that each of my inside angles on this triangle would be 180 minus 120, or 60 degrees. Adding all three inside angles together gave me a total of 180 degrees.

I tried the same with a square. I figured out the inside angles for a square and found them to be 90 degrees each, for a total of 360. I tried the inside angles for a pentagon, and found them to be 108 each, for a total of 540. I tried the

inside angles for the "ten-agon," found them to be 144 each, for a total of 1440. To be truthful, that was about as interesting as a dandelion to me. I couldn't really figure out any particular meaning or pattern to that. I thought it was neat that, whenever I wanted to draw a closed geometrical figure, all I had to do was make sure the total turtle turns added up to 360. But I didn't see that adding up the inside angles told me much of anything. (Note: My spies tell me that Mr. Rick Billstein has a nice article in the November 1982 issue of *The Computing Teacher* on how the turtle can be used to do such things, and also to prove a special formula for figuring out sums of inside angles.)

Well, at that point, I quit and went back upstairs. I must have been down in the den for about an hour, and I had forgotten all about my poor little turtle in the living room. When I got back upstairs, he had disappeared and left only a trail (from the pen I had tied to him) that led into the kitchen and behind the fridge. From there the trail disappeared. With certainty, this is a mere coincidence—but two days later I discovered that there were significant supplies missing from the fridge. I've more to say, but it'll have to be next time, I remain,

Uncle Bert

P.S. You can send your cards and letters to me in care of my good friend Dale Peterson. Just address them like this:

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Build This Parallel Printer Interface

By Tony DiStefano
Rainbow Contributing Editor

The *Parallel Printer Interface* is the first project that will adapt to my Y-ER expansion card. After you build this circuit, you will be able to use any parallel printer that is Centronics compatible. This circuit uses one MC6821 PIA. The other two chips used are for decoding the address bus to memory map the PIA from \$FF70 to \$FF73. The PIA has two functions: 1) to check if the printer is busy and 2) to transfer data to the printer. Bit 0 of port A is used to monitor if the printer is busy. All 8 bits of port B are used to transfer the data to the printer. The Control line CB2 is used to strobe the data into the printer. The PIA is initialized in such a way that CA2 auto strobes when a write to port B is done. Refer to the Motorola MC6821 PIA data sheet for more details on how a PIA works.

To put the circuit together is not too hard, but, like all electronic projects, care should be taken in the process. The circuit is shown in Figure 1. It consists of only three chips. The shopping list below includes everything you need to build the project. The first thing you must do is trim one side of one of the connectors of the project board. I'll explain why later. Look at Figure 2 to get the location of where to cut the board. You have to remove three pads. Well, it is actually six pads because there are three pads on each side. Use a hacksaw to cut the board. Be careful not to cut or scratch any of the other pads. Next, position the IC sockets as shown in Figure 2. Note the position of pin one on each socket. They all go on the bottom and to the left. Position them the same way. Solder all the pins on all of the sockets. The next thing to do is to get the B-Plus and the B-Minus buses in. Turn the card upside down and locate the bus that is parallel to position 5 written on the sides. That will be the ground bus. I traced all the legs of the ground bus with a black grease pencil. This makes finding a ground point easier. The other bus, at location 33 on the sides, will be the B-plus line. That's the 5-volt line. Use a red grease pencil to mark it.

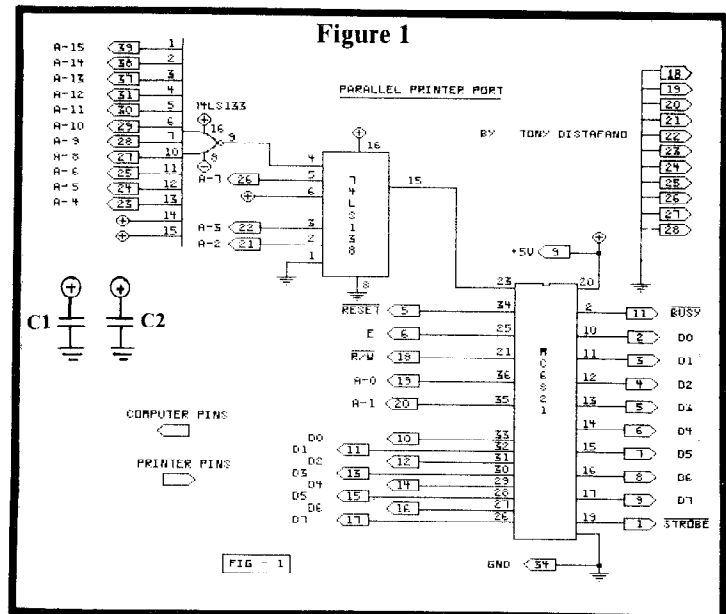
The rest of the soldering on this card will be made following the schematic. Solder the wires one by one, and after each connection is done, mark it on the schematic. This

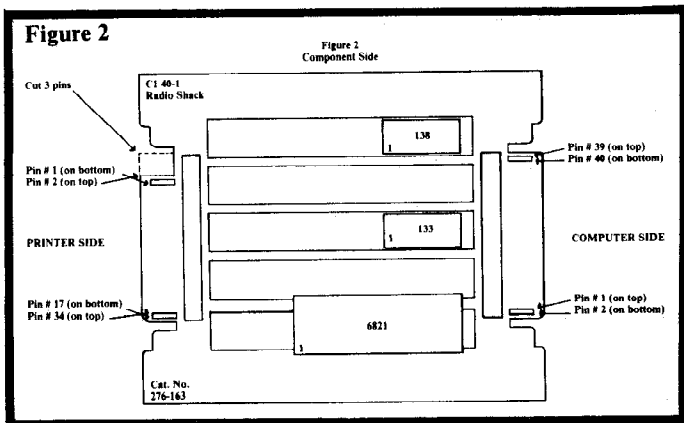
(Tony DiStefano is well known as an early specialist in Color Computer hardware projects. He is one of the acknowledged experts on the "insides" of CoCo.)

Shopping List For The Parallel Printer Port

Quantity	Description	RS # (if any)
1	PROJECT BOARD	276-163
1	40 pin IC socket	276-1996
2	16 pin IC socket	276-1998
1	74LS133	N/A
1	74LS138	N/A
1	MC6821	N/A
2	.01 uf CAP	272-1265

prevents you from trying to connect a wire twice or forgetting others. The small pads that point to the left on the schematic mean that it goes to a pin on the Color Computer cartridge side. The small pads that point to the right mean that it goes on the printer connector side. Refer to Figure 2 to get the proper location of the pinout for both the computer side and the printer side. Note that pin 1 for the computer side is the top of the upper pad and that pin 1 for the printer side is the bottom lower pad. I did it that way because the





ribbon cable will sit properly in the connector. It will drop downwards. After all the wiring is done, clean the board of the flux residue. This can be done with flux remover, or anything else that will remove the flux. Check your work carefully and make sure there are no shorts or cold solder joints. It would be wise to check the wiring once again.

Put the board aside for now, it's time to concentrate on the printer ribbon cable. You have two choices: 1) buy one from Radio Shack, or 2) make one yourself. The first choice is simple; go to your nearest Radio Shack store and buy printer cable #26-1401. That is a 34-pin edge card to 36-pin plug. It's for a Model I/III to standard parallel printer cable. It will work perfectly. The second choice is a bit more work but will cost you much less. You will need three parts.

- 1) 34-pin edge card to ribbon connector, RS # 276-1564.
- 2) 36-pin Centronics type connector, RS # N/A.
- 3) 6 feet of 34-conductor ribbon wire, RS # N/A.

Take one end of the ribbon wire and connect it to the 34-pin edge card connector. Procedures on how to connect a ribbon wire to a connector are explained in last month's issue in my Y'ER article. Now, the other end is a bit tricky. There are 36 pins and only 34 wires. The last two are not used. When you put the ribbon and the connector together, make sure that the first wire (pin 1 on the edge card connector) meets with pin 1 on the Centronics connector. The last two pins will be left empty. On the connector the empty pin numbers are # 36 and # 18. Then, press the connector in the usual manner. This will give you a printer cable for about half the price of one you would buy.

Okay, now you have the board and the connector. After you are sure that both are constructed right, it's time to plug it in. Now, the computer gives you the familiar logo, but what do you do with it? It doesn't work, does it? You are missing some software to hook it into BASIC. The machine language program listed below will re-route the *PRINT#-2* command to the parallel port. All you have to do to hook it in is *EXEC*. When you type *EXEC* again, it will unhook itself and *PRINT#-2* will again go to the RS-232 port. Be careful that you give it an *ORG* in the right place, and make sure that you reserve enough memory, so you don't crash the program. That's all there is to it!

The listing:

* PARALLEL PRINTER ROUTINE
* BY TONY DISTEFANO

```

0001 0E00          NAM  PPRINT
0002 0E00          ORG  $7F00

0003 006F        PRNO  EQU  $6F
0004 009C        CRHOOK EQU  $9C
0005 0168        PRHOOK EQU  $168
0006 FF70        PIA   EQU  $FF70

```

```

0007 7F00 8EFF70      INIT  LDX  #PIA      PIA LOCATION
0008 7F03 4F         CLRA
0009 7F04 A701        STA   1,X      DDR ACCESS A
0010 7F06 A703        STA   3,X      DDR ACCESS B
0011 7F08 A7B4        STA   0,X      ALL INPUT A
0012 7F0A 4C         INCA
0013 7F0B 979C        STA   CRHOOK   BASIC IDEO
0014 7F0D B6FF        LDA   #$FF
0015 7F0F A702        STA   2,X      ALL OUTPUTS B
0016 7F11 A701        STA   1,X      CONTROL ACCESS
0017 7F13 B62C        LDA   #$2C     B+STROBE
0018 7F15 A703        STA   3,X      CONTROL ACCESS
0019 7F17 BE0168      LDX  PRHOOK
0020 7F1A 10BE7F40    LDY  RETURN+1
0021 7F1E BF7F40      STX  RETURN+1
0022 7F21 10BF0168    STY  PRHOOK
0023 7F25 39         RTS

0024 7F26 3402        PRINT PSHS  A      PRINT DEVICE #
0025 7F28 966F        LDA  PRNO
0026 7F2A 81FE        CMPA #$FE        TO PRINTER?
0027 7F2C 260F        BNE  NOGO        NOT PRINTER
0028 7F2E B6FF70      F1   LDA  PIA
0029 7F31 B401        ANDA #1          IS PRINTER
0030 7F33 26F9        BNE  P1          READY?
0031 7F35 3502        PULS A          TO PRINTER
0032 7F37 B7FF72      STA  PIA+2      & STROBE
0033 7F3A 3262        LEAS 2,S        GO BACK TO
0034 7F3C 39         RTS            CALLER

0035 7F3D 3502        NOGO PULS  A      NOT FOR PRINTER
0036 7F3F 7E7F26      RETURN JMP  PRINT ADDRESS

0037 7F42          END

NO ERRORS FOUND

CRHOOK 009C 0013
INIT 7F00
NOGO 7F3D 0027
P1 7F2E 0030
PIA FF70 0007 0028 0032
PRHOOK 0168 0019 0022
PRINT 7F26 0036
PRNO 006F 0025
RETURN 7F3F 0020 0021

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Examining Some Educational Uses Of The Color Computer

By Michael Plog, Ph.D.

When most people talk about educational uses of a computer, two topics are mentioned more than any other—interactive instructional use and teaching BASIC. These are very important uses of microcomputers in schools. Indeed, the BASIC language of the Color Computer is one of the most advanced I have seen. It is far superior to the MBasic used in most minis, and anyone who has programmed an Apple is relieved to get back to Extended Color BASIC. For interactive instruction, the Color Computer is a powerful tool for classroom use. Students can have lessons using color and graphics, as well as enough power and speed for almost any type of application.

There are other uses of computers in education, however. In our haste to have students get “hands on” experience with machines, we should not ignore these other uses. It is my contention that some of these other uses may prove more worthwhile to students, teachers and administrators than either interactive instruction or teaching about computers.

First, consider the *development of materials* for students. The microcomputer is an ideal way to prepare materials uniquely suited for individual students. Spelling words, for example, can be used in work search puzzles or word scrambles for elementary children. A more sophisticated use of the Color Computer for materials development is to prepare individual tests for students, including items missed on past quizzes.

(Michael Plog received his Ph.D. degree from the University of Illinois, the M.S. from Memphis State University, and the B.S. from the University of Tennessee. For his foreign/research language option required for the doctorate, he naturally selected computer language. Michael currently works for the Illinois State Board of Education as a research and evaluation specialist.)

Another important use of a microcomputer, gaining popularity more in recent months, is *management of instruction*. For example, in a high school literature class, a microcomputer is an ideal way of keeping track of books read by students, and their scores on exams on each book. Teachers can easily determine what gaps are present for each student,

“For interactive instruction, the Color Computer is a powerful tool for classroom use. Students can have lessons using color and graphics, as well as enough power and speed for almost any type of application.”

and design educational experiences to complete the course of study. Management of instruction also involves keeping track of test scores and “modules” completed by students. The major thing to remember is that computer assisted instruction (CAI) is not the same as computer managed instruction (CMI). When teachers use computer managed instruction, students may never come near a machine.

Another possible use of microcomputers in schools is for *administrative management of information*. The Color Computer is not widely used in this field (to the best of my knowledge), but certainly should be. The printing of class

lists, recording daily attendance, preparation of mailing lists to parents, keeping financial records, information about substitute teachers, are all examples of ways administrators can use microcomputers. The list of uses here is only limited by the imagination and time available to administrators. I even know of some schools that prepare their schedules (what students will be enrolled in which classes) on a microcomputer. The program has to run overnight, but that time is a vast savings compared with older, manual ways of preparing a schedule, or buying time on a mainframe.

One use of microcomputers, *data exchange*, appears to be a high interest topic currently. Some schools have a bulletin board service run out of the computer laboratory—designed and operated by students. On a different level (of more immediate importance to school districts, although not students) electronic mail can be a valuable aid to school people. When a student transfers from one school to another, for example, complete records can be only a telephone call away. The use of electronic mail has other possibilities for educators. When a piece of legislation is being discussed in a state (or even federal) congress, educators can learn of the debates, contact their elected officials, and lobby for their interest. All this can be done in a matter of hours, using electronic mail. In an effort to save time and money, the state of New Jersey is currently testing a system whereby school districts report to the state office via telephone and modem. This example of data exchange may well prove the most financially beneficial use of microcomputers in schools.

There are other uses of microcomputers in education; I have not attempted to exhaust the possibilities, just to classify some major topics. Uses of hardware, for example, could be very important for students with physical disabilities. The

day is not too distant when blind students will be able to read teacher developed materials on a brailled computer output. (There are experiments in the field today, but they are still expensive and rare.) With a speech synthesizers, mute children can use their own microcomputers to actually talk with their peers.

Instead of going on about possible uses, let us stop for a moment and regroup. Future articles will present more detailed examples of each of the uses noted briefly above. Right now, however, let me pose a question to you: What is the greatest problem of microcomputer use in education?

No, it is not availability of hardware. The price of the Color Computer is continuing to drop, especially with local Radio Shack monthly sales and educational discounts. Schools can find the money for the purchase of a few machines. The greatest problem is knowledge about quality software available for schools. Now note—I said *knowledge* about quality software, not the existence of quality software. I will bet dollars to doughnuts that every reader has purchased a program and felt they were the victim of fraud. Likewise, every reader has purchased a program and been willing to pay twice the price because of the value received. The problem is knowing the difference before purchasing. Well, I am going to suggest a potential solution to this problem next month. Please tune in and read the article, because I will need your help. By the way, next month's issue of *the Rainbow* is devoted to education and the Color Computer! Should be interesting.

As a final shot, if you have an experience or thought to share about microcomputers in education (especially, but not limited to, the Color Computer), please write me. I would very much like to know your views and ideas. My address is 829 Evergreen, Chatham, Illinois 62629.



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The Powerful QSort Routine Comes To The Color Computer

Part Two

By Colin J. Stearman

This two part article brings to the Color Computer a fast and versatile number and string sorting routine. In addition, we will explore the way numbers and strings are represented by Microsoft BASIC.

Colin Stearman's Quicksort program for the Color Computer should not be confused with a similar program of the same name available commercially through Skyline Marketing. Their ad appears in this issue of the Rainbow.

In the last issue we looked at *Quicksort* implemented in BASIC. Now we will look at a machine code version which offers significant speed and flexibility while occupying around 1.5K of memory space. The program is written in Position Independent Code or PIC for short. This means it will work correctly no matter where it is loaded in memory. Although this adds somewhat to its overall length, it provides the ability to append it to a BASIC program using one of the many previously described techniques. The assembly was performed at address E00 (hexadecimal) as this is the normal starting address of graphic screen 1 when running Disk Extended Color BASIC.

Design Considerations

As I mentioned in the previous installment, the *Quicksort* implementation by Don Brumm for the TRS-80 Model I was my model for the Color Computer version. However, it used a technique which had some problems when transferred to the Color Computer. Instead of actually sorting the array in question, Don chose to sort an index array of integers. Then this array could be used to access the "sorted" array. By this technique the subscript of the 10th element in the "sorted" array is the value of the 10th element in the integer array. By using the one level indirection, it was not necessary to actually rearrange the original array.

The problem with this approach is that the Color Computer does not have integer arrays. All number arrays are floating point, and as I described earlier, each number takes up five bytes of memory. So if we wished to sort an array of 4096 elements, the index array would also have to contain 4096 elements. This alone would take up 4096 x 5 bytes, plus

seven more for the array header. This is 20487 bytes! Hardly a practical proposition in a 32K system. If integer arrays had been possible, the index array would only occupy 8192 bytes. So the first design decision was obvious. We would have to sort the array itself.

At the outset, we set some goals which the sort must achieve. To refresh your memory they were:

- Sort string or number arrays
- Sort in ascending or descending order
- Sort a part of an array only
- Have good call error checking
- Sort 1 or 2 dimensioned arrays
- Include or exclude 2nd dimension in sort
- Sort either 1st or 2nd dimension

This flexibility calls for a method of communication between BASIC program using the routine, and the routine itself. Don Brumm used the index array for this, so we might as well use a similar system. Because we will not be using the array as an index array, however, let's call it a parameter array. This array will contain data on how to conduct the sort. This information will tell the routine which subscript to start the sort at; which one to end on; the order; the array to sort; and, if a string sort, which elements of each string to use for comparison purposes. The first element of the parameter array is then pointed to by the *VARPTR* function in the call routine.

Call Error Checking

This only leaves the call error checking. The BASIC line which calls the routine is in the form "X=USR(n)." The variable "X" can be given a value by the machine code routine. This variable is used to return a value which describes the success or failure of the call, and the nature of the problem, if any. If the variable has the value zero, the sort was successful. Any other value indicates a problem. The codes and their meanings are:

0 SORTED WITHOUT ERROR

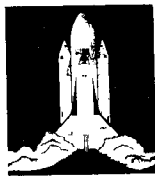
(Mr. Stearman is Field Engineering Manager for Boston Digital Corp., a manufacturer of precision, computer-controlled milling machines. He was born and educated in England and has lived in the U.S.A. since 1970.)

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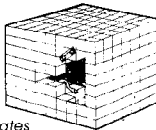


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- 2 **PARAMETER ARRAY NAME ERROR.** This array must be called "I" or "I*", where "*" can be any letter.
- 2 **PARAMETER ARRAY DIM ERROR.** Parameter array must be unidimensional.
- 3 **PARAMETER ARRAY NOT NUMERIC.** Parameter array cannot be a string array.
- 4 **PASSED NO. OF ELEMENTS > 4096 OR 0.** You can sort an array longer than 4096 elements, but you can only sort 4096 elements of it at a time.
- 5 **INSUFFICIENT DATA IN PARAMETER ARRAY.** You must define elements 1 and 2 as a minimum.
- 6 **ERROR IN I(3) VALUE (0 THROUGH 3 ONLY).** This selects the dimensions in two dimension array sorts, and has only these four legal values.
- 7 **SORT ARRAY NAME ERROR.** The sort array must be named "A" or "A*" for numeric, or "A\$" or "A*\$" for strings. "*" is any letter.
- 8 **SORT ARRAY DIM ERROR.** Sort array must be unidimensional, or two dimensioned, with the second dimension a 1.
- 9 **INCONSISTENT SORT ARRAY SIZE.** Sort array dimension is not consistent with values given parameter array, elements 0 and 1.
- 10 **I (3) VALUE INCONSISTENT WITH NO. OF SORT ARRAY DIMENSIONS.** You cannot use one through three if the sort array is unidimensional.

By inspecting the returned value it should be possible to debug most of the difficulties calling the routine.

The Assembly Language Version

I do not propose to "walk" you through the program shown in Listing 3. It would consume far too much space on these pages, and I suspect also consume far too much of your patience! I have tried to comment the assembly listing so that those curious amongst you can see how it was done. The program itself breaks down into various sections. First data space is reserved and a particularly useful macro is defined. Following this is the mainline of the program. Notice it is not very long and represents the whole program. Mostly it consists of calls to other subroutines. Closer inspection will reveal the general flow of the program.

The subroutines which follow perform these general functions:

GETNUM — uses a subroutine in BASIC to convert a floating point number to a 16 bit integer.

INTRL — the reverse of GETNUM.

INIT — does all the initialization and call error checking.

ARKCHK — is used by INIT to check an array's header.

GETPTR — returns the address of an element in an array, given its subscript.

UNSTCK — gets the partition data from the stack to sort next.

LSCAN and **RSCAN** — scan the current partition from left and right respectively, for matches to the comparand.

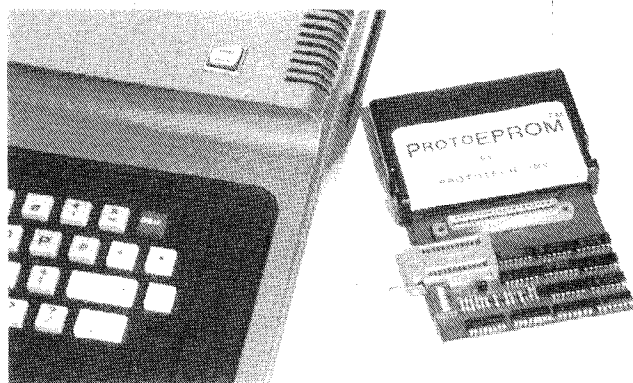
SWAP — exchanges elements found by LSCAN and RSCAN.

RGSTK and **LFTSTK** — stack the right and left partition data respectively, for later sorting.

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PARTSZ — checks the two resulting partition sizes for relative size, to decide which to stack.

RNDCMP — extracts a random element from the current partition to become the comparand.

RANDOM — is used by RNDCMP to get a random number. It uses BASIC's random number generator routine.

COMPAR — performs the actual comparison between the selected element and the comparand.

COMPNUM — is used by COMPAR to compare numeric array elements.

COMPSTR — is used by COMPAR to compare string array elements.

EZSORT — is a complete implementation of the simple sorting procedure.

With this information you should be able to understand the detailed operation of the program.

Using QSORT

Listing 1 shows the test routine I used to check QSORT for "bugs." It is designed for Color Computers with 32K, Extended BASIC and a disk. If you do not have disks, line 20 can be changed to CLOADM to get the QSORT routine off a cassette. It assumes that QSORT is located at the assembly

"Quicksort . . . offers significant speed and flexibility while occupying around 1.5K of memory space."

address of E00 (HEX). The actual starting address of the routine is 4E (HEX) beyond the load point. When loaded at E00 the starting address would be E4E.

It is designed to sort a random array of numbers, but can be simply modified to demonstrate string sorting. The key lines are as follows:

```
50 DIM A(999),I(2),B(3)
```

A is the numeric array being sorted. I is the parameter array. B holds the timer values.

```
140 I(0)=0:I(1)=K9:I(2)=VARPTR(A(0))
```

I(0) defines the lowest subscript to start the sort on, I(1) the highest. I(2) uses VARPTR to point to the address of the zeroth element of the sorted array.

```
170 X =USR(VARPTR(I(0)))
```

calls QSORT jumping to the address defined in line 40. The argument uses VARPTR to point to the zeroth element of the parameter array. The variable X will contain the call status value and is checked on the following line. Note that X was predefined on line 90. If it was being defined for the first time on line 170 the value returned by VARPTR to I(2) on line 140 would no longer be correct.

Listing 2 shows a more complex call to QSORT. It is designed to provide an alphabetic directory of the selected disk drive floppy. After extracting the file names from the

directory track it sorts them first by file type, then by name. The important lines to note are:

```
20 DIM AX$(63),I(7)
```

AX\$ is the string array to be sorted. Allowing a second letter for the string array name permits a program to sort several arrays. I is the parameter array.

```
35 RC=0
```

preassigns the calling variable.

```
190 I(0)=0
```

begins the sort with element zero.

```
195 I(1)=R-1
```

determines the last element to sort. This ensures higher, but blank, elements stay where they are.

```
200 I(2)=VARPTR(AX$(0))
```

points to the array to be sorted.

```
205 I(4)=10:I(5)=12:I(6)=1:I(7)=8
```

says first sort by elements 10 through 12, then by elements 1 through 8. This gets the result in file type order first, then by file name. I(3) is undefined and hence zero.

```
220 RC=USR(VARPTR(I(0)))
```

calls the QSORT routine and points to the parameter array.

Exact Calling Requirements

Now we've looked at a couple of calling examples, let's define the exact requirements in general terms.

First the sorting array must be a one or two letter named string or number array with the first letter an "A." It must be unidimensional, or two dimensional with the second dimension set to one. It can be over 4096 elements on size, but only 4096 elements can be sorted at one time.

The parameter array must be numeric and have at least three elements. It must have a name of one or two letters, starting with an "I." It must have enough elements to handle all the desired data to be given to the QSORT routine.

Now let's look at the parameter array itself. Elements zero and one describe the subscript range on which to sort. If the zeroth element is lower than the first, the sort is ascending. Otherwise it will be descending.

Element two points to the zeroth element of the sorted array using the function VARPTR. If it is a two dimensional array, it must point to the (0,0) element. For example, I(2)=VARPTR(AZ(0,0)).

The third element is always zero for unidimensional sort arrays. If the sort array is two dimensional, this element determines which elements in the array are sorted and moved. The effect of variable I(3) is as follows:

```
I(3)=0 Sort (n,0), Leave (n,1)
```

```
I(3)=1 Sort (n,0), Move (n,1)
```

```
I(3)=2 Sort (n,1), Leave (n,0)
```

```
I(3)=3 Sort (n,1), Move (n,0)
```

The virtue of making I(3) equal to 1 and 3 is that a group of data from a larger group can be sorted along with a pointer to the rest of the data. For example, the sorted array could contain names, with the second dimension pointing to the record number of the associated addresses.

The remaining subscripts of the parameter array determine string element order for sorting purposes. They should be considered in pairs, as defining the character range and priority when sorting string arrays. With numeric arrays

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they have no significance. If undefined, the comparison of strings will be made across the whole string starting at the leftmost character. Undefined means that the "I" array is dimensioned so that the subscript in question is outside the array bounds. This is not the same as defining it as zero.

However, by defining the values, the comparison order can be changed. For example, if element seven is set to 3 and the remainder undefined, comparison will start at character 3 of the string and continue to the end. Characters 1 and 2 will not be considered. If element eight is defined as 10, only characters 3 through 10 will be considered in the comparison, with all others ignored. If element nine is defined as 20

"It is slightly slower than Don Brumm's Model I version, sorting 1000 strings in 16 seconds (but) . . . a few seconds is well worth trading in for the increased power the various sorting modes offer."

and 10 as 30, then after considering characters 3 through 10, characters 10 through 20 will be further considered when the comparison is made. Using this technique, the order of character comparison can be controlled. If the second element of a definition pair is undefined, then the end of the string is assumed.

The minimum acceptable call to *QSORT* is when the parameter array is dimensioned I(2) and when I(1) is set to the number of the last element to sort, and I(2) is set to point to the array to sort. This assumes that I(0) is left at its initialized value of zero.

QSORT Performance

Running the program in listing 1 will give an indication of the kind of performance you can expect from *QSORT*. By all accounts it is fast. The time from one run to the next varies slightly. This is due to the random selection of the comparand.

Sometimes it more often hits a near median value, and the sizes of the resulting sub-partitions are more nearly equal. However, it rarely varies that much, indicating the validity of a random comparand selection.

It is slightly slower than Don Brumm's model I version, sorting 1000 strings in 16 seconds. Sorting 3000 strings will take about 45 seconds. When numeric arrays are sorted, 1000 numbers take about 8 seconds and 3000 numbers about 23 seconds. The decreased performance for string sorts is the price paid for a significant increase in the flexibility of the routine. A few seconds is well worth trading in for the increased power the various sorting modes offer.

In Summary

Besides providing you with a useful, fast and versatile sorting routine, this article should have provided you with an insight into how to go about writing routines in assembly language. Initial implementation in BASIC ensures that the concept is fully understood, before digging into the machine code. Also it should give you a feel for the power of the MC6809 microprocessor at the heart of the Color Computer. This powerful 8 bit computer has many 16 bit instructions, many of which have been used in this routine.

If you want this utility in your collection but are daunted by the typing, or lack of an assembler, I would be happy to provide a copy to you. Just send a check or money order for \$6, plus a blank cassette or floppy disk (5.25 inch) to Colin J. Stearman, 143 Ash Street, Hopkinton, MA 01748. I will put on it a copy of the source listing along with a binary file of *QSORT*.

Listing 1:

```

10 GOTO380
20 LOADM"QSORT"
30 CLS: CLEAR 2000
40 DEFUSR=&HE4E
50 DIM A(999), I(2), B(3)
60 TIMER=0
70 FOR K9=199 TO 999 STEP 200
80 PRINT@448, "BUILDING ARRAY"
90 X=0: B(0)=TIMER
100 FOR J=K9-199 TO K9
110 A(J)=RND(5000)-2500
120 PRINT@64, "ELEMENT #"; J;
130 NEXT J
140 I(0)=0: I(1)=K9: I(2)=VARPTR(A(0))
150 PRINT@448, "SORTING ARRAY"
160 B(1)=TIMER
170 X=USR(VARPTR(I(0)))
180 IF X>0 THEN PRINT"ERROR CODE ="; X: STOP
190 PRINT@448, "VERIFYING ARRAY"
200 B(2)=TIMER
210 FOR J=0 TO K9-1
220 IF A(J)>A(J+1) THEN PRINT J; A(J); A(J+1): STOP
230 NEXT J
240 B(3)=TIMER
250 PRINT@132, "SORT OF "; K9+1; "ELEMENTS"
260 PRINT USING "ARRAY BUILD START WAS ###.##"; B(0)/60
270 PRINT USING "                END WAS ###.##"; B(1)/60
280 PRINT USING "SORT ENDED AT ---- ###.##"; B(2)/60
290 PRINT USING "VERIFY ENDED AT ---- ###.##"; B(3)/60
300 PRINT USING "SORTING TIME WAS ---- ###.##"; (B(2)-B(1))/60
310 PRINT: PRINT
320 TTL=TTL+((B(2)-B(1))/60)
330 NEXT K9
340 PRINT USING "TOTAL SORT TIME ---- ###.##"; TTL
350 PRINT@448, "TEST COMPLETE."
360 INPUT "AGAIN (Y/N)"; R$
370 IF R$="Y" THEN RUN 30 ELSE END
380 PCLEAR2: GOTO20

```

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Listing 2:

```

10 CLEAR 3000
20 DIM AX$(63), I(7)
30 DEF USR=&HE4E
35 RC=0
40 CLS
60 INPUT"DRIVE #";DR
65 INPUT"LISTING TO PRINTER";A$
66 IFA$="Y" THEN DV=-2 ELSE DV=0
70 IF DR<0 OR DR>1 THEN 40
80 FOR X= 3 TO 11
90 DSKI$ DR, 17, X, A$, B$
100 A$=A$+LEFT$(B$, 127)
110 FOR N=0 TO 7
120 FILE$=MID$(A$, N*32+1, 8)
130 EXT$=MID$(A$, N*32+9, 3)
140 IF ASC(FILE$)=0 THEN 180
150 IF FILE$=STRING$(8, 255) THEN
180
160 AX$(R)=FILE$+"." +EXT$
170 R=R+1
180 NEXT N, X

```

```

190 I(0)=0
195 I(1)=R-1
200 I(2)=VARPTR(AX$(0))
205 I(4)=10:I(5)=12:I(6)=1:I(7)=
8
210 PRINT"CALLING SORT"
220 RC=USR(VARPTR(I(0)))
230 IF RC<>0 THEN PRINTRC:STOP
240 FOR X=1TOR
241 IF INT(X/16)=X/16 AND DV=0
THEN A$=INKEY$: IF A$="" THEN 241
251 PRINT#DV, USING"## -- %
%"; X, AX$(X-1)
260 NEXT

```

Listing 3:

```

0001 *****
0002 *      QUICKSORT      *
0003 *      *
0004 *      FOR THE TRS-80 COLOR *
0005 *      COMPUTER      *
0006 *      *
0007 * (C) 1983 COLIN J STEARMAN *
0008 *      *
0009 *****
0010 *      DRG  $E00      *
0011 *      *
0012 *****
0013 *MEMORY ALLOCATIONS *
0014 *****

```

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```

0E00 0015 BEGIN RMB 2 CURRENT PARTITION START
0E02 0016 ENDING RMB 2 CURRENT PARTITION END
0E04 0017 LI RMB 2 LEFT SCANNING INDEX
0E06 0018 RI RMB 2 RIGHT SCANNING INDEX
0E08 0019 CMPADD RMB 5 COMPARAND STORAGE
0020 *WILL BE NUMBER OR POINTER TO STRING
0E0D 0021 STACK RMB 2+12*2 PARTITION STACK SPACE
0E3D 0022 NTPTR RMB 2 RETAINS VALUE OF U WHEN AT STACK TOP
0023 * WHEN STACK IS EMPTY
0E3F 0024 VPTR1 RMB 2 ADDRESS OF I(0)
0E41 0025 IFLAG RMB 1 0 IF REGULAR SORT, 1 IF SPECIAL SORT
0E42 0026 VPTRA RMB 2 ADDRESS OF A(0) OR A*(0)
0E44 0027 ASLAVE RMB 2 SLAVE DIMENSION ADDRESS
0E46 0028 DIMEN RMB 1 0,1,2 DIMENSION TO SORT IN BIDIM ARRAY
0E47 0029 SORTYP RMB 1 TYPE OF SORT
0E48 0030 CMEQ RMB 1 0 IF STRINGS ARE
0031 *BOTH EQUAL TO COMPARAND, NOT 0 ELSE
0E49 0032 SORDER RMB 1 0=ASCENDING,1=DESCENDING
0E4A 0033 ICOUNT RMB 2 VARIABLE TO COUNT
0034 *ELEMENTS USED FROM I
0E4C 0035 SCSTRT RMB 1 SCAN START FOR STRING COMPARE
0E4D 0036 SCEND RMB 1 SCAN END FOR STRING COMPARE
0037 *****
0038 * EQUATES
0E4F4 0039 BASIC EQU $B4F4 RETURN TO BASIC WITH VALUE IN D
03ED 0040 INTCNV EQU $B3ED BASICS FPM-INT ROUTINE
0E4F 0041 RND EQU $BF1F BASICS RANDOM ROUTINE
004F 0042 FAC EQU $4F ADDRESS OF FLOATING POINT ACC.
0E4E 0043 PARTTN REG X,Y PARTITION POINTERS X IS LEFT, Y RIGHT
0044 *****
0045 * MACRO MOVES
0046 *****
0047 *** MACRO DEFINITION
0048 * MOVES 5 BYTES FROM ADDRESS IN 1ST REGISTER
0049 *TO ADDRESS IN SECOND
0050 *
0051 MOVES MACR
0052 LDB #4 COUNTER
0053 \.0 LDA B,\0 GET BYTE
0054 STA B,\1 MOVE IT
0055 DECB
0056 BPL \.0 LOOP UNTIL B NEG
0057 ENDM
0058 *****
0059 *
0060 ****MAINLINE PROGRAM*****
0061 *****
0062 *
0E4E 3460 0063 QSORT PSHS Y,U PRESERVE BASICS REGISTERS
0E50 17008E 0064 LBSR INIT CHECKS FOR ERRORS IN CALL
0E53 5D 0065 TSTB B IS ZERO IF ALL OK
0E54 2706 0066 BEQ CALLOK
0067 *B HAS ERROR CODE IF NOT OK
0E56 4F 0068 EXIT CLRA
0E57 3560 0069 PULS U,Y RESTORE BASICS REGISTERS
0E59 7EB4F4 0070 JMP BASIC RETURN VALUE
0071 *****
0E5C 17024F 0072 CALLOK LBSR UNSTCK UNSTACK NEXT SET OF POINTERS
0073 *IF B IS ZERO NO MORE TO UNSTACK SO EXIT
0E5F 5D 0074 TSTB
0E60 27F4 0075 BEQ EXIT
0076 *****
0077 * TEST BEGIN & ENDING FOR SIZE OF PARTITION
0E62 EC8C9D 0078 CKSIZE LDD ENDING,PCR
0E65 A38C98 0079 SUBD BEGIN,PCR
0E68 10030009 0080 CMPD #9
0081 *IF 10 OR LESS ELEMENTS SORT BY EASISORT,
0082 *ELSE DO BY QUICKSORT
0E6C 2331 0083 BLS EISRT
0084 *****
0085 **START OF QSORT CALLS**
0E6E 170399 0086 LBSR RNDCMP GET RANDOM COMPARAND
0E71 17025A 0087 SCAN LBSR LSCAN SCAN FROM LEFT
0E74 170280 0088 LBSR RSCAN SCAN FROM RIGHT
0089 *TEST FOR CROSSED OR CONCURRENT INDICES
0E77 EC8C8C 0090 LDD RI,PCR GET RIGHT INDEX
0E7A 10A38C86 0091 CMPD LI,PCR SUBTRACT LEFT INDEX
0092 *IF RESULT IS ZERO OR NEGATIVE THEY HAVE CROSSED

```

```

0E7E 2F05 0093 BLE CROSS
0094 *NOT CROSSED TO SWAP
0E80 170295 0095 LBSR SWAP
0E83 20EC 0096 BRA SCAN CONTINUE SCANNING
0097 *****
0E85 17036A 0098 CROSS LBSR PARTS2 COMPARES RIGHT & LEFT PARTITIONS
0099 *AND SETS C FLAG IF RIGHT>LEFT
0E88 2505 0100 BCS RIGHT
0E8A 170339 0101 LBSR LFTSTK STACK LEFT AS EQUAL OR LARGER
0E8B 2003 0102 BRA NXPRT PREPARE OTHER PARTITION
0103 *****
0E8F 170309 0104 RIGHT LBSR RGTSTK STACK RIGHT PARTITION
0105 *COMPARE SIZE OF REMAINING PARTITION FOR 1 OR LESS ELEMENTS
0E92 EC8DFF6C 0106 NXPRT LDD ENDING,PCR
0E96 10A38DFF65 0107 CMPD BEGIN,PCR
0E9B 2F0F 0108 BLE CALLOK
0E9D 20C3 0109 BRA CKSIZE CONTINUE SORTING
0110 *****
0111 *USE EISRT ON 10 OR LESS
0E9F 1704E0 0112 EISRT LBSR EISRT
0EA2 2080 0113 BRA CALLOK UNSTACK NEXT PARTITION
0114 *****
0115 *END OF MAINLINE
0116 *****
0117 *
0118 *GETNUM RETURNS A VALUE INTO D
0119 *WHICH IS THE 16 BIT INTEGER OF
0120 * A FLOATING POINT NUMBER POINTED
0121 *TO BY THE ADDRESS IN X
0122 *STORED IN MEMORY TYPE FORMAT
0123 *THIS WILL LOAD FAC WITH NUMBER
0124 * CONVERTED TO APPROPRIATE FORMAT
0125 *THEN INTCNV IS USED TO RETURN VALUE
0126 *
0EA4 10BE004F 0127 GETNUM LDY #FAC POINT Y TO FAC
0128 *MOVE 5 BYTES FROM MEMORY TO FAC
0129 MOVES X,Y

```



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```

0EAB C604 + LDB #4 COUNTER
0EAA A685 +.00000 LDA B,X GET BYTE
0EAC A7A5 + STA B,Y MOVE IT
0EAE 5A + DECB
0EAF 2AF9 + BPL .00000 LOOP UNTIL B NEG
0130 *NOW FIX FOR FAC FORMAT
0EB1 A621 0131 LDA 1,Y GET SECOND BYTE
0EB3 A725 0132 STA 5,Y STORE IN SIXTH BYTE
0EB5 8A00 0133 ORA %X10000000 SET BIT 7 TO 1
0EB7 A721 0134 STA 1,Y PUT IN BYTE 2
0135 ** FAC IS ALL SET SO CALL INTCNV
0EB9 1F21 0136 TFR Y,X POINT X AT FAC FOR INTCNV
0EBB BDB3ED 0137 JSR INTCNV
0138 *NUMBER IS NOW IN D
0EBE 39 0139 RTS
0140 *****
0141 *
0142 *****
0143 * RELOCATABLE CONVERTER FROM
0144 * POSITIVE INTEGER TO A REAL
0145 * NUMBER. NUMBER IS IN D AS
0146 * A POSITIVE NUMBER IN THE
0147 * RANGE 0 - 7FFF. X POINTS
0148 * TO BASE ADDRESS OF RECEIVING
0149 * VARIABLE. Y IS USED
0150 * INTERNALLY.
0151 *****
0152 * FIRST TEST FOR 0 IN D
0EBF 5D 0153 INTRL TSTB DO LOWER HALF
0EC0 2606 0154 BNE NTZERO
0EC2 4D 0155 TSTA CHK UPPER HALF
0EC3 2E03 0156 BGT NTZERO
0157 *NUMBER IS ZERO OR NEGATIVE SO CLEAR EXPONENT
0158 *AND RETURN AS ZERO
0EC5 6F84 0159 CLR ,X EXPONENT
0EC7 39 0160 RTS
0161 *NUMBER IS NOT ZERO
0EC8 10BE0010 0162 NTZERO LDY #16 BASE POWER COUNT
0163 *SHIFT D LEFT ONE PLACE BY DOING 0 THEN A

```

```

0EEC 58 0164 AGAIN LSLB TOP BIT INTO CARRY
0ECD 49 0165 ROLA CARRY INTO BOTTOM
0ECE 313F 0166 LEAY -1,Y DECREASE COUNT
0167 *HAS NUMBER GONE NEGATIVE?
0ED0 2AFA 0168 BPL AGAIN NO SO SHIFT AGAIN
0169 *STRIP TOP BIT AND MOVE D INTO ARRAY
0ED2 847F 0170 ANDA %X01111111
0ED4 ED01 0171 STD 1,X
0172 *FIX Y FOR EXPONENT. ADD 128 TO IT AND
0173 *STORE IN FIRST BYTE OF VARIABLE
0ED6 1F20 0174 TFR Y,D MOVE INTO D
0ED8 CA00 0175 ORB %X10000000 SET 128 BIT
0EDA E784 0176 STB ,X STORE EXPONENT
0177 *NOW CLEAR REMAINING BYTES
0178 CLR 3,X
0179 CLR 4,X
0180 *ALL DONE SO RETURN
0EE0 39 0181 RTS
0182 *
0183 *****
0184 *THIS INITIALIZES EVERYTHING
0185 *AND CHECKS VALIDITY OF CALL
0186 *
0187 *ORDER OF CHECKING AND RETURNED VALUE TO BASIC IS:
0188 *
0189 * 0 = SORTED WITHOUT ERROR
0190 * 1 = PARAMETER ARRAY NAME ERROR
0191 * 2 = PARAMETER ARRAY DIM ERROR
0192 * 3 = PARAMETER ARRAY NOT NUMERIC
0193 * 4 = PASSED NO. OF ELEMENTS > 4096 OR ZERO
0194 * 5 = INSUFFICIENT DATA IN PASSING ARRAY
0195 * 6 = ERROR IN I(3) VALUE (0,1,2 ONLY)
0196 * 7 = SORT ARRAY NAME ERROR
0197 * 8 = SORT ARRAY DIM ERROR
0198 * 9 = INCONSISTENT SORT ARRAY SIZE
0199 * 10 = I(3) VALUE INCONSISTENT WITH # OF A DIMENSIONS
0200 *
0201 *REGISTER B IS USED TO RETURN THE CODE TO THE MAIN PROGRAM
0202 *****
0203 *THIS ALSO SETS UP THE FOLLOWING:
0204 * U REGISTER TO LAST PUSHED PARTITION VALUE
0205 *ORDER OF STACKING IS LEFT THEN RIGHT.
0206 *ORDER OF UNSTACKING IS RIGHT THEN LEFT
0207 *
0208 *THE FIRST PARTITION VALUES ARE PUT ONTO THE STACK.
0209 *IF THERE IS ONLY ONE ELEMENT IN ARRAY THEN
0210 *NOTHING IS STACKED
0211 *
0212 *THE NUMBER OF ELEMENTS IS PUT INTO COUNT
0213 *THE ADDRESS OF I(0) IN VARPTI
0214 *THE ADDRESS OF A(0) OR A*(0) IN VARPTA
0215 *THE SORT TYPE IS PUT IN SORTYP
0216 * 0 = STRING SORT
0217 * 1 = NUMERIC SORT
0218 * THE SORT ORDER IS IN SORDER:
0219 * 0=ASCENDING
0220 * 1=DESCENDING
0221 *
0222 ***
0223 *THE SORTED VARIABLE MUST BE CALLED "A*" OR "A**" AND THE
0224 *PARAMETER ARRAY
0225 * MUST BE CALLED "I*". WHERE * IS ANY LEGAL CHARACTER
0226 * "A" ARRAY CAN BE EITHER SINGLE
0227 *DIMENSIONED, OR 2 DIMENSIONED.
0228 *IF 2, THEN SECOND DIMENSION MUST BE 1.
0229 *FOR EXAMPLE: A*(300,1)
0230 *IN THIS EXAMPLE EITHER THE A*(0,0) THRU A*(300,0) SECTION
0231 *OR A*(0,1) THRU A*(300,1) SECTION
0232 *CAN BE SORTED. IN ADDITION,
0233 *THE OTHER SECTION CAN BE MOVED WITH THE SORTED
0234 *ONE OR NOT, AS DESIRED.
0235 *MINIMUM CALL FROM BASIC IS:
0236 *
0237 * DIM I(2),A*(N) [OR A(N)]
0238 * I(0)=FIRST SUBSCRIPTS TO SORT
0239 * IF ASCENDING, LAST IF DESCENDING
0240 * I(1)=LAST SUBSCRIPT TO SORT IF ASCENDING,
0241 *FIRST IF DESCENDING
0242 * I(2)=VARPTR(A*(0)) OR VARPTR(A(0))

```

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```

0243 * RC=USR0(VARPTR(I(0)))
0244 *PREDEFINE RC BEFORE USING IN ABOVE LINE
0245 *
0246 *STRING ARRAYS CAN BE SORTED IN OTHER THAN LEFT-RIGHT
0247 *CHARACTER ORDER.
0248 *TO SPECIFY, USE FURTHER ELEMENTS IN I ARRAY
0249 *TO DEFINE CHARACTERS TO SORT THROUGH.
0250 *EG. TO SORT THE 9TH THRU 12TH, THEN 1ST THRU 8TH
0251 *USE:
0252 * I(3)=9:1(4)=12:1(5)=1:1(6)=8
0253 * IF THE 2ND OF A PAIR IS MISSING
0254 *255 IS ASSUMED.
0255 *
0256 *IF SORT ARRAY IS DIMENSIONED (N,1) THEN:
0257 * I(3)=0 THEN SORT (0,1)-(N,1)
0258 * AND LEAVE (0,0)-(N,0) AS IS
0259 * I(3)=1 SORT (0,1)-(N,1) AND MOVE OTHER SECTION TOO
0260 * I(3)=2 THEN AS I(0) BUT MOVE OTHER SECTION TOO
0261 *****
0262 *GET POINTER TO I(0)
0263 INIT JSR INTCNV
0264 STD VPTR1,PCR
0265 TFR D,X SO X POINTS TO I(0)
0266 PSHS X PRESERVE POINTER
0267 LEAX 10,X MOVE X TO I(2)
0268 LBSR GETNUM GET POINTER TO A(0) OR A*(0)
0269 STD VPTRA,PCR
0270 *****
0271 * NOW CHECK I ARRAY VALIDITY
0272 PULS X POINT AT I(0)
0273 LDA #'1 ARRAY FIRST LETTER
0274 LBSR ARYCHK RETURNS 0,1, OR 2 IN B
0275 *B IS ZERO IF NAME OK
0276 TSTB
0277 BEQ CHKTYP
0278 BPL GOTERR -1 IS BAD TOO
0279 LDB #2
0280 GOTERR RTS AND RETURN

```

```

0EE1 DDB3ED
0EE4 ED8DF57
0EE8 1F01
0EEA 3410
0EEC 300A
0EEE 17FFB3
0EF1 ED8DF4D
0EF5 3510
0EF7 8649
0EF9 170163
0EFC 5D
0EFD 2705
0EFF 2402
0F01 C602
0F03 39

```

```

0281 ****
0282 *CHECK FOR TYPE OF ARRAY SHOULD BE 1 FOR NUMBER ARRAY
0283 CHKTYP CMPA #1
0284 BEQ IISNUM
0285 LDB #3 ERROR CODE
0286 RTS AND RETURN
0287 ****
0288 *GET VALUE IN I(0)
0289 IISNUM PSHS Y,X PRESERVE ARRAY SIZE AND X POINTER
0290 LBSR GETNUM D WILL FIRST PARAMETER
0291 LDX ,S RECOVER X POINTER LEAVE ON STACK
0292 PSHS D SAVE ON STACK
0293 LEAX 5,X POINT TO I(1)
0294 LBSR GETNUM D HAS SECOND PARAMETER
0295 CLR SORDER,PCR
0296 CMPD ,S COMPARE 2ND W/ 1ST
0297 BHS ASCND ASCENDING ORDER
0298 INC SORDER,PCR DESCENDING
0299 PULS X GET 1ST PARAMETER IN X
0300 EXG X,D SWAP VALUES
0301 BRA CALCRG CALCULATE RANGE
0302 ASCND PULS X GET 1ST PARAMETER
0303 CALCRG STX BEGIN,PCR GET BEGIN OF RANGE
0304 STD ENDING,PCR SET END OF RANGE
0305 *D HAS HIGHER PARAMETER
0306 * IS N =0?
0307 CMPD #0
0308 BEQ SIZBAD
0309 *IS IT >4095?
0310 CMPD #4095
0311 BLS NISOK
0312 SIZBAD LEAS 2,S CLEAN Y OFF STACK
0313 LDB #4 GET ERROR CODE
0314 RTS
0315 ***
0316 NISOK PULS X GET VPTR1 IN X
0317 LDY ,S GET ARRAY ELEMENT COUNT
0318 CMPY #3
0319 BLO CALERR MUST BE >=3

```

```

0F04 8101
0F06 2703
0F08 C603
0F0A 39
0F0B 3430
0F0D 17FF94
0F10 AEE4
0F12 3406
0F14 3005
0F16 17FF8B
0F19 6F8DF2C
0F1D 10A3E4
0F20 240A
0F22 6C8DF23
0F26 3510
0F28 1E10
0F2A 2002
0F2C 3510
0F2E AF8DFECE
0F32 ED8DFECC
0F36 10830000
0F3A 2706
0F3C 10830FFF
0F40 2305
0F42 3262
0F44 C604
0F46 39
0F47 3510
0F49 10AEE4
0F4C 108C0003
0F50 252E

```



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0F52 2206 0320 BHI GETDIM THERE IS I(3) VALUE
0F54 6F8DFE0E 0321 CLR DIMEN,PCR SET FLAG
0F58 2014 0322 BRA IVALS
0323 **
0F5A 300F 0324 BETDIM LEAX 15,X POINT TO I(3) VALUE
0F5C 17FF45 0325 LBSR GETNUM GET IT IN D
0F5F 10030003 0326 CMPD #3
0F63 2305 0327 BLS STRVAL MUST BE 0 TO 3
0F65 3262 0328 LEAS 2,S CLEAN STACK
0F67 C606 0329 LDB #6
0F69 39 0330 RTS
0331 **
0F6A E78DFE08 0332 STRVAL STB DIMEN,PCR
0F6E 3520 0333 IVALS PULS Y RESTORE I ELEMENT COUNT
0F70 6F8DFE0D 0334 CLR IFLAG,PCR PRESET REGULAR SORT FLAG
0F74 100C0004 0335 CMPY #4 TEST 1 DIMENSION
0F78 2709 0336 BEQ ISIZOK
0F7A 6C8DFE03 0337 INC IFLAG,PCR SET TO SPECIAL SORT
0F7E 2003 0338 BRA ISIZOK
0339 *MUST BE AT LEAST 3 ELEMENTS
0F80 C605 0340 CALERR LDB #5 SET UP RETURN CODE
0F82 39 0341 RTS AND RETURN
0342 *****
0343 *CHECK "A" ARRAY VALIDITY
0F83 AE8DFE0B 0344 ISIZOK LDX VPTRA,PCR POINT TO A ARRAY
0F87 8641 0345 LDA #A SET FIRST LETTER OF NAME
0F89 1700D3 0346 LBSR ARYCHK
0F8C 5D 0347 TSTB OK IF ZERO
0F8D 2F03 0348 BLE AOK
0F8F C806 0349 ADDB #6 ERROR CODE 7/8
0F91 39 0350 RTS RETURN ERROR CODE
0351 * RETURNED BY ARYCHK
0352 *STORE ARRAY TYPE FROM A
0F92 A78DFE01 0353 AOK STA SORTYP,PCR
0354 *TEST ARRAY SIZE AGAINST N
0355 *IN LAST DIMENSION
0F96 10AC8DFE67 0356 CMPY ENDING,PCR

```

```

0F98 2203 0357 BHI BIDIM ARRAY IS SAME OR LARGER
0F9D C609 0358 NINERR LDB #9 SET RETURN CODE
0F9F 39 0359 RTS RETURN
0360 *****
0FA0 5D 0361 BIDIM TSTB 0 IF UNIDIM,-1 OF BIDIM
0FA1 2738 0362 BEQ CKDIMN
0FA3 AE8DFE9B 0363 LDX VPTRA,PCR
0FA7 AE1C 0364 LDX -4,X GET 2ND DIM SIZE
0FA9 8C0002 0365 CMPX #2 MUST BE TWO
0FAC 26EF 0366 BNE NINERR
0367 ****
0FAE 1F21 0368 TFR Y,X
0FB0 1700E3 0369 LBSR GETPTR TO A(0,1)
0370 * Y HAD ELEMENT COUNT IN FIRST DIM
0371 *X NOW HAS ITS ADDRESS
0FB3 AF8DFE0D 0372 STX ASLAVE,PCR SET SLAVE POINTER
0FB7 E68DFE8B 0373 LDB DIMEN,PCR MUST WE SWAP VPTRA & ASLAVE
0FB8 C102 0374 CMPB #2 NOT IF IT'S LESS THAN 2
0FB9 2525 0375 BLD SIZOK
0FBF AE8DFE7F 0376 LDX VPTRA,PCR
0FC3 10AE8DFE7C 0377 LDY ASLAVE,PCR
0FC8 AF8DFE7B 0378 STX ASLAVE,PCR
0FCC 10AF8DFE71 0379 STY VPTRA,PCR
0FD1 C102 0380 CMPB #2 IF I(3)=2 DON'T SORT SLAVE ELEMENT
0FD3 260F 0381 BNE SIZOK
0FD5 6F8DFE6D 0382 CLR DIMEN,PCR RESET SO APPEARS 1 DIMENSIONAL
0FD9 2009 0383 BRA SIZOK
0384 ****
0385 *CHECK DIMEN IS ZERO IF UNIDIMENSIONAL
0FDB 6D8DFE67 0386 CKDIMN TST DIMEN,PCR
0FD7 2703 0387 BEQ SIZOK
0FE1 C60A 0388 LDB #10
0FE3 39 0389 RTS
0390 *****
0391 * BOTH ARRAYS CHECK OUT
0392 *****
0393 *SET UP STACK POINTER
0394 *12 DEEP, 2 BYTES, LEFT & RIGHT POINTER
0FE4 338DFE55 0395 SIZOK LEAU STACK+(2*12*2),PCR
0FE8 EF8DFE51 0396 STU NTPTR,PCR TO DETECT WHEN STACK IS EMPTY
0FEC EC8DFE12 0397 LDD ENDING,PCR GET ITEM COUNT
0FF0 10A38DFE0B 0398 CMPD BEGIN,PCR
0399 * IF EQUAL THEN NOTHING TO STACK
0400 *ONLY 1 ELEMENT IN ARRAY
0FF5 270B 0401 BEQ NOSTAK
0402 *MORE THAN 1 ELEMENT SO PUSH LEFT THEN RIGHT
0FF7 AE8DFE05 0403 LDX BEGIN,PCR LEFT POINTER
0FFB 10AE8DFE02 0404 LDY ENDING,PCR GET RIGHT END
1000 3630 0405 PSHU #PARTN AND STORE
0406 *****
0407 *INITIALIZING COMPLETE
1002 5F 0408 NOSTAK CLR GOOD RETURN CODE
1003 39 0409 RTS
0410 *****
0411 *
0412 **** DATAGT ****
0413 *THIS GETS 2 VALUES FROM I ARRAY IF
0414 *THEY EXIST, OTHERWISE SETS SCAN START TO 0, SCEND TO 0
0415 *VALUES ARE REDUCED TO A ZERO BASE
0416 *B=0 IF IT GOT AT LEAST ONE VALUE FROM ARRAY
0417 *B=1 IF NONE FROM ARRAY
1004 3430 0418 DATAGT PSHS X,Y PRESERVE POINTERS
1006 801E 0419 BSR NITVAL
1008 270A 0420 BEQ VALUES B=0 SO MORE VALUES IN I
100A 6F8DFE3E 0421 CLR SCSTRT,PCR SCAN SRART=0
100E 6F8DFE3B 0422 CLR SCEND,PCR SCAN END =0
1012 200F 0423 BRA RETRN WITH B=1
0424 *****
1014 A78DFE34 0425 VALUES STA SCSTRT,PCR SET SCAN START
1018 8D0C 0426 BSR NITVAL GET NEXT
101A 2703 0427 BEQ GOTVAL MORE VALUES
101C 86FF 0428 LDA #255 SET TO MAX
101E 5F 0429 CLR DATA FLAG SET TO 0 FOR RETURN
101F A78DFE2A 0430 GOTVAL STA SCEND,PCR
1023 3530 0431 RETRN PULS X,Y
1025 39 0432 RTS WITH B
0433 *****
0434 *GETS NEXT TWO VALUES FROM I ARRAY
0435 *IF NO MORE THEN B IS RETURNED 1, ZERO ELSE

```

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```

1026 10AEBDFE14 0436 NXTVAL LDY VPTRI,PCR POINT X TO I(0)
102B AEBDFE1B 0437 LDX ICOUNT,PCR GET CURENT SUBSCRIPT OF I
102F AC3E 0438 CMPX -2,Y ELEMENT COUNT IN HEADER
1031 2429 0439 BHS NODATA NO MORE DATA
1033 3001 0440 LEAX 1,X INCREMENT ICOUNT
1035 AF8DFE11 0441 STX ICOUNT,PCR FOR NEXT TIME
1039 301F 0442 LEAX -1,X RETURN X TO ORIGINAL VALUE
103B 170061 0443 LBSR MULT5 CALCULATE OFFSET
103E E38DFDFD 0444 ADDD VPTRI,PCR AND ACTUAL ADDRESS
1042 1F01 0445 TFR D,X
1044 17FE5D 0446 LBSR GETNUM GET VALUE IN D
1047 10830000 0447 CMPD #0 IF ZERO LEAVE AS IS
104B 270F 0448 BEQ NODATA
104D 830001 0449 SUBD #1 REDUCE TO ZERO BASE
1050 108300FF 0450 CMPD #255 TOO HIGH?
1054 2302 0451 BLS NTHIGH NO IN RANGE
1056 C6FF 0452 LDB #255 SET LO LIMIT
1058 1E09 0453 NTHIGH EXG A,B
105A 5F 0454 CLR8 SET TO INDICATE MORE DATA
105B 39 0455 RTS
0456 *****
105C C601 0457 NODATA LDB #1 SET FLAG
105E 39 0458 RTS
0459 *
0460 *****
0461 *SUBROUTINE TO CHECK ARRAY NAME
0462 *FIRST LETTER OF ARRAY IS PASSED IN A REGISTER
0463 *X CONTAINS POINTER TO ZERO ELEMENT
0464 *A IS RETURNED:
0465 * 1 OF A NUMBER ARRAY
0466 * 0 IF A STRING
0467 *B IS RETURNED:
0468 * -1 OF OK AND BIDIMENSIONAL
0469 * 0 IF ALL OK
0470 * 1 IF BAD NAME
0471 * 2 IF BAD DIMENSION
0472 *Y CONTAINS ARRAY ELEMENT COUNT
0473 *****
0474 *SEE IF SORT ARRAY IS NAMED OK
0475 ARYCHK PSHS X SAVE PTR TO A*(0)

```

```

1061 3019 0476 LEAX -7,X POINT TO NAME IF UNIDIM
1063 10AE05 0477 LDY 5,X GET FIRST DIM ELEMENT COUNT IN Y
1066 A184 0478 CMPA ,X TEST NAME
106B 2711 0479 BEQ NAMEOK
106A 301E 0480 LEAX -2,X NAME IF 2 DIMENSIONS
106C A184 0481 CMPA ,X
106E 270B 0482 BEQ NAMEOK
1070 301E 0483 LEAX -2,X NAME IF 3 DIMENSIONS
1072 A184 0484 CMPA ,X
1074 2705 0485 BEQ NAMEOK
1076 3262 0486 LEAS 2,S CLEAN STACK
1078 C601 0487 LDB #1 SET ERROR CODE
107A 39 0488 RTS AND RETURN
0489 *****
107B 4F 0490 NAMEOK CLRA SET TO STRING TYPE
107C E601 0491 LDB 1,X GET NEXT LETTER
107E 2B01 0492 BMI STRING IT IS A STRING ARRAY
1080 4C 0493 INCA SET FLAG TO 1 FOR NUMBER ARRAY
0494 **CHECK DIMENSION
0495 STRING LDB 4,X DIMENSION LOCATION
0496 CMPB #2 IS IT BIDIMENSIONAL?
0497 BLS DIMOK NOT 3 OR MORE
0498 LEAS 2,S CLEAN STACK
0499 LDB #2 RETURN 2 IF SIZE IS WRONG
0500 RTS
0501 *****
108C 2703 0502 DIMOK BEQ TWDIM ITS BIDIMENSIONED
108E 5F 0503 CLR8 SET FLAG
108F 2002 0504 BRA BOMOUT ALL DONE SO EXIT
1091 C6FF 0505 TWDIM LDB #-1 SET BIDIM FLAG
0506 ***
1093 3510 0507 BOMOUT PULS X RECOVER POINTER
1095 39 0508 RTS
0509 *****
0510 *****GETPTR*****
0511 *THIS RETURNS A POINTER TO A STRING DESCRIPTOR
0512 *IN A** OR THE NUMBER IN A*
0513 *GIVEN THE SUBSCRIPT
0514 *X CONTAINS SUBSCRIPT COMING IN
0515 *AND POINTER TO 5 BYTE GROUP IN A*

```

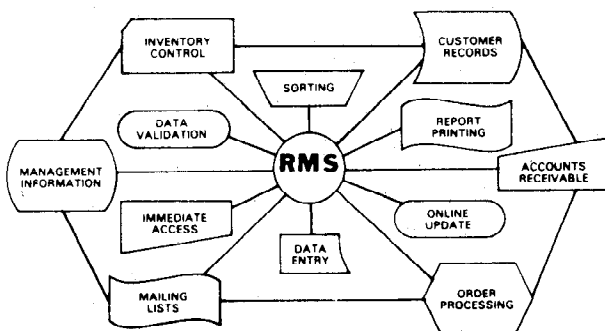
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```

0516 *OR A ON EXIT.
0517 *PROCEDURE: MULT5 MULTIPLIES X BY 5 ADDS VPTRA TO
0518 *RETURN DESCRIPTOR ADDRESS
0519 ***
1096 0007 0520 GETPTR BSR MULT5 GET DATA ADDRESS IN X
0521 *
1098 E38DFDA6 0522 ADDD VPTRA,PCR ADD ADDRESS OF A*(0)
109C 1F01 0523 TFR D,X PUT INTO X FOR RETURN
109E 39 0524 RTS
0525 *****
0526 * THIS MULTIPLIES A POINTER IN X BY 5
0527 *RETURN RESULT IN D
109F 3410 0528 MULT5 PSHS X
10A1 1F10 0529 TFR X,D
0004 0530 RPT 4
0531 ADDD ,S X ON STACK
0532 ENDR
10A3 E3E4 + ADDD ,S X ON STACK
10A5 E3E4 + ADDD ,S X ON STACK
10A7 E3E4 + ADDD ,S X ON STACK
10A9 E3E4 + ADDD ,S X ON STACK
10AB 3262 0533 LEAS 2,S CLEAN STACK
10AD 39 0534 RTS
0535 *
0536 *****
10AE 11A38DFD8A 0537 UNSTCK CMPU MTPTR,PCR ANYTHING TO UNSTACK?
10B3 2602 0538 BNE POPSTK YES SO GET POINTERS
10B5 5F 0539 CLR B FLAG FOR STACK EMPTY
10B6 39 0540 RTS
0541 ***
10B7 3730 0542 POPSTK PULU #PARTN X HAS LEFT, Y RIGHT
10B9 AF8DFD43 0543 STX BEGIN,PCR SET SCAN BEGINNING
10BD AF8DFD43 0544 STX LI,PCR SET LEFT INDEX
10C1 10AF8DFD3C 0545 STY ENDING,PCR SET SCAN END
10C6 10AF8DFD3B 0546 STY RI,PCR SET RIGHT INDEX
10CB C601 0547 LDB #1 SET FLAG TO SHOW POP
10CD 39 0548 RTS
0549 *****
0550 * SCANS FROM "LI" LOOKING FOR ITEM => THEN COMPARAND

```

```

0551 *"LI" IS LEFT POINTING TO => ITEM
10CE AE8DFD32 0552 LSCAN LDX LI,PCR PUT LI INTO X FOR GETPTR
10D2 318DFD32 0553 LEAY CMPADD,PCR GET COMPARAND ADDRESS
0554 * THIS WILL REMAIN GOOD FOR RSCAN
10D6 3410 0555 CONSCN PSHS X PRESERVE POINTER
10D8 17FFB0 0556 LBSR GETPTR RETURNS X POINTING TO 5 BYTE
0557 * DESCRIPTOR OF STRING OR NUMBER
0558 *NOW DO A COMPARE
10DB 17016F 0559 LBSR COMPAR RETURNS B=0 IF EQUAL,
0560 * 1 IF ITEM > COMP
0561 *IF B IS -1 THEN ITEM IS <COMP
0562 *REVERSED IF ORDER IS DESCENDING
10DE 3510 0563 PULS X RECOVER POINTER
10E0 6F8DFD64 0564 CLR CMEQ,PCR CLEAR EQUALITY FLAG
10E4 5D 0565 TSTB INSPECT RETURNED VALUE
10E5 2705 0566 BEQ ISSAME AS COMPARAND
10E7 6C8DFD5D 0567 INC CMEQ,PCR SET FLAG TO NOT ZERO
10EB 5D 0568 TSTB RETEST B
10EC 2C04 0569 ISSAME BGE GOTGE GOT ONE => THAN
0570 *COMP. (OR =< FOR DESCENDING)
0571 *AS COMPARAND WAS CHOOSEN FROM THIS PARTITION,
0572 *A MATCH IS INEVITABLE
0573 ****
0574 * MOVE LI ONE RIGHT
10EE 3001 0575 LEAX 1,X INCREMENT POINTER
10F0 20E4 0576 BRA CONSCN CONTINUE SCANNING
0577 **
10F2 AF8DFD0E 0578 GOTGE STX LI,PCR SAVE NEW LI VALUE
10F6 39 0579 RTS WITH LI POINTING TO => ITEM
0580 *****
0581 * SCANS FROM "RI" LOOKING FOR ITEM =< THEN COMPARAND
0582 *"RI" IS RIGHT POINTING TO =< ITEM
10F7 AE8DFD0B 0583 RSCAN LDX RI,PCR PUT RI INTO X FOR GETPTR
10FB 3410 0584 DOSCAN PSHS X PRESERVE RI POINTER
10FD 17FF96 0585 LBSR GETPTR RETURNS X POINTING TO 5 BYTE
0586 * DESCRIPTOR OF STRING OR NUMBER
0587 *NOW DO A COMPARE
1100 17014A 0588 LBSR COMPAR RETURNS B=0 IF EQUAL,
0589 * 1 IF ITEM > COMP
0590 *IF B IS -1 THEN ITEM IS <COMP
0591 *(REVERSED IF DESCENDING ORDER)
1103 3510 0592 PULS X RECOVER RI POINTER IN X
1105 5D 0593 TSTB INSPECT RETURNED VALUE
1106 2705 0594 BEQ ISSAM AS COMPARAND
1108 6C8DFD3C 0595 INC CMEQ,PCR SET TO NOT ZERO
110C 5D 0596 TSTB RETEST VALUE IN B
110D 2F04 0597 ISSAM BLE GOTLE GOT ONE =< THAN COMP.
0598 *AS COMPARAND WAS CHOOSEN FROM THIS PARTITION,
0599 *A MATCH IS INEVITABLE
0600 ****
0601 * MOVE RI ONE LEFT
110F 301F 0602 LEAX -1,X REDUCE TI POINTER
1111 20E8 0603 BRA DOSCAN CONTINUE SCANNING
0604 **
1113 AF8DFCEf 0605 GOTLE STX RI,PCR SAVE NEW RI VALUE
1117 39 0606 RTS WITH RI POINTING TO =< ITEM
0607 *****
0608 * SWAP WILL EXCHANGE VALUES DESCRIPTORS
0609 *POINTED TO BY RI AND LI
0610 *THEN INCREASE LI AND DECREASE RI TO MOVE
0611 *PAST SWAPPED ITEMS
0612 *
1118 327B 0613 SWAP LEAS -5,S TEMP STORAGE SPACE
111A 608DFD2A 0614 TST CMEQ,PCR CHK FOR EQUALITY TO COMPARAND
111E 2764 0615 BEQ NOSWAP EQUAL SO DBNT SWAP
1120 AE8DFCE0 0616 LDX LI,PCR
1124 17FF6F 0617 LBSR GETPTR GET ADDRESS OF DESCRIPTOR
1127 1F12 0618 TFR X,Y LI DESCRIPTOR ADDRESS
1129 AE8DFCD9 0619 LDX RI,PCR GET OTHER POINTER
112D 17FF66 0620 LBSR GETPTR GER ADDRESS
0621 *X NOW HAS ADDRESS OF RI DESCRIPTOR
0622 MOVES X,S SWAP THE 2 STRING DESCRIPTORS
+ LDB #4 COUNTER
1130 C604 + .00001 LDA B,X GET BYTE
1132 A685 + STA B,S MOVE IT
1134 A7E5 + DECB
1136 5A + BPL .00001 LOOP UNTIL B NEG
1137 2AF9 + 0623 MOVES Y,X OR FP VALUES
1139 C604 + LDB #4 COUNTER
113B A6A5 + .00002 LDA B,Y GET BYTE

```

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```

113D A705 + STA B,X MOVE IT
113F 3A + DECB
1140 2AF9 + BPL .00002 LOOP UNTIL B NEG
                                0624 MOVES S,Y USING STACK FOR TEMP STORAGE
1142 C604 + LDB #4 COUNTER
1144 A6E5 +.00003 LDA B,S GET BYTE
1146 A7A5 + STA B,Y MOVE IT
1140 5A + DECB
1149 2AF9 + BPL .00003 LOOP UNTIL B NEG
114B 60BDFCF7 0625 TST DIMEN,PCR IF ZERO LEAVE SLAVE DIM
114F 2733 0626 BEQ NOSWAP
1151 1F10 0627 TFR X,D POINT X TO OTHER ARRAY ELEMENT
1153 A3BDFCEB 0628 SUBD VPTRA,PCR
1157 E3BDFCE9 0629 ADDD ASLAVE,PCR
1150 1F01 0630 TFR D,X
1150 1F20 0631 TFR Y,D DD SAME FOR Y
115F A3BDFCDF 0632 SUBD VPTRA,PCR
1163 E3BDFCDD 0633 ADDD ASLAVE,PCR
1167 1F02 0634 TFR D,Y
                                0635 *NDW SWAP 5 BYTES
                                0636 MOVES X,S
1169 C604 + LDB #4 COUNTER
116B A685 +.00004 LDA B,X GET BYTE
116D A7E5 + STA B,S MOVE IT
116F 5A + DECB
1170 2AF9 + BPL .00004 LOOP UNTIL B NEG
                                0637 MOVES Y,X
1172 C604 + LDB #4 COUNTER
1174 A6A5 +.00005 LDA B,Y GET BYTE
1176 A785 + STA B,X MOVE IT
1170 5A + DECB
1179 2AF9 + BPL .00005 LOOP UNTIL B NEG
                                0638 MOVES S,Y
117B C604 + LDB #4 COUNTER
117D A6E5 +.00006 LDA B,S GET BYTE
117F A7A5 + STA B,Y MOVE IT
1181 5A + DECB
1182 2AF9 + BPL .00006 LOOP UNTIL B NEG
1184 AEBDFC7C 0639 NOSWAP LDX LI,PCR GET LI POINTER
1188 3001 0640 LEAX I,X AND ADD ONE
118A AFBDFC76 0641 STX LI,PCR AND SAVE IT
118E AEBDFC74 0642 LDX RI,PCR GET RI POINTER
1192 301F 0643 LEAX -I,X REDUCE RI
1194 AFBDFC6E 0644 STX RI,PCR AND SAVE IT
119B 3265 0645 LEAS S,S CLEAN STACK
119A 39 0646 RTS
                                0647 *****
                                0648 * THIS STACKS THE RIGHT PORTION OF THE PARTITION
                                0649 *AND PREPARES OTHER FOR SORTING
                                0650 *
119B AEBDFC67 0651 RGTSTK LDX RI,PCR
119F 3001 0652 LEAX I,X LEFT END OF STACK PARTITION
11A1 ACBDFC5D 0653 CMPX ENDING,PCR
11A5 2407 0654 BHS DNTSTK
11A7 19AEBDFC56 0655 LDY ENDING,PCR GET RIGHT END
11AC 3630 0656 PSHU #PARTTN SAVE RIGHT PARTITION
                                0657 *SET UP BEGIN, ENDING,LI AND RI
11AE ECBDFC52 0658 DNTSTK LDD LI,PCR GET LEFT POINTER
11B2 B30001 0659 SUBD #1 DECREASE BY ONE
11B5 EBDFC49 0660 STD ENDING,PCR
11B9 EBDFC49 0661 STD RI,PCR
11BD ECBDFC3F 0662 LDD BEGIN,PCR
11C1 EBDFC3F 0663 STD LI,PCR
11C5 39 0664 RTS
                                0665 *****
                                0666 * THIS STACKS THE LEFT PORTION OF THE PARTITION
                                0667 *AND PREPARES OTHER FOR SORTING
                                0668 *
11C6 19AEBDFC39 0669 LFTSTK LDY LI,PCR
11CB 313F 0670 LEAY -I,Y RIGHT END OF STACK PARTITION
11CD 19ACBDFC2E 0671 CMPY BEGIN,PCR
11D2 2306 0672 BLS NOTSTK
11DA AEBDFC28 0673 LDX BEGIN,PCR GET LEFT END
11DB 3630 0674 PSHU #PARTTN SAVE RIGHT PARTITION
                                0675 *SET UP BEGIN, ENDING,LI AND RI
11DA ECBDFC28 0676 NOTSTK LDD RI,PCR GET RIGHT POINTER
11DE C30001 0677 ADDD #1 INCREASE BY ONE
11E1 EBDFC1B 0678 STD BEGIN,PCR
11E5 EBDFC1B 0679 STD LI,PCR
    
```



```

11E9 EC8DFC15 0680 LDD ENDING,PCR
11ED E88DFC15 0681 STD RI,PCR
11F1 39 0682 RTS
0683 *****
0684 *PARTSZ COMPARES LEFT AND RIGHT PARTITIONS
0685 *LEFT PARTITION IS FROM BEGIN TO LI
0686 *RIGHT PARTITION IS FROM RI TO ENDING
11F2 EC8DFC0C 0687 PARTSZ LDD ENDING,PCR
11F6 A38DFC0C 0688 SUBD RI,PCR
0689 * D NOW HAS RIGHT PARTITION SIZE
11FA 3406 0690 PSHS D SAVE IT
11FC EC8DFC#4 0691 LDD LI,PCR
1200 A38DFBFC 0692 SUBD BEGIN,PCR
0693 *D NOW HAS LEFT PARTITION SIZE
1204 10A3E4 0694 CMPD ,S TEMP ON STACK CARRY WILL BE SET IF LEFT>=RIGHT
1207 3262 0695 LEAS 2,S CLEAN STACK
1209 39 0696 RTS
0697 ***** RNDCMP *****
0698 *PUTS INTO CMPADD A 5 BIT DESCRIPTOR
0699 *OF A RANDOM ELEMENT IN THE RANGE BEGIN-ENDING.
0700 *SUBSCRIPT IS SELECTED BY RND
0701 *THEN GETPTR GETS POINTER TO ITEM IN A(0).
0702 *THIS VALUE IS THEN MOVED TO CMPADD
0703 *****
120A 8D13 0704 RNDCMP BSR RANDOM
0705 *D CONTAINS # IN RANGE BEGIN-ENDING
120C 1F01 0706 TFR D,X FOR GETPTR
120E 17FE85 0707 LBSR GETPTR
0708 *X NOW POINTS TO ELEMENT IN ARRAY
0709 *X CONTAINS THE ADDRESS OF THE 5 BYTE DESCRIPTOR
0710 *POINT Y TO CMPADD
1211 318DFBF3 0711 LEAY CMPADD,PCR
0712 *NOW MOVE 5 BYTES
0713 MOVES X,Y
1215 C604 + LDB #4 COUNTER
1217 A685 +.00007 LDA B,X GET BYTE
1219 A7A5 + STA B,Y MOVE IT
121B 5A + DECB
121C 2AF9 + BPL .00007 LOOP UNTIL B NEG
121E 39 0714 ** ALL DONE SO RETURN
0715 RTS
0716 *****
0717 *** THIS RETURNS A RANDOM NUMBER BETWEEN BEGIN
0718 *** AND ENDING INCLUSIVE.
0719 *** VALUE IS RETURNED IN REG D.
0720 *** BASICS RANDOM ROUTINE IS USED BY LOADING THE
0721 *** RANGE IN THE FAC AND EXTRACTING
0722 *** THE VALUE WITH INTCNV
0723 *****
0724 *CALCULATE RANGE
121F EC8DFBDF 0725 RANDOM LDD ENDING,PCR
1223 A38DFBD9 0726 SUBD BEGIN,PCR
1227 C30001 0727 ADDD #1 MAKE ACTUAL COUNT
0728 *POINT X AT FAC
122A BE004F 0729 LDX #FAC
122D 17FC8F 0730 LBSR INTRL MAKE IT REAL AS IN MEMORY
0731 * FIX FOR FAC FORMAT
1230 A601 0732 LDA 1,X GET 2ND BYTE
1232 A705 0733 STA 5,X STORE IN 6TH
1234 8A80 0734 ORA #%100000000 SET BIT 7 TO 1
1236 A701 0735 STA 1,X PUT IT BACK
0736 * NOW CALL RANDOM ROUTINE
1238 3440 0737 PSHS U PRESERVE PARTN POINTER
123A 8DBF1F 0738 JSR RND
0739 * GET VALUE IN D WITH INTCNV
123D 8E004F 0740 LDX #FAC ENSURE X POINTING AT FAC
1240 BDB3ED 0741 JSR INTCNV
1243 3540 0742 PULS U RECOVER POINTER
0743 *RANDOM NUMBER IN RANGE IS NOW IN D
1245 830001 0744 SUBD #1 REDUCE TO ZERO BASE
1248 E38DFBBA 0745 ADDD BEGIN,PCR ADD OFFSET
0746 * RESULT IS IN D
124C 39 0747 RTS
0748 *
0749 *****
0750 *
0751 ***** COMPARE *****
0752 *ENTRY: X POINTS TO 5 BYTE STRING
0753 *DESCRIPTOR OF ITEM

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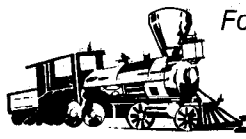
0754 * Y TO 5 BYTE DESCRIPTOR OF COMPARAND
0755 * SORTYP IS 0 FOR STRING COMPARE 1 FOR NUMBER
0756 *
0757 *EXIT:
0758 * SORDER=0 SORDER=1
0759 * B = -1 IF ITEM < COMP. / ITEM> COMP.
0760 * B = 0 IF ITEM = COMP. / ITEM = COMP.
0761 * B = 1 IF ITEM > COMP. / ITEM < COMP.
0762 *****
0763 * SEE IF STRING OR NUMBER COMPARE
0764 *BY CHECKING SORTYP
124D 688DFBF6 0765 COMPAR TST SORTYP,PCR
1251 2704 0766 BEQ STRG
0767 *ITS A NUMBER COMPARE
1253 8D39 0768 BSR CMPNUM
1255 202F 0769 BRA ORDCCHK CHECK ORDER OF SORT
0770 *****
1257 688DFBE6 0771 STRG TST IFLAG,PCR SPECIAL OR REGULAR SORT
1258 270D 0772 BEQ REGLR REGULAR
125D CC0004 0773 LDD #4 PRESET ICOUNT TO
1260 E88DFBE6 0774 STD ICOUNT,PCR SKIP FIRST 2 ELEMENTS
1264 17FD9D 0775 LBSR DATAGT GET FIRST VALUES FROM ARRAY
1267 5D 0776 TSTB
1268 270A 0777 BEQ STRCMP
0778 *GOT HERE BECAUSE B=1 AS NO DATA IN ARRAY
0779 *SCSTRT & SCEND ARE BOTH 0 SO SET
0780 *SCEND TO 255
126A 688DFBDE 0781 REGLR CLR SCSTRT,PCR
126E B6FF 0782 LDA #255
1270 A78DFBD9 0783 STA SCEND,PCR
1274 1700A1 0784 STRCMP LBSR CMPSTR
1277 260D 0785 BNE ORDCCHK B<X> SO STRINGS NOT EQUAL
0786 *THEREFORE CHECK NO FURTHER
0787 *IF REGULAR SORT WE'RE DONE
1279 E68DFB04 0788 LDB IFLAG,PCR
127D 2707 0789 BEQ ORDCCHK
127F 17FD82 0790 LBSR DATAGT GET NEXT VALUES
0791 *FOR STRING COMPARE RANGE

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1282 5D      0792 *B COMES BACK=# IF DATA AVAILABLE
1283 27EF    0793      TSTB
1285 5F      0794      BEQ  STRCMP   COMPARE NEXT RANGE
1286 60BDFBFF 0795      CLRB    AS STRINGS ARE EQUAL
0796 *****
1286 60BDFBFF 0797 ORDCHK TST  SORDER,PCR
128A 2701    0798      BEQ  COMEXT
128C 50      0799      NEGB    REVERSE POLARITY
128D 39      0800 COMEXT RTS
0801 *****
0802 ***** CMPNUM *****
0803 ** COMPARES 2 FLOATING POINT NUMBERS
0804 ** "A" POINTED TO BY X
0805 ** "B" POINTED TO BY Y
0806 *REG B RETURNED AS FOLLOWS:
0807 * A=B REG B =#
0808 * A>B REG B =1
0809 * A<B REG B =-1
0810 *****
0811 * FIRST SEE IF BOTH ARE ZERO
0812 CMPNUM LEAS -3,S MAKE ROOM FOR
0813 *SIGN FLAG AND TEMP STORAGE
1290 6FE4    0814      CLR  ,S      CLEAR SIGN FLAG
0815 *ON THE STACK
1292 6DB4    0816      TST  ,X      EXPONENT
1294 2600    0817      BNE  ANOT#
1296 6DA4    0818      TST  ,Y
1298 2614    0819      BNE  BNOT#
129A 5F      0820      CLR#  BOTH ZERO
129B 3263    0821 LEAVE LEAS 3,S REMOVE SIGN FLAG & TEMP STORE
129D 39      0822      RTS
0823 *****
0824 *A IS NOT ZERO
129E 6DA4    0825 ANOT# TST  ,Y      EXPONENT B
12A0 2612    0826      BNE  ANOT#    NEITHER ARE ZERO
12A2 6D01    0827      TST  1,X     LOOK AT SIGN OF A
12A4 2A04    0828      BPL  BPOSTV
12A6 C6FF    0829 BMINUS LDB  #-1
12A8 20F1    0830      BRA  LEAVE

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12AA C601    0831 *****
12AC 20ED    0832 BPOSTV LDB  #1
0833      BRA  LEAVE
0834 *****
0835 * A IS ZERO B IS NOT
0836 BNOT# TST  1,Y      LOOK AT SIGN OF B
0837      BPL  BMINUS
0838      BRA  BPOSTV
0839 *****
0840 *NEITHER A NOR B ARE ZERO
0841 ANOT# TST  1,X     IS A NEG?
0842      BPL  APOS
0843 *A IS NEGATIVE IS B?
0844      TST  1,Y
0845      BPL  BMINUS
0846 *B IS NEGATIVE SO BOTH ARE
0847      COM  ,S      SIGN FLAG SET
0848      BRA  EXPCHK  NOW CHECK EXPONENTS
0849 *****
0850 *A IS POSITIVE
0851 APOS TST  1,Y     IS B NEG?
0852      BMI  BPOSTV
0853 *BOTH POSITIVE SO LEAVE SFALG CLEAR
0854 *****
0855 *NOW CHECK EXPONENTS.
0856 * DONT FORGET SIGN IS REVERSED
0857 EXPCHK TST  ,X     A EXPONENT NEG
0858      BPL  AEXPNG  BRANCHES IF NEG
0859 *A EXPONENT IS POSITIVE
0860      TST  ,Y     B EXPONENT NEG
0861      BPL  BPOCK  BRANCH OF NEGATIVE
0862 *A AND B EXP ARE POSITIVE
0863 *LOAD AND COMPARE
0864      LDB  ,Y     GET B IN ACC
0865      ANDB #10111111 REMOVE SIGN BIT
0866      STB  1,S    ON STACK
0867      LDB  ,X     GET A IN ACC
0868      ANDB #10111111
0869 EXPCHK CMPB 1,S    ON STACK
0870      BGT  BPOCK  A>B
0871      BLT  BNEGCK A<B
0872 *EXPONENTS ARE THE SAME
0873      BRA  EXPEQL
0874 *****
0875 *A EXPONENT IS NEGATIVE
0876 AEXPNG TST  ,Y     TEST B EXPONENT
0877      BMI  BNEGCK  BRANCH IF POSITIVE
0878      LDB  ,X     GET A EXPONENT
0879      STB  1,S    TEMP VALUE ON STACK
0880      LDB  ,Y     GET B EXPONENT
0881      BRA  EXPCMP
0882 *EXPONENTS ARE REVERSED IN A AND B SO SAME CHECK
0883 *CAN BE DONE
0884 *****
0885 *EXPONENTS ARE EQUAL SO COMPARE MANTISSA
0886 *REMEMBER MS BYTE HAS A SIGN BIT
0887 EXPEQL LDD  1,Y     MSB OF B AS 16 BITS
0888      ANDA #10111111 REMOVE SIGN BIT
0889      STD  1,S    SAVE ON STACK
0890      LDD  1,X     GET MSB OF A AS 16 BITS
0891      ANDA #10111111 REMOVE SIGN
0892      CMPD 1,S     VALUE ON STACK
0893      BGT  BPOCK  A>B
0894      BLT  BNEGCK A<B
0895 *THESE ARE EQUAL DO NEXT
0896      LDD  3,X     GET LAST 2 BYTES OF B
0897      CMPD 3,Y     COMPARE WITH THAT OF B
0898      BGT  BPOCK  A>B
0899      BLT  BNEGCK A<B
0900 *BOTH NUMBERS ARE SAME
0901      CLR#
0902      LBRA LEAVE
0903 *****
0904 BPOCK LDB  #1
0905      BRA  SGNCHK
0906 BNEGCK LDB  #-1
0907 SGNCHK TST  ,S     SIGN FLAG
0908      LBEQ LEAVE
0909      NEGB

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1315 16FFB3 0910 LBRA LEAVE
0911 *****
0912 ***** CMPSTR *****
0913 * COMPARES 2 STRINGS A# AND B#
0914 * REGISTER B RETURN RESULT AS FOLLOWS:
0915 *
0916 * A#>B# REG B=B
0917 * A#<B# B=B-1
0918 * A#=B# B=0
0919 *****
0920 * REG X POINTS TO DESCRIPTOR OF A#
0921 * REG Y TO THAT OF B#
0922 *****
1318 3430 0923 CMPSTR PSHS X,Y PRESERVE POINTERS
0924 *REVISE STRING LENGTH BASED ON
0925 *SCSTR AND SCEND
131A A6BDFB2F 0926 LDA SCEND,PCR
131E A18DFB2A 0927 CMPA SCSTR,PCR ARE POINTERS CROSSED?
1322 255B 0928 BLD BZERO NO STRING IF SO
1324 1F89 0929 TFR A,B SET UP B FOR LATER
1326 A184 0930 CMPA ,X SCEND WITH STRING LENGTH
1328 2404 0931 BHS CUT STRING SHORTER THAN SELECTED RANGE
132A 8B01 0932 ADDA #1 ADJUST TO 1 BASE
132C 2002 0933 BRA RRGADJ FIX START POINT
132E A6B4 0934 CUT LDA ,X GET STR LNTH FROM HEADER
1330 A0BDFB18 0935 RRGADJ SUBA SCSTR,PCR REMOVE START POINTER
1334 2401 0936 BHS BTZERO RANGE > ZERO
1336 4F 0937 CLRA SET RANGE TO ZERO
1337 E1A4 0938 BTZERO CMPB ,Y SCEND WITH LENGTH OF B
1339 2404 0939 BHS READJ TOO LONG
133B C001 0940 ADDB #1 SET TO 1 BASE
133D 2002 0941 BRA ADJRNG REMOVE START POINTER
133F E6A4 0942 READJ LDB ,Y GET B COUNT FROM HEADER
1341 E0BDFB07 0943 ADJRNG SUBB SCSTR,PCR REMOVE START POINTER
1345 2401 0944 BHS SETADD RANGE >=0
1347 5F 0945 CLRB SET RANGE TO ZERO
1348 3406 0946 SETADD PSHS A,B ONTO STACK
0947 * B IS AT 1,S , A IS AT 0,S
0948 * NOW GET ADDRESS OF EACH STRING
0949 *INTO X AND Y
134A 4F 0950 CLRA
134B E6BDFAFD 0951 LDB SCSTR,PCR LOAD START OFFSET
134F E302 0952 ADDD 2,X
1351 1F01 0953 TFR D,X
1353 4F 0954 CLRA
1354 E6BDFAF4 0955 LDB SCSTR,PCR
1358 E322 0956 ADDD 2,Y
135A 1F02 0957 TFR D,Y
0958 *
0959 *START COMPARISON LOOP
135C 6DE4 0960 COMLOP TST ,S ANY MORE CHARACTERS IN A?
135E 2718 0961 BEQ AEMPTY NO SO BRANCH
0962 *MORE LEFT IN A#
1360 6D61 0963 TST 1,S ANY LEFT IN B#?
1362 2713 0964 BEQ B1 NO SO A#>B#
0965 *MORE IN B# TOD SO COMPARE NEXT CHARACTER
1364 6AE4 0966 DEC ,S DECREASE COUNT OF A#
1366 6A61 0967 DEC 1,S DECREASE COUNT OF B#
1368 A680 0968 LDA ,X+ GET NEXT CHARACTER AND
0969 *INCREMENT X
136A A1A0 0970 CMPA ,Y+ COMPARE WITH NEXT IN B#
136C 27EE 0971 BEQ CONLOP SAME
136E 2207 0972 BHI B1
1370 C6FF 0973 BMIN1 LDB #1
1372 3262 0974 FINSH LEAS 2,S CLEAN UP STACK
1374 3530 0975 PULS X,Y RECOVER POINTERS
1376 39 0976 RTS
1377 C001 0977 B1 LDB #1
1379 20F7 0978 BRA FINSH
0979 *****
137B 6D61 0980 AEMPTY TST 1,S IS B EMPTY
137D 26F1 0981 BNE BMIN1 NO SO A#<B#
0982 *YES SO A#=B#
137F 5F 0983 BZERO CLRB
1380 20F0 0984 BRA FINSH
0985 *****
0986 ***** EASISORT *****
0987 * SORTS ITEMS BETWEEN BEGIN & ENDING
0988 *INCLUSIVE USING A FASTER ROUTINE FOR

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0989 *SMALL GROUPS
0990 *****
1382 3440 0991 EZSORT PSHS U PRESERVE STACK PTR
1384 327B 0992 LEAS -5,S TEMP STORAGE
1386 1F43 0993 TFR S,U POINT U TO IT
1388 AEBDA74 0994 LDX BEGIN,PCR LEFT SUBSCRIPT
138C 3410 0995 PSHS X ONTO STACK
138E AEE4 0996 UPSCAN LDX ,S GET VARIABLE "X"
1390 3001 0997 LEAX 1,X INCREMENT X
1392 AFE4 0998 STX ,S AND SAVE IT
1394 ACBDA6A 0999 CMPX ENDING,PCR ARE WE AT END?
1398 2305 1000 BLS NOTEND
139A 3267 1001 LEAS 7,S CLEAN STACK
139C 3540 1002 PULS U RECOVER STACK POINTER
139E 39 1003 RTS AND RETURN
1004 *****
139F 17FCFA 1005 NOTEND LBSR GETPTR ADDRESS OF A#(K) IN X
13A2 1F12 1006 TFR X,Y MOVE TO Y
13A4 313B 1007 LEAY -5,Y POINT Y AT A#(K-1)
13A6 3410 1008 PSHS X PRESERVE A#(K) ADDRESS
13A8 17FEA2 1009 LBSR COMPAR DO A COMPARE
13AB 3510 1010 PULS X RECOVER A#(K) ADDRESS
13AD 5D 1011 TSTB LOOK COMPARE RESULT
13AE 2ADE 1012 BPL UPSCAN A#(K)=A#(K-1)
13B0 31BFA54 1013 LEAY CMPADD,PCR POINT Y AT COMADD
1014 MOVES X,Y PUT A#(K) IN TEMP
13B4 C604 + LDB #4 COUNTER
13B6 A605 +.00000 LDA B,X GET BYTE
13B8 A7A5 + STA B,Y MOVE IT
13BA 5A + DECB
13BB 2AF9 + BPL .00000 LOOP UNTIL B NEG
13BD 60BFA85 1015 TST DIMEN,PCR
13C1 2719 1016 BEQ SHFT DONT SWAP SLAVE
13C3 3410 1017 PSHS X SAVE A#(K) PTR
13C5 1F10 1018 TFR X,D
13C7 A3BDA77 1019 SUBD VPTRA,PCR POINT TO
13C9 E3BDA75 1020 ADDD ASLAVE,PCR SALVE ELEMENT
13CF 1F01 1021 TFR D,X

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13D1 C604      1022      MOVES X,U      SAVE TEMPORARILY
+             LDB #4      COUNTER
13D3 A6B5      +.00009 LDA B,X      GET BYTE
13D5 A7C5      +             STA B,U      MOVE IT
13D7 5A        +             DECB
13D8 2AF9      +             BPL .00009  LOOP UNTIL B NEG
13DA 3510      1023      PULS X      RECOVER PTR
1024 * X HAS ADDRESS OF A*(J)
13DC 1F12      1025 SHFT TFR X,Y      POINT Y @ A*(J)
13DE 301B      1026      LEAX -5,X      POINT X @ A*(J-1)
1027 *AND REDUCE FOR NEXT PASS
13E0 C604      +             MOVES X,Y      A*(J)=A*(J-1)
+             LDB #4      COUNTER
13E2 A6B5      +.00010 LDA B,X      GET BYTE
13E4 A7A5      +             STA B,Y      MOVE IT
13E6 5A        +             DECB
13E7 2AF9      +             BPL .00010  LOOP UNTIL B NEG
13E9 3410      1029      PSHS X      SAVE A*(J) ADDRESS
13EB 60BFA57  1030      TST DIMEN,PCR IF ZERO DONT DD
13EF 2721      1031      BEQ NXSHT  SLAVE SWAP
13F1 1F10      1032      TFR X,D
13F3 A30DFA4B 1033      SUBD VPTRA,PCR
13F7 E30DFA49 1034      ADDD ASLAVE,PCR
13FB 1F01      1035      TFR D,X
13FD 1F20      1036      TFR Y,D
13FF A30DFA3F 1037      SUBD VPTRA,PCR
1403 E30DFA3D 1038      ADDD ASLAVE,PCR
1407 1F02      1039      TFR D,Y
1040      MOVES X,Y
1409 C604      +             LDB #4      COUNTER
140B A6B5      +.00011 LDA B,X      GET BYTE
140D A7A5      +             STA B,Y      MOVE IT
140F 5A        +             DECB
1410 2AF9      +             BPL .00011  LOOP UNTIL B NEG
1412 AE8DF9EA 1041 NXSHT LDX BEGIN,PCR GET BEGIN SUBSCRIPT
1414 17FC7D 1042      LBSR GETPTR  GET ITS ADDRESS
1419 ACE4      1043      CMPX ,S      COMPARE WITH A*(J) ADDRESS
141B 2712      1044      BEQ SLOTIN  AT START OF PARTITION

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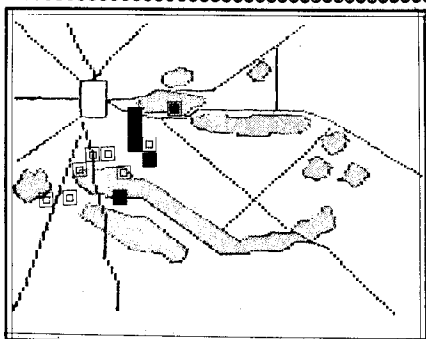
141D AEE4      1045      LDX ,S      RECOVER A*(J) BUT LEAVE ON STACK
141F 301B      1046      LEAX -5,X      MOVE TO A*(J-1)
1421 310DF9E3 1047      LEAY CMPADD,PCR POINT Y @ COMADD
1425 17FE25 1048      LBSR COMPAR  COMPARE A*(J-1) WITH TEMP
1428 5D        1049      TSTB      LOOK AT RESULT
1429 2B04      1050      BMI SLOTIN  FOUND RIGHT SLOT
142B 3510      1051      PULS X      RECOVER A*(J) ADDRESS
142D 20AD      1052      BRA SHFT    CONTINUE SHIFTING UP
1053 *****
142F 3510      1054      SLOTIN PULS X      RECOVER A*(J) ADDRESS
1431 310DF9D3 1055      LEAY CMPADD,PCR POINT Y @ COMADD
1056      MOVES Y,X      A*(J)=TEMP
1435 C604      +             LDB #4      COUNTER
1437 A6A5      +.00012 LDA B,Y      GET BYTE
1439 A7B5      +             STA B,X      MOVE IT
143B 5A        +             DECB
143C 2AF9      +             BPL .00012  LOOP UNTIL B NEG
143E 60BFA04  1057      TST DIMEN,PCR DONT DD IT OF ITS 0
1442 1027FF48 1058      LBEQ UPSCAN
1446 1F10      1059      TFR X,D
1448 A30DF9F6 1060      SUBD VPTRA,PCR
144C E30DF9F4 1061      ADDD ASLAVE,PCR
1450 1F01      1062      TFR D,X
1063      MOVES U,X      SET TEMP INTO ARRAY
1452 C604      +             LDB #4      COUNTER
1454 A6C5      +.00013 LDA B,U      GET BYTE
1456 A7B5      +             STA B,X      MOVE IT
1458 5A        +             DECB
1459 2AF9      +             BPL .00013  LOOP UNTIL B NEG
145B 16FF30 1064      LBRA UPSCAN
1065 *****
1066      NAM QSORT
1067      TTL QUICKSORT BY COLIN J. STEARMAN
1068      END QSORT
0E4E
NO ERROR(S) DETECTED

```

SYMBOL TABLE:

.00000 0EAA	.00001 1132	.00002 113B	.00003 1144
.00004 116B	.00005 1174	.00006 117D	.00007 1217
.00008 13B6	.00009 13D3	.00010 13E2	.00011 140B
.00012 1437	.00013 1454	ABNOT0 12B4	ADJRN6 1341
AEMPTY 1378	AEXPNG 12DE	AGAIN 0ECC	ANOT0 129E
ADK 0F92	APOS 12C0	ARYCHK 105F	ASCND 0E2C
ASLAVE 0E44	B1 1377	BASIC 04F4	BEGIN 0E00
BIDIM 0FA0	BMIN1 1370	BMINUS 12A6	BNEGCK 130C
BNDT0 12AE	BPOSK 1308	BPOSTV 12AA	BZERO 137F
CALCRG 0F2E	CALERR 0F00	CALLOK 0E5C	CHKTYP 0F04
KDINN 0FDB	CKSIZE 0E62	CMEQ 0E48	CMPADD 0E08
CMPNUM 128E	CMPSTR 1318	COMEXT 12BD	COMLOP 135C
COMPAR 124D	CONSCN 10D6	CROSS 0E85	CUT 132E
DATAGT 1004	DIMEN 0E46	DIMOK 10BC	DNTSTK 11AE
DOSCAN 10FB	ENDING 0E02	EXIT 0E56	EXPCHK 12C4
EXPCMP 12D6	EXPEQL 12EA	EZSORT 13B2	EZSRT 0E9F
FAC 004F	FINSH 1372	GETDIM 0F5A	GETNUM 0EA4
GETPTR 1096	GONOUT 1093	GOTERR 0F03	GOTGE 10F2
GOTLE 1113	GOTVAL 101F	GTZERO 1337	ICOUNT 0E4A
IFLAG 0E41	IISNUM 0F08	INIT 0EE1	INTCNV B3ED
INTRL 0EBF	ISIZOK 0F83	ISSAM 110D	ISSAME 10EC
IYALS 0F6E	LEAVE 129B	LFTSTK 11C6	LI 0E04
LSCAN 10CE	MOVES MACRO	MTPTR 0E3D	MULT5 109F
NAMEOK 107B	NINERR 0F9D	NISOK 0F47	NODATA 105C
NOSTAK 1002	NOGWRAP 1184	NOTEND 139F	NCTSTK 11DA
NTHIGH 1058	NTZERO 0ECB	NXSHT 1412	NXTPRT 0E92
NXTVAL 1026	ORDCHK 1286	PARTSZ 11F2	PARTTN 0030
POPSTK 1007	QSORT 0E4E	RANDOM 121F	READJ 133F
REGLR 126A	RETRN 1023	RGSTK 119B	RI 0E06
RIGHT 0EBF	RND BF1F	RNDCMP 120A	RNGADJ 1330
RSCAN 10F7	RSCAN 0E71	SCEND 0E4D	SCSTRT 0E4C
SETADD 1348	SGNCHK 130E	SHFT 13DC	SIZBAD 0F42
SIZOK 0FE4	SLOTIN 142F	SORDER 0E49	SORTYP 0E47
STACK 0E0D	STRCMP 1274	STRG 1257	STRING 10B1
STRVAL 0F6A	SWAP 1118	TWODIM 1091	UNSTCK 10AE
UPSCAN 138E	VALUES 1014	VPTRA 0E42	VPTRI 0E3F
WARG 0002			

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Well, there I was, nervous before I even began. I anxiously pressed *CLOAD* and *ENTER* and there before my eyes was a mountainous war field with my opponent shielded in the mountain range. I entered my coordinates — “Meet your destiny, moose breath!”

If you'd like to set your sites on an exciting game of skill and combat, then head for the hills, put on your battle helmets and get ready for *Missile Barrage*. This is a deliberate game of strategy in which you and five friends can declare war on each other. *Missile Barrage*, requiring 16K with Extended BASIC, provides a combat arena of 60 assorted mountain ranges with color and sound.

Each soldier's site is embedded in the mountain range. By entering the coordinates for angle and velocity, you guide your missile to wipe out your opponent(s). Sound easy? Well, *Missile Barrage* requires concentration and time for you to acquire a keen sense of strategy. For instance, if you set the coordinates for an opponent and miss, your enemy may figure out your erroneous calculations and return the fire with corrected coordinates . . . right on your head!

You can set the launch angle of your missile anywhere between 5° and 175° and the velocity up to 1500. Velocities above 500 will carry the missile off the top of your screen for a short time, but the missile will return unless its trajectory carries it past the right or left screen border. If you shoot clear off the border, it will be the next combatant's turn. In case of an incorrect entry, simply depress M and reselect.

If your site is on the left side of the screen and you want to destroy your opponent's to your right, set the coordinates between 0° and 90°. However, if you are on the right side of the screen and want to launch your missile to the left side, aim your missiles between 90° and 180°.

Watch out for the blinking Δ (the malfunction alert) on the top left of the screen and listen for its beeping sound. A missile launch malfunction could happen anytime and destroy you. To avoid the malfunction, immediately depress the space bar to stop the launch or you'll lose your turn. If

you're too slow, your own missile site will be destroyed.

Destroying an opponent's site is worth 25,000 points. However, for each missile fired, you are fined 5,000 points. The maximum score is 100,000. The site and site player number will disappear as they are destroyed. The object of the game is to be the sole survivor of this missile barrage. Each new run of the game brings a new terrain and new missile sites.

—Susan Remini

The listing:

```

1 GOTO 8000
10 PMODE1,1
20 PCLS
30 DIML$(15)
40 DIMW$(13)
50 E=0
60 TRN=0:TRT=0:SCR=0:HIT=0:HT=0:
TT=0
70 MM=RND(6)
80 GOSUB1910
90 GOSUB2190
100 CLS
110 IF PLY=1 THEN PLY=0:GOTO 310
120 FORX=1TO6:NAM(X)=0:NEXTX
130 PRINT@138,"COPYRIGHTED"
135 PRINT@206,"BY"
140 PRINT@265,"DAN DROUILLARD"
150 PRINT@333,"1982":FOR X=1TO40
0:NEXTX
    
```

```

170....01A0
460....049F
670....06C9
930....0944
1270...0C78
1470...0F1C
1750...119A
2060...14C2
2360...17E7
2510...1A34
2730...1C86
2870...1EB1
END...2110
    
```




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```

160 CLS:PRINT@135,"HOW MANY PLAY
ERS?":PRINT@231,"UP TO SIX CAN
PLAY"
161 NP#=INKEY#
162 IF NP#="" THEN GOTO 161
163 NP=VAL(NP#)
170 IF NP>6 THEN CLS:GOTO160
190 CLS:PRINT@136,"WHATS YOUR NA
ME":GOSUB 2640: FORX=1TO NP:PRIN
T@195+SPC,"PLAYER N0." X;:INPUT
NAM$(X):SPC=SPC+32:NEXTX
200 IF NP=1THEN NS=6:GOTO2400
210 IF NP=0 THEN NP=1:GOTO200
220 IF NP=2THEN NS=6:GOTO2340
230 IF NP=3THEN NS=6:GOTO2300
240 IF NP=4THEN NS=4:GOTO2370
250 IF NP=5 THEN NS=5 :GOTO 2370
260 IF NP=6THEN NS=6:GOTO2370
270 ZP#=INKEY#
280 IF ZP#=CHR$(13) THENGOTO310
290 XM=RND(13)
300 GOTO270
310 GOSUB1280:GOSUB1530
320 DRAW"BM156,192":DRAW"C8R6U5L
6U5R8C5R4C8D10R2C5R6C8U10L4R10C5
R4C8R6L6D5R4L4D5R8C5R8C8U10D2F8D
2U10R2C5R4C8R6D10L6U10R6D10R2C5R
4C8R2"
330 FORX=1TO6:LF(X)=0:WN(X)=0:MZ

```

```

(X)=0:NEXTX:ML=0
340 DRAW"BM8,192":GOSUB 1760
345 J=RND(10)
350 D=0:AN=0:AN$(1)="" :D$(1)="" :
E=0
360 TRN=TRN+1
370 FOR X=1 TO6:MZ(X)=0:NEXTX:ML
=0
380 FORX=1TO5
390 DRAW "C8"
400 DRAWWO$(X)
410 DRAW "C5"
420 DRAW "R4"
430 NEXT X
440 FORX=0TO12:LINE(236,192-X)-(
252,192-X),PRESET:NEXTX
450 IF NP=1THEN GOTO470
460 GOTO490
470 IF MZ(MM)=1THEN GOTO2910
480 IF NP=1 THEN GOTO500
490 MM=MM+1:IF MM>NS THEN MM=1
500 PP=0
510 GOTO2690
520 DRAW"BM240,192":DRAWN$(MM):S
OUND220,1
530 AN#=INKEY#
540 XM=RND(13)
550 IF AN#="" THEN GOTO530
555 SOUND230,1
560 IF AN#"M" THEN DR=0:FORX=0T
012:LINE(68,192-X)-(136,192-X),P
RESET:NEXTX:GOTO530
570 IF AN#=CHR$(13) THEN DR=0:FO
RX=0TO12:LINE(68,192-X)-(136,192
-X),PRESET:NEXTX:GOTO 630
580 IF DR>2 THEN DR=0:FORX=0TO12
:LINE(68,192-X)-(136,192-X),PRES
ET:NEXTX:GOTO530
590 AN(2)=VAL(AN#):GOSUB 2020
600 AN$(1)=AN$(1)+AN#
610 AN=VAL(AN$(1))
620 GOTO530
630 IF AN>180 OR AN<1 THEN AN#=""
":AN$(1)="" :GOTO 530
640 DRAW "BM8,192":DRAW"C5"
650 FOR X=1 TO 5
660 DRAWWO$(X):DRAW"R4"
670 NEXTX
680 DRAW"BM4,192"
690 DRAW"C8":DRAWWO$(6):DRAW"C5"
:DRAW"R8"
700 FORX=7TO13
710 DRAW"C8"
720 DRAWWO$(X)
730 DRAW"C5"
740 DRAW"R4"
750 NEXTX
760 D#=INKEY#
770 IF D#="" THENGOTO760
772 SOUND250,1

```



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```

775 IF D$="M"THENDR=0:FORX=0TO12
:LINE(92,192-X)-(140,192-X),PRES
ET:NEXTX:GOTO760
780 IF D$=CHR$(13)THEN DR=0:FOR
X=0TO12:LINE(92,192-X)-(140,192-
X),PRESET:NEXT X:GOTO850
790 IF DR>3THEN DR=0:FOR X=0TO12
:LINE(92,192-X)-(140,192-X),PRES
ET:NEXTX:GOTO760
800 AN(2)=VAL(D$):GOSUB2020
810 D$(1)=D$(1)+D$
820 D=VAL(D$(1))/3
830 GOTO760
840 G=1
850 IF D>500 OR D<1 THEN D$="":D
$(1)="":GOTO 760
860 AN=AN/57.29577951
870 H(1)=COS(AN)*D:H(2)=COS(AN)*
3
880 V(1)=SIN(AN)*D:V(2)=SIN(AN)*
3
890 V(1)=192-V(1)
900 V(1)=V(1)-(192-VS(MM))
910 V(2)=V(2)-G
920 H=MS(MM):V=VS(MM)-8
930 R=0
940 IF V<5 THEN GOTO 960
950 LINE(H,V)-(H,V-2),PRESET
960 IF V<V(1) THEN R=1

```

```

970 IF R=0 THEN V=V-V(2)
980 IF R=1 THEN V=V+V(2)
990 H=H+H(2)
1010 SE=SE+1
1020 IF H=>250 THEN GOSUB1130:GO
TO1110
1030 IF H<5 THEN GOSUB 1130:GOTO
1110
1040 IF V>156 THEN GOSUB 1130:GO
TO1110
1050 IF V<1 THEN GOTO 940
1060 SCREEN1,1
1080 IF V<5 THEN GOTO 1100
1085 IF J=3THENFORX=1TO4:DRAW"CB
;BM32,44;E16F16L32":SOUND150,5:J
$=INKEY$:IF J$=" " THEN DRAW"C5;
BM32,44;E16F16L32":GOTO 1110ELSE
::DRAW"C5;BM32,44;E16F16L32":NE
XTX:V=V+9:FORI=1TO4:H=(MS(MM)-2)
+I:GOSUB1130:NEXTI:GOTO1110
1090 LINE(H,V)-(H,V-2),PSET
1100 IF PPOINT(H,V+2)=6 OR PPOIN
T(H,V+2)=8 OR PPOINT(H,V+1)=8 OR
PPOINT(H,V)=8 OR PPOINT(H,V-1)=
8 THEN GOSUB 1130 ELSE GOTO 940
1110 DRAW"BM4,192":DRAW"C5":DRAW
W0$(6):DRAW"R8":FORX=7TO13:DRAW
W0$(X):DRAW "R4":NEXTX
1120 GOTO340

```



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```

1130 GOTO 1140
1140 IF V<5 THEN GOSUB6000: GOTO
1270
1150 TA=1
1160 PLAY"T2L7001V30":PLAY"E-"
1170 FORX=1TO2
1180 CIRCLE(H,V),4,8
1190 PLAY"G"
1200 PAINT(H,V+2),8,8
1210 CIRCLE(H,V),4,5
1220 PLAY STR$(X)
1230 CIRCLE(H,V),2,5
1240 PLAY "F-"
1250 NEXTX
1260 PLAY"E-"
1270 RETURN
1280 L$(1)="R6D8L254U8R8"
1290 L$(2)="E20R4E12R8F8R4F24":'
L$=MOUNTAINS
1300 L$(3)="R16E4R12E4R36F8"
1310 L$(4)="E16R20E12R12F8D4F8D4
F4"
1320 L$(5)="E8U12E4R8E4U28R4E4R8
F4D20F4D16R8E8R4F4D4F4D8F4"
1330 L$(6)="E4R16E8U8E4R8F8D4R4F
4R8F4R8F4"
1340 L$(7)="R8E8R12E8R12F12R16F4
"
1350 L$(8)="E8U4E12R44F4D4R4F4D4

```

```

F4D4"
1360 L$(9)="R28E4R8E4U8E4R20F4D8
F8"
1370 L$(10)="E16U4E4R4F4D8F8R16E
4R4E4R8D4F8"
1380 L$(11)="U4E8R4E4U8E4U4E4U4E
4U4E4R36F4D20F8D20"
1390 L$(12)="R8U8E12U8R4E4U8R8D2
4R12E4U4R8D20R4E4U4R4F4D4F4"
1400 L$(13)="U4E4U8E4U8E4UE4R4F4
D8F4D8F4R12E4U8E4U4E4R4F4D8F4DF8
D4F4"
1410 PCLS
1420 DRAW"BM248,152"
1430 DRAW"C6"
1440 DRAWL$(1)
1450 MT=0
1460 XM=RND(13):MT=MT+1
1470 IF XM=0 OR XM =1 THEN XM=RN
D(13):GOTO1470
1480 DRAW L$(XM)
1490 IF MT=>3 GOTO 1500 ELSE GOT
O 1460
1500 PAINT(20,154),6,6
1510 SCREEN1,1
1520 RETURN
1530 FORX=1TONS
1540 MS(X)=RND(244)
1550 MS(X)=MS(X)/2
1560 MS(X)=INT(MS(X))
1570 MS(X)=MS(X)*2
1580 MS(X)=MS(X)/2:MS(X)=FIX(MS(
X)):MS(X)=MS(X)*2
1590 IF MS(X)<10 THEN GOTO 1540
1600 FORYY=1TONS
1610 IF YY=X THEN GOTO1650
1620 IF MS(X)=>MS(YY) THEN MX=MS
(X)-MS(YY)
1630 IF MS(X)<MS(YY) THEN MX=MS(
YY)-MS(X)
1640 IF MX<20 THEN GOTO 1540:'SI
TE SPACING
1650 NEXTYY
1660 NEXTX
1670 FORY=1TONS
1680 VS=70
1690 VS=VS+1
1700 IF PPOINT(MS(Y),VS)=6 THEN
VS=VS-2:VS(Y)=VS: GOTO 1710 ELSE
GOTO 1690
1710 FOR X=1 TO 8 :PSET(MS(Y)-4+
X,VS,8):NEXTX
1720 FOR X=1 TO 4:PSET(MS(Y),VS-
4+X,8):NEXTX
1730 LINE(0,176)-(MS(Y),176),PRE
SET: DRAW"C5":DRAW"U2":DRAW"C8":D
RAW N$(Y)
1735 SOUND245,1
1740 NEXTY
1750 RETURN

```

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1760 WO$(1)="U10R6D5L6R6D5R2"
1770 WO$(2)="U10D2F6D2U10D10R2"
1780 WO$(3)="U10R6L6D10R6U5L2R2D
5R2"
1790 WO$(4)="U10D10R6R2"
1800 WO$(5)="U10R6L6D5R4L4D5R8"
1810 WO$(6)="H4U6D6F4R2E4U6D6G4"
1820 WO$(7)="U10R6L6D5R4L4D5R8"
1830 WO$(8)="U10D10R8"
1840 WO$(9)="U10R6D10L6R8"
1850 WO$(10)="U10R6L6D10R8"
1860 WO$(11)="U10D10R2C5R4"
1870 WO$(12)="U10L4R8L4D10R2C5R8
"
1880 WO$(13)="U5L4U5D5R8U5R2"
1890 RETURN
1900 GOSUB1910
1910 N$(1)="C5R6C7U10D10"
1920 N$(2)="C5C7U2E6U2L6R6D2G6D2
R6"
1930 N$(3)="C5C7R6U5L2R2U5L6R6D1
0"
1940 N$(4)="C5R6C7U10D5L6U5"
1950 N$(5)="C5C7R6U5L6U5R6"
1960 N$(6)="C5C7U10D10R6U5L6"
1970 N$(7)="C5R6C7U10L6"
1980 N$(8)="C5C7R6U5L6R6U5L6D10"
1990 N$(9)="C5R6C7U10L6D5R6"
2000 N$(10)="C5C7U10R6D10L6"
2010 RETURN
2020 DR=DR+1
2030 IF DR=1 THEN DRAW"BM100,192
"
2040 IF DR=2 THEN DRAW"BM110,192
"
2050 IF DR=3 THEN DRAW "BM120,19
2"
2060 IF DR=4 THEN DRAW"BM130,192
"
2070 IF AN(2)=0 THEN DRAWN$(10)
2080 IF AN(2)=1 THEN DRAWN$(1)
2090 IF AN(2)=2 THEN DRAWN$(2)
2100 IF AN(2)=3 THEN DRAWN$(3)
2110 IF AN(2)=4 THEN DRAWN$(4)
2120 IF AN(2)=6 THEN DRAWN$(6)
2130 IF AN(2)=5 THEN DRAWN$(5)
2140 IF AN(2)=7 THEN DRAWN$(7)
2150 IF AN(2)=8 THEN DRAWN$(8)
2160 IF AN(2)=9 THEN DRAWN$(9)
2170 IF DR=5 THEN DR=0
2180 RETURN
2190 NE$(1)="R6U10D10"
2200 NE$(2)="U2E6U2L6R6D2G6D2R6"
2210 NE$(3)="R6U5L2R2U5L6R6D10"
2220 NE$(4)="R6U10D5L6U5"
2230 NE$(5)="R6U5L6U5R6"
2240 NE$(6)="U10D10R6U5L6"
2250 NE$(7)="R6U10L6"
2260 NE$(8)="R6U5L6R6U5L6D10"
2270 NE$(9)="R6U106D5R6"

```

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```

2280 NE$(10)="U10R6D10L6"
2290 RETURN
2300 CLS:PRINT@131,NAM$(1);:PRIN
T@136,"-YOU HAVE SITES# 1,4"
2310 PRINT@195,NAM$(2);:PRINT@20
0,"-YOU HAVE SITES# 2,5"
2320 PRINT@259,NAM$(3);:PRINT@26
4,"-YOU HAVE SITES# 3,6
2330 GOSUB 2640:GOTO 270
2340 CLS:PRINT@163,NAM$(1);:PRIN
T@168,"-YOU HAVE SITES# 1,3,5"
2350 PRINT@259,NAM$(2);:PRINT@26
4,"-YOU HAVE SITES# 2,4,6"
2360 GOSUB 2640:GOTO 270
2370 SPC=0
2380 CLS:FOR X=1 TO NP
2390 PRINT@131+SPC,NAM$(X):PRINT
@131+SPC+5,"-YOU HAVE SITE NO.-"
X:SPC=SPC+32:NEXTX:GOSUB2640:LIN
E INPUT CON$:GOTO 310
2400 CLS:PRINT@103,"THE COMPUTER
WILL":PRINT@167,"SELECT A SITE
FOR":PRINT@231,"YOU TO FIRE FROM
":PRINT@295,"GO FOR HIGH SCORE!!
":GOSUB2640:INPUTCON
2410 CLS:PRINT@37,"EACH MISSLE L
AUNCHED":PRINT@101,"COST YOU 500
0 POINTS":PRINT@166,"EACH SITE D
ESTROYED":PRINT@228,"GIVES YOU 2

```

```

5,000 POINTS":PRINT@292,"PERFECT
SCORE IS 100,000 ":PRINT@361,"0
OOD LUCK!!":GOSUB2640:INPUTX:GOT
0310
2420 IF NP=3THENGOTO2520
2430 IF NP=2THENGOTO2610
2440 FORTX=1TONS
2450 ML=ML+MZ(TX)
2460 IF NP=1 THENGOTO2480
2470 IF ML=NS-1THEN GOTO2650
2480 IF ML=NS-1THEN GOTO2920
2490 NEXTTX
2500 ML=0
2510 RETURN
2520 IF MZ(1)+MZ(4)=2 THEN LF(1)
=1
2530 IF MZ(2)+MZ(5)=2 THEN LF(2)
=1
2540 IF MZ(3)+MZ(6)=2 THEN LF(3)
=1
2550 FORX=1TO3
2560 IF LF(1)+LF(2)=2THEN WN=3:G
OTO2770
2570 IF LF(1)+LF(3)=2THEN WN=2:G
OTO2770
2580 IF LF(2)+LF(3)=2THEN WN=1:G
OTO2770
2590 NEXTX
2600 GOTO 2510
2610 IF MZ(1)+MZ(3)+MZ(5)=3THEN
WN=2:GOTO2770
2620 IF MZ(2)+MZ(4)+MZ(6)=3THEN
WN=1:GOTO2770
2630 GOTO2510
2640 PRINT@452,"PRESS ENTER TO C
ONTINUE":RETURN
2650 FORX=1TONS
2660 IF MZ(X)=0THEN WN=X
2670 NEXTX
2680 GOTO 2770
2690 FORY=1TONS
2700 PP=0
2710 FORX=1TO8:IF PPOINT(MS(Y)-4
+X,VS(Y))=8 THEN PP=PP+1:NEXTX
2720 FORX=1TO8:IF PPOINT(MS(Y),V
S(Y)-4+X)=8 THEN PP=PP+1:NEXTX
2730 IF PP<2 THEN MZ(Y)=1:GOSUB2
420:LINE(0,176)-(MS(Y),176),PRES
ET:DRAW"C5":DRAW"U2":DRAW NE$(Y)
:GOSUB 3030
2740 NEXTY
2750 GOSUB2420
2760 IF MZ(MM)=1 THEN GOTO 450 E
LSE GOTO 520
2770 CLS:PRINT@195,NAM$(WN);:PRI
NT@200,"-YOU WON!!":NAM(WN)=NAM(
WN)+1:GOSUB2640:INPUTX
2780 WN=0
2790 CLS:PRINT@256,"DO YOU WANT
TO SEE TOTAL SCORE

```

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```

Y/N"
2791 X$=INKEY$
2792 IF X$="" THEN GOTO 2791
2793 IF X$="Y" THEN GOTO2800 ELS
E GOTO 2830
2800 SPX=0:CLS
2810 FORX=1TONP:PRINT@131+SPX,NA
M$(X);:PRINT@130+SPX+6,"-YOU WON
"NAM(X)" GAMES":SPX=SPX+32
2820 NEXTX:GOSUB2640:INPUTX
2830 CLS:PRINT@353,"DO YOU WISH
TO PLAY AGAIN Y/N"
2840 ED$=INKEY$
2841 IF ED$="" THEN GOTO 2840
2850 IF ED$="N" THEN GOTO 2900
2860 CLS:PRINT@192,"DO YOU WANT
TO CHANGE THE NAMES OR NUMBER
OF PLAYERS Y/N"
2870 ED$=INKEY$
2871 IF ED$="" THEN GOTO 2870
2880 IF ED$="N" THEN PLY=1:GOTO
50
2890 GOTO50
2900 CLS:PRINT "BYE":END
2910 PRINT " ":FORX=1TO8:SOUND100
,2:CLSX:PRINT@195,"YOU JUST DEST
ROYED YOURSELF";:NEXTX:FORX=1TO5
00:NEXTX:GOTO2920
2920 TRN=TRN-1:IF TRN=<0THEN TRN

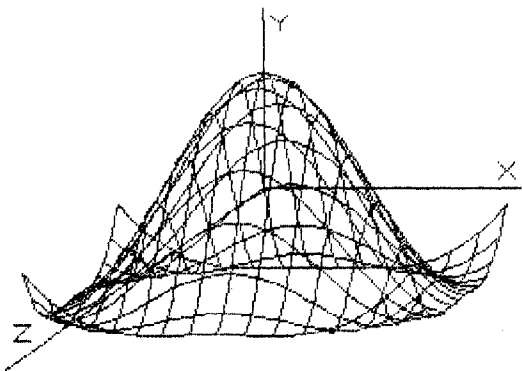
```

```

=0
2930 TT=TRN*5000
2940 IFMZ(MM)=1THEN MZ(MM)=0
2950 FORX=1TO6
2960 IF MZ(X)=1 THEN HIT=HIT+1
2970 NEXTX
2980 IF HIT<0THENHIT=0
2990 HT=HIT*25000
3000 SCR=HT-TT
3010 CLS:PRINT@163,NAM$(1);:PRIN
T@168,"-YOUR SCORE IS ";:PRINTSC
R
3020 GOSUB2640:INPUTX:GOTO2830
3030 FORX=1TO8:PSET(MS(Y)-4+X,VS
(Y),5):NEXTX
3040 FORX=1TO4:PSET(MS(Y),VS(Y)-
4+X,5):NEXTX
3050 RETURN
6000 PLAY"T2L17001V30":PLAY"E-"
6010 FOR X=1 TO 3
6015 FORV=1TO30:NEXTV
6020 PLAY"G"
6030 PLAY STR$(X)
6035 FORV=1TO30:NEXTV
6040 PLAY"F-"
6050 NEXTX
6060 PLAY"E-"
6070 RETURN
8000 PCLEAR2:GOTO10

```

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CONTRACT BASICS FOR THE COMPUTER USER

BY TOM NELSON
RAINBOW CONTRIBUTING EDITOR

How many things can you think of to argue about with a friend on the qualities of various computers or programs? Come on now, be honest. Hundreds, right? Sometimes it is a wonder that you can even agree that the computer has the name on its cover.

Well, that's just arguing mostly for fun. It can get heated, but it doesn't really mean much in the end. Anyway, you can't control the inards of the computer, so what the heck?

Contracts, like programs, are something we can create and control. As with programs, the better we control the contract, the less possibility there is that the contract will "bomb." The more that is at stake, the more the chance that failure to control the contract can lead to personal business failure.

Contracts are everyday parts of life. In fact, we each make one or more oral contracts every day. "I'll wash that car if you dig the garden;" "if you give me a copy of your finished program, I'll help you with your bug," and so on. These are just simple contracts; oral contracts at that (yes, ma, oral contracts are perfectly legal, with certain exceptions).

Of course, there are just simple contracts with very few terms. There's an exchange of goods and/or services within a certain time frame. Even in these simple contracts, however, much is left unsaid. It may be assumed that work on the program will be done at your house, or the program will be given on disk, or maybe the author will supply the disk for the program.

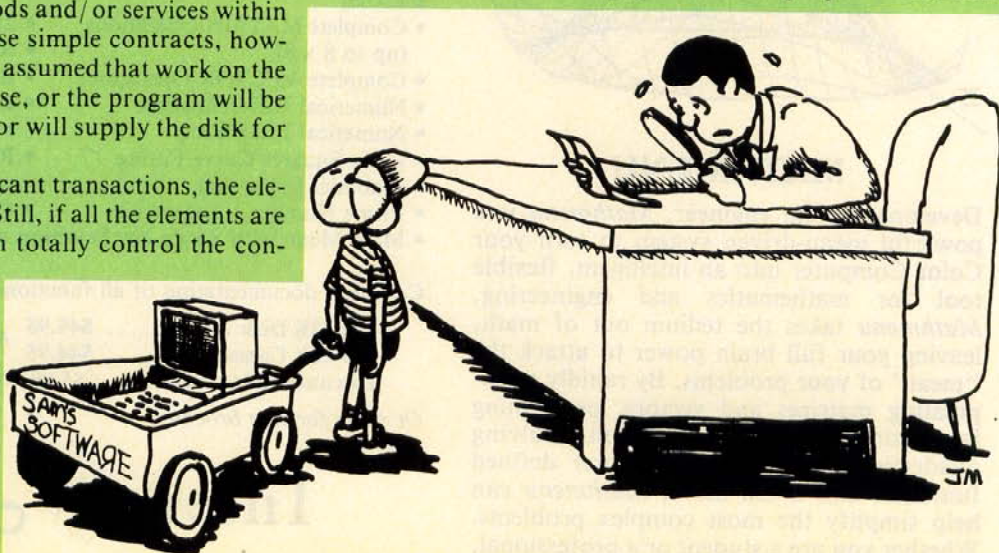
As contracts cover more significant transactions, the elements to be considered increase. Still, if all the elements are carefully considered, you still can totally control the con-

tract. Yet, much like a complicated program, not all contingencies can always be successfully covered in a contract. There may be some element that was totally neglected, or left to the business "operating system."

Contract law is made of rules to interpret contracts. The rules have two functions. First, trained persons can build contracts around known rules which will control significant parts of the contract without the need to write long contracts covering every possible situation. The Uniform Commercial Code, a voluminous law covering merchants adopted by most states, was designed specifically for this purpose. The second function of contract rules is to interpret contracts which have gone awry, or were poorly drafted. Courts will look at the contract and apply uniform principles to attempt to salvage the contract or to help an injured party. The most important thing to remember about all this is that if you don't cover a term in your agreement and that term becomes the center of controversy, general contract rules will define the term for you, whether or not you approve.

These rules are not written in stone. If you wish, you may contract these rules away, provided the purpose is not crim-

(Tom Nelson is a Special Assistant Attorney General for the State of Minnesota representing various state agencies, and a consultant to Nelson Software Systems. He has written almost all the manuals for the programs in the Super "Color" Library.)



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inally illegal or otherwise improper. You are the master of your contract. The more you understand it, the more you are in control. What you want to do is cover every essential term, make a total agreement between the parties spelling out how you want things done so that you can avoid later misunderstandings and avoid surprises should the contract rules be applied.

This brings me to a little anecdote. People say that lawyers and long contracts "queer" deals. Lawyers come in and write up long contracts covering everything down to the size of the pencil eraser to be used for cleaning disk pack plugs. It's actually true that legal gobbledygook can be pretty intimidating. Of course, those with power are aware of this, so they make sure all contracts, no matter the size, are fashioned to fit on one page. Thus what could take 10 or so pages in normal type sizes is squished and crammed into one page, the "fine print" of which we are all so fond. The consumer feels that whatever is on that one page cannot be so bad or harmful since it is only one page. But let the contract flow onto two pages and people balk at signing it. Suddenly it becomes a looming legal document, with overtones of attorneys, etc.

When I was buying a house, I naively wrote up a purchase agreement of six or so pages in the normal print size. It amounted to no more text than the standard, single-sheet, fine-print, realtor-supplied purchase agreement. Yet, when I presented it to several home sellers, I and it were rejected as being suspicious. Why couldn't I use those nice single-sheet forms? After several such experiences, and several houses later, I finally did just that, changing the terms on the single

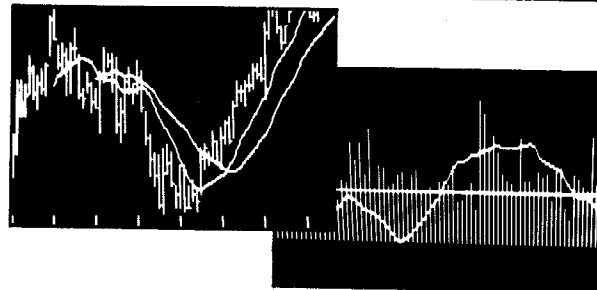
sheet that I couldn't stomach, and the deal was closed.

This "single-sheet" mentality is not limited to home or car purchases. The same psychology applies to any industry. I have seen several computer software license agreements which fit nicely onto one page, but they sure can say a lot—or leave a lot unsaid. And lo and behold, that one page becomes four to five pages if printed in a normal print font. Since you want to control your contract, you have to avoid the temptation to rely on the "single-sheet" mentality. Sure, if the terms seem fair or adequate, you should consider signing the single-sheet contract; but if its terms seem lopsided or it doesn't contain the terms you want, that one page has got to become more. Don't let that pretty form turn your head.

Now that you are past the fear of putting your head to work to control your contract, let's get to know some more about contracts. First, a little more on the "whats" of a contract. A contract is an agreement between two or more persons to exchange something of value. A contract can be oral or in writing, with some exceptions. For example, no agreement with a merchant to purchase something worth over \$500 is valid unless in writing, and no contract for the performance of services which cannot be performed within one year is valid unless in writing.

As you can see, many things can be covered by an oral contract. And oral contracts are fully binding and enforceable. Still, oral contracts have problems which make them unattractive. One problem is that of proof. Problems of proof arise not only from "little white lies," but also from ambiguity of terms, and actual misunderstandings. Another

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equally important problem is that oral agreements generally cannot be of any great complexity. It's hard to successfully specify limitations to a worldwide license over the phone and have both parties remember whether or not Outer Slavonia was included.

It is obviously wise to put all significant agreements into writing. Thus, I want to devote the remainder of this column to introducing you to the formal characteristics of contracts so that you can more easily find your way through them.

All contracts have several sections in one shape or another. Contracts covering the same general subject matter

"You are the master of your contract . . . (so) you want to . . . cover every essential term, make a total agreement between the parties spelling out how you want things done so that you can avoid later misunderstandings and avoid surprises should the contract rules be applied."

also tend to look very similar. The first section of the contract sets out the parties to the agreement. The second part sets out the purposes of the contract. In old fashioned contracts these were the "Whereas" clauses. A third section usually is devoted to definitions of important terms. Next comes the body of the contract containing the essential terms. The body of the contract can contain many sections,

each devoted to a particular significant area of concern. After the body comes what I call the boiler plate. The boiler plate clauses cover many important standard elements of contract law. Finally comes the signature block. Many agreements also have attachments of one sort or another, often called exhibits. Very simple contracts lack almost all of these items. All that is needed is a general statement of the nature of the agreement and the signatures of the parties. The rest of the parts are added as the agreement becomes more important.

Of course, the names and addresses of the parties should be clearly stated at the beginning of the agreement. Next, the purposes of the agreement. It is always helpful to state the purposes of the agreement. This section is often used to set the tone for the rest of the agreement, and to show the intent of the parties. This latter use is often helpful when structuring the agreement to make it fit within some particular legal niche. For example, to create a valid work-for-hire agreement, the contract should recite certain basic elements. Similarly, to create an independent contractor relationship, as opposed to an employment relationship, thereby avoiding certain tax and insurance liabilities, the agreement should recite the requisite independent contractor elements.

The definition section gives a convenient place to make sure that any important terms be clearly understood by the parties. Definitions perform two functions. First, definitions are used to allow one term, such as "Program," to be used throughout the agreement to include the source and object code for a program with a specific title. Definitions are also important to establish the meanings of key terms

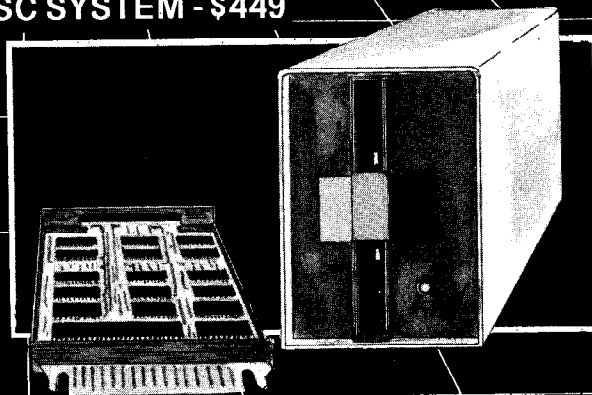
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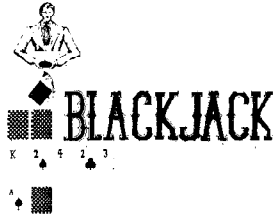


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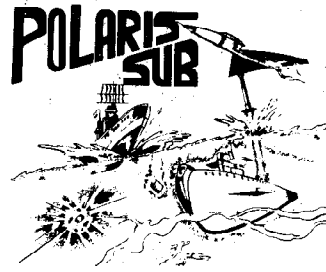
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SKY DESTROY - Planes and helicopters are coming from all directions, they must be stopped! This game is similar to Atari's and now available to color computer users. Machine language. Only \$19⁹⁵.

BOWLING SCORED FOR DOLLARS - Do your leagues bowling averages. This program will keep individual scores, team totals, individual averages, team standings, and print all this information to your line printer. On cassette and disk, specify on order. Only \$19⁹⁵.

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Two 'Bumbles' Make Learning Enjoyable

The Follett Library Book Company has developed, through The Learning Company, two programs for teaching children how to locate positions on arrays and grids. According to the introduction, students "... will need this skill to find streets on maps, to build charts and graphs and to design computer graphics." This reviewer would add latitude and longitude.

I was immediately impressed with the packaging of the programs. One of the problems with educational materials is durability. The Follett Company has each diskette enclosed in a self-sealing vinyl case and the multi-colored instruction booklet in a transparent sleeve on the cover.

The two programs, *Bumble Games* (for ages four to 10) and *Bumble Plot* (for ages eight to 13), come on either cassette or disk. Both programs are designed to teach X,Y coordinates beginning with horizontal lines and then vertical lines, increasing with difficulty according to mastery levels.

Bumble Games has six programs, including Find Your Number, Find The Bumble, Butterfly Hunt, Visit From Space, Tic Tac Toc and Bumble Dots. *Bumble Plot* has five games: Trap And Guess, Bumblebug, Hidden Treasure, Bumble Art and Roadblock.

The "Bumble" is a colorful cartoon bug that leads you through the precise instruction booklet that not only explains how to use a cassette or disk but includes photographs of the Color Computer keyboard with necessary program keys highlighted, plus actual color photographs of each program screen. The directions actually give hints on how to win the games.

Teachers and students will enjoy the author's ability to make learning enjoyable through excellent program designs, graphic numbers and letters, sounds and music (I enjoyed the Westminster Chimes and "bell" to count the proper number guess in one program).

Each series is set up to first teach horizontal coordinates. *Bumble Games* starts with "Find Your Number" from zero to five, while *Bumble Plot* begins with "Trap And Guess" that goes from negative three to positive three. The second phase, when the child comprehends horizontal coordinates, is both horizontal and vertical (X,Y) locations. The younger children's version uses graphic letters for the horizontal line and graphic numbers for the vertical. The older student's version uses numbers from negative two to positive two for both axes. The games require the students to find, hunt, outwit, play against another student, and generally have fun, but always developing and using the horizontal and vertical locations on the grids. As the student advances, the grids and arrays become more complex, but each program continues giving sentence clues (in graphic letters) or arrows for proper direction on the grid.

Almost as a bonus, each series includes an art program that allows the student to either plot his own drawing or have the program, using a cursor, tell him where to list the X,Y coordinates. In either case, when the picture is completed, the grid is automatically erased and painted by the computer.

My children Jennifer (first grade), David (fourth grade) and Michael (sixth grade) thoroughly enjoyed the programs.

While my children were able to do the programs and figure out the X,Y coordinates, it should be noted that the purpose of *Bumble Games* and *Bumble Plot* is to aid the teacher in teaching place location on maps, grids and arrays. The programs, while they can stand alone, are the first programs being marketed by the Follett Company with the idea of computer aided instruction (C.A.I.). The teacher is still required to teach the basics and then use the computer to back up and expand upon the classroom instruction. The Follett Library Book Company is to be commended for developing programs for the TRS-80 Color Computer and showing how students and educators can benefit from classroom computers.

Each program has a 90-day warranty from defects, and back-up copies can be obtained from the company with a "certificate" and proper payment for the disk.

(Follett Library Book Company, 4506 Northwest Highway, Crystal Lake, IL 60014, 16K ECB, cassettes \$45 for either program, diskettes \$65)

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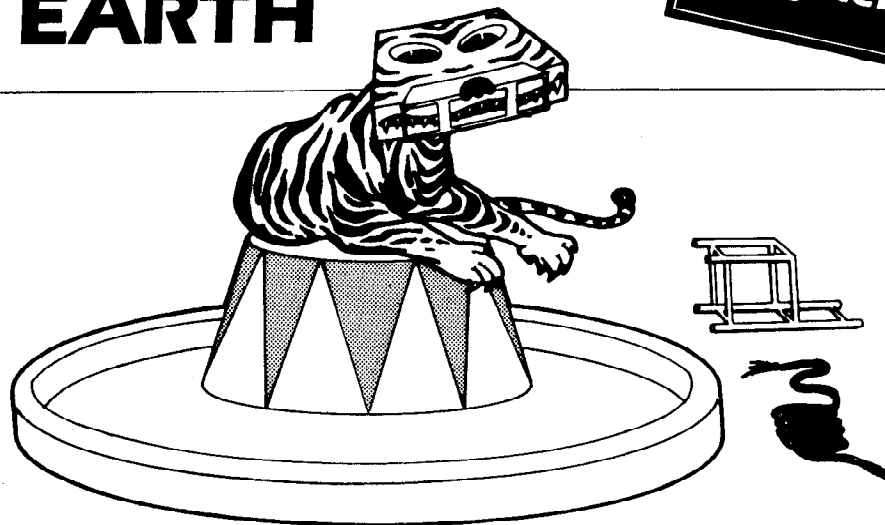
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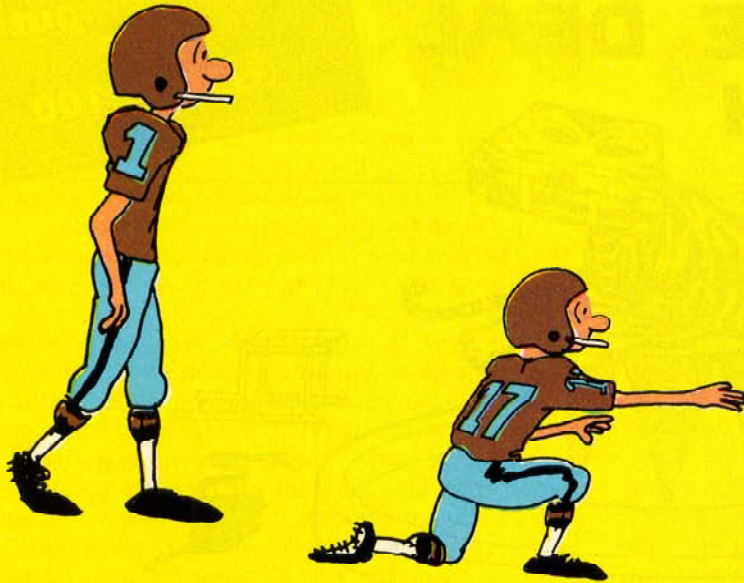
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The Fine Print: All issues from July 1981 available — ask for list. Programs are for the Extended BASIC model and occasionally for disks.



Chromasette MAGAZINE

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Ever since my first football simulation game on an IBM 360/35 way back in 1967, I have been fascinated with a computer's ability to simulate real events and make realistic playing field decisions. I produced versions of this game on a Tektronix 4051 microcomputer and a PDP-11 mini in the last 10 years. With the purchase of my Color Computer I had a new challenge: make it easy enough for anyone to play *and* make it challenging enough for a real football buff. I think I've succeeded.

This is a game that makes you the coach; or, if you're the athletic type, the quarterback and the defensive signal caller. *Strategy Football* is not a graphics game, so it doesn't matter if you have joysticks or good hand-eye coordination. *Strategy Football* is a "thinking person's" football. You are guided through the game with a display of the scoreboard (including the time remaining), and the play situation. You'll see the outcome of each play just as Howard Cosell or Keith Jackson might tell you.

You have the choice of team names. You can tailor the team rushing, passing, defense, and kicking games to your favorite teams (or rivals). As a play caller you have nine offensive plays to choose from and five defenses. You can onside kick when necessary or call a timeout to stop the clock. The play outcomes are dependent upon your play selection, the opponent's play selection, a history of play outcomes from actual NFL records, and, of course, some random occurrences. Big breaks happen now and then. The game clock tells you how much time you have left but each team can call three timeouts per half. When a team scores, the band plays and the crowd

(Dr. Tyson holds a Ph.D. in physics. He is a Senior Systems Engineer working on high energy laser beam control system development and computer simulation. He and his family live in Jupiter, Florida.)

cheers. The referee's whistle blows every play dead. But watch out for the penalties that the referees call; they can stop a drive just when you need it.

There's a halftime show to keep you entertained. Sorry, no Dallas Cowboy cheerleaders. The game takes over 30 minutes to play even if you call the quick plays and don't stop the clock with sideline passes. There is a provision to save your game onto tape or disk and come back to it later. You can play NFL or NCAA rules; your Color Computer read the rulebook and knows the differences. You can have a one player game and play against the computer (it wins now and then) or you can have a two player game and turn your friends into nervous wrecks. Or, if you're a football fan who prefers to just watch the game, you can play the zero player game with the computer playing its alter ego (Sam?). Be ready for the next football strike.

Load the tape or disk version. Type *RUN*. The *Strategy Football* logo will appear and ask if you want to play a saved game. If you have one saved, simply type *Y* and the game will start where you left off. If you type *N* the game will begin with prompts for information.

First type the two team names (no more than twelve characters). Type the city or school rather than the nickname. This helps the grammar sound correct when you get the play situation. For instance, type "Dallas" rather than "Cowboys," or "Penn State" rather than "Lions." Next, choose NFL (pro) rules or NCAA (college) rules. If you want to play high school rules, choose NCAA. Next, choose the mode. Zero is the computer versus itself. Fun to watch, but not much of a challenge. The others are self-explanatory.

Next, choose the team strengths. You have five categories for each team. Strength can range from 0 to 10 on each category. The limit is that the total must equal 10. Therefore, for a perfectly balanced team, type 2 for all

STRATEGY FOOTBALL



By Dr. Bob Tyson

categories. For a team with a good running game but no passing game, type 4:0:2:2:2. These can have a great effect on play outcomes; be realistic—Earl Campbell, Dan Fouts, and Jack Ham don't play on the same team!

The game will begin with the coin toss. From this point on the computer will prompt either team for a response. If the response would come from the computer playing, then it'll happen before you know it.

When you get to a scrimmage play choice (that is, choosing an offensive or defensive play), you can continue with the game, call a timeout for this play, or save the game at this point. If you call a timeout, you will be told how many you have left, if any, and the time for the next play will be very short. If you want to save the game type a lower case (s). Do this by typing (shift)0, and then "S," (shift)0 to exit the mode. The computer will prompt you for a save to tape or disk. CAUTION: If you do not have disk BASIC, do not choose the disk SAVE mode. The computer will give you a ?SN ERROR and execution will stop.

For those interested in tailoring the game to their specific interests, a few notes are in order. If the words whiz by too fast, just change the delay in lines 126, 127, and 128. Double the limit in the FOR:NEXT loop. Lines 1-83 are the initialization lines. A master loop begins at line 87 where all things are decided, like the play situation (is it a scrimmage play, a kickoff, or an extra point try?). This is reminiscent of my FORTRAN Namelist upbringing. The variable "L" is the mode. From line 106 the

branch is to 134 for a kickoff, line 213 for a scrimmage play, and line 357 for an extra point try. Other major variables are MD (0, 1, or 2 players); YL (yardline -70 to +70); PO (the offensive play); PD (the defensive play); and BT (the team with the ball). Line 178 is an example of the ball changing hands. DATA lines 545-549 contain the basic results without team strengths factored in or randomness. If the game of football does not interest you, but you've read this far, consider the challenge of finding just how the play outcomes are really determined. It is *not* straightforward. For the music buffs, identify the pep songs played throughout the game and you deserve to be spotted seven points in your next game.

When you play *Strategy Football*, don't try to "out-think" the game or "beat" the game by looking at the DATA statements and trying to figure out what to choose. Just play the game like football. Think football. When it's necessary to onside kick, do it. Remember, the ball won't travel very far... but there is a good chance of a fumble. Also, when going for a field goal, realize that a kick inside the 20 yard line is almost a sure thing. Almost! A kick from outside the 40 yard line is tough, but possible.

Your offensive plays all have things going for them:

- 1) The dive play is good for short yardage situations. It's good for 1 or 2 yards almost always.
- 2) The trap play is the basic running play to the inside. It's hard to stop for a few yards unless the defense is keyed on the runner.



- 3) The sweep is the basic outside running play. It can be stopped with a keying defense or the blitz. It can also break it big!
- 4) The reverse is a "gadget" play. This will either go long or lose yardage.
- 5) The slant pass is a pass play to the tight end over the middle. A zone defense can beat it, but it can go for big yardage.
- 6) The sideline curl pass is a good medium yardage pass. It's good to stop the clock and hard to intercept. But when it is intercepted, watch out! The defense has nothing but daylight to score.
- 7) The fly pass is "the bomb." The split end streaks down the sideline and catches it for a big gainer. Beware of a blitz. This pass takes a long time to throw and a blitzing defense can sack the quarterback.

The defensive plays also have special uses:

- 1) A 5-3 man-to-man is the basic defense. You key on the runner and guard the receivers man-to-man. This is better against the run.
- 2) A 4-4 zone is the basic anti-pass defense. The backs cover a zone rather than a man. A sweep can beat this defense.
- 3) A 5-3 zone strong side is good at rushing the passer (five man) and it can usually stop the most common strong side passes. Watch out. The weak side is vulnerable and you might get burned.
- 4) A 4-4 blitz looks like the 4-4 zone except the safety and one linebacker rush the passer. This defense can

be devastating to a pass play and can usually stop a short yardage running play. Be careful here. The blitz leaves the receivers open usually just enough.

- 5) The prevent defense (pronounced PRE-vent) will stop virtually all long gainers when the offense has "pulled out all the stops." A few long gainers can happen; that's the game of football. Oh yes, the prevent practically gives away the 10 to 20 yard play, so use it sparingly.

Well, that's *Football Strategy*. Put on your helmet and go to it. A few bumps and bruises and you'll be an expert.

The listing:

27.....	02E3	296.....	2355
50.....	058C	325.....	26D5
76.....	07FA	344.....	291D
87.....	0A16	371....	2C43
106....	0C2A	388.....	2E5F
136....	0FBD	419.....	3213
162....	11FA	440.....	3498
186....	145C	469.....	3779
219....	17EF	488.....	3A5B
236....	1A90	510.....	3CD0
256....	1DBE	534.....	3F3A
280....	2107	END....	4281

```

5 CLEAR500:GOTO550
6 PRINT@449,"":G$=INKEY$
7 DIMS(2),SR(2,5),N$(2),L$(12),Q
(2)
8 I=RND(TIMER)
9 GOTO489
10 CLS:PRINT@70,"CHOOSE TEAM NAM
ES"
11 PRINT:PRINT:PRINT
12 FORI=1TO2
13 PRINT"TEAM #";I:INPUTN$(I)
14 IFLEN(N$(I))>12THEN15ELSE16
15 PRINT"ONLY 12 CHARACTERS...TR
Y AGAIN":GOTO13
16 NEXTI
17 FORI=1TO2:L$(1)="
"
18 IFLEN(N$(I))=12THEN20
19 N$(I)=N$(I)+RIGHT$(L$(1),12-L
EN(N$(I)))
20 NEXTI
21 CLS
22 CLS:PRINT@70,"CHOOSE LEAGUE R
ULES":PRINT@160,"1=NFL OR 2=NCAA
"
23 INPUTRU:IFRU=1ORRU=2THEN24ELS
E21
24 IFRU=2THENPLAY"T403L3C02L8B03
L4DCP8L3FL8EL4GFP8AP16AP16AP16AP
16L2AP2L4GFGA-AL3B-L4FGAB-O4CD03
L3AL8GL2F"
25 CLS:PRINT@70,"CHOOSE NUMBER O
F PLAYERS":PRINT:PRINT"0=COMPUTE
R VS. COMPUTER":PRINT"1=YOU VS.
COMPUTER":PRINT"2=TWO PLAYERS"

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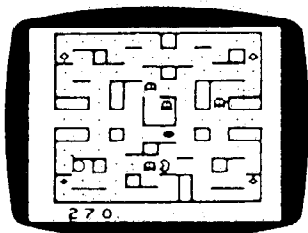
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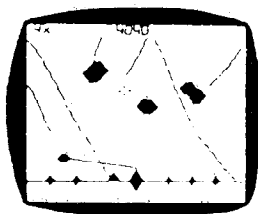
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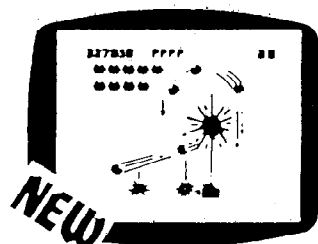
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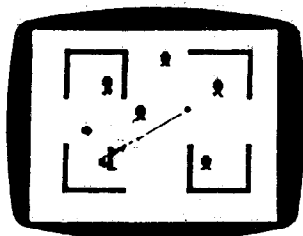
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```

26 INPUTMD:MD=INT(MD):IFMD<0ORMD
>2THEN25
27 CLS:PRINT@70,"CHOOSE TEAM STR
ENGTHS":PRINT:PRINT"TOTAL MUST A
DD TO 10":GOSUB126
28 L$(1)="RUSHING OFFENSE":L$(2)
="PASSING OFFENSE":L$(3)="RUSHIN
G DEFENSE":L$(4)="PASSING DEFENS
E":L$(5)="KICKING GAME "
29 FORI=1TO2
30 FORK=1TO5:SR(I,K)=0:NEXTK
31 FORK=1TO5
32 CLS:FORJ=1TO5:PRINT@14+(J+1)*
32,L$(J);SR(I,J):NEXTJ
33 PRINT@224,N$(I):GOSUB35:PRINT
@258,L$(K):INPUTSR(I,K):GOSUB35:
IFSR(I,K)<0ORSR(I,K)>10THEN48
34 GOTO37
35 T=0:FORJ=1TO5:T=T+SR(I,J):NEX
TJ
36 PRINT@500,"TOTAL ";T:RETURN
37 IFT=10THEN40
38 IFT>10THEN49
39 NEXTK
40 IFT<>10THEN49ELSECLS:PRINT"VE
RIFY SELECTIONS":PRINT:PRINTN$(I
):PRINT:FORK=1TO5:PRINTL$(K);SR(
I,K)
41 NEXTK

```

```

42 PRINT"PRESS <ENTER> TO CONTIN
UE,          <N> TO REDO"
43 G$=INKEY$:IFG$=""THEN43
44 IFG$="N"THEN31
45 IFG$="Y"THEN46
46 NEXTI
47 GOTO50
48 PRINT"VALUE TOO HIGH":GOSUB12
7:GOTO32
49 PRINT"TOTAL MUST EQUAL TEN":G
OSUB127:GOTO30
50 CLS:PRINT"          COIN TOSS"
51 ONMD+1GOTO69,52,72
52 GOSUB54
53 GOTO58
54 PRINTN$(1)
55 PRINT"CHOOSE <H>EADS OR <T>AI
LS"
56 G$=INKEY$:IFG$=""THEN56
57 IFG$="H"ORG$="T"THENRETURNELS
E56
58 IFRND(2)=1THEN59ELSE61
59 PRINT" HEADS IT IS !!":GOSUB1
26
60 IFG$="H"THEN65ELSE63
61 PRINT" TAILS IT IS !!":GOSUB1
26
62 IFG$="T"THEN65ELSE63
63 PRINT" YOU LOSE, ":PRINTN$(2

```

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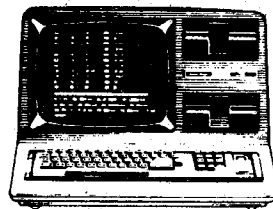
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```

);" WILL RECEIVE":GOSUB127
64 BL=1:GOTO84
65 PRINT" YOU WIN THE TOSS...WIL
L YOU      <K>ICK OR <R>ECEIVE?"
66 G$=INKEY$:IFG$=""THEN66
67 IFG$="K"THENBL=1ELSEIFG$="R"
HENBL=2
68 GOTO84
69 IFRND(2)=1THENBL=1ELSEBL=2
70 PRINTN$(BL);" WINS THE TOSS";
PRINT"AND WILL RECEIVE":GOSUB127
:IFBL=1THENBL=2ELSEBL=1
71 GOTO84
72 GOSUB54
73 IFRND(2)=1THEN74ELSE77
74 PRINT" HEADS IT IS !!":GOSUB1
26
75 IFG$="H"THENBL=1ELSEBL=2
76 GOTO79
77 PRINT" TAILS IT IS !!":GOSUB1
26
78 IFG$="T"THENBL=1ELSEBL=2
79 PRINTN$(BL);" WINS THE TOSS";
PRINT"WILL YOU <K>ICK OR <R>ECEI
VE ?"
80 G$=INKEY$:IFG$=""THEN80
81 IFG$="K"THEN84
82 IFG$<>"R"THEN80
83 IFBL=1THENBL=2ELSEBL=1

```

```

84 S(1)=0:S(2)=0:TQ=1:TM=15:TS=0
:YF=10:YT=0:L=1:DN=1:FLAG=BL:Q(
)=3:Q(2)=3
85 L$(1)="DIVE":L$(2)="TRAP":L$(
3)="SWEEP":L$(4)="REVERSE":L$(5)
="TIGHT END SLANT":L$(6)="SIDELI
NE CURL":L$(7)="FLY":L$(8)="5-3
MAN-TO-MAN"
86 L$(9)="4-4 ZONE":L$(10)="5-3
ZONE STRONG SIDE":L$(11)="4-4 BL
ITZ":L$(12)="PREVENT"
87 CLS:PRINT@33,N$(1);:PRINT@47,
S(1);:PRINT@53,"QUARTER ";TQ;
88 IFTS>9THENM$=STR$(TS)ELSEM$="
0"+STR$(TS)
89 M$=STR$(TM)+" ":"+M$
90 PRINT@65,N$(2);:PRINT@79,S(2)
;:PRINT@85,M$
91 PRINT@130,DN;" DOWN ";
92 IFYF<>-1THENPRINT@140,YF;"YAR
DS TO GO"ELSEPRINT@140,"GOAL TO
GO"
93 PRINTSTRING$(32,"-")
94 IFL=1THENPRINTN$(BL)+" KICKIN
G OFF"
95 IFL=3THENPRINTN$(BL)+" EXTRA
POINT TRY"
96 IFL=2THEN99
97 GOSUB129

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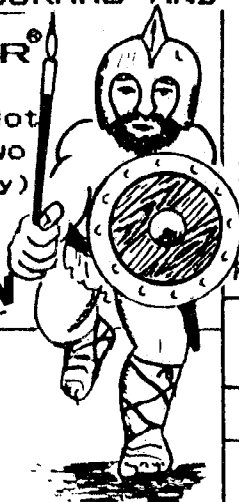
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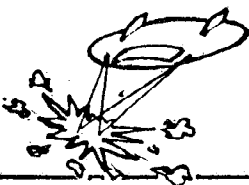
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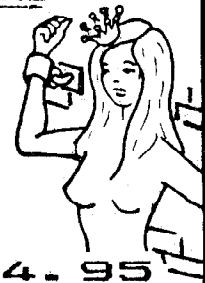
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98 IFLAG=-1THEN101ELSE106
99 GOSUB107:PRINT$(BL)+" BALL":
PRINTY$
100 GOTO97
101 PRINT@354," THE GAME IS OVER
";
102 IFS(1)>S(2)THENPRINT@420,N$(
1)+ " IS THE WINNER"
103 IFS(2)>S(1)THENPRINT@420,N$(
2)+ " IS THE WINNER"
104 IFS(2)=S(1)THENPRINT@420," T
HE GAME ENDS IN A TIE !!"
105 END

```

```

106 ONLGOTO134,213,357
107 YL=INT(YL)
108 IFYL<=-60THEN117
109 IFYL<-50THEN118
110 IFYL=-50THEN119
111 IFYL<0THEN120
112 IFYL=0THEN121
113 IFYL<50THEN122
114 IFYL=50THEN123
115 IFYL<60THEN124
116 IFYL>=60THEN125

```

*yard line
tell where
they are
loop*

```

117 Y$="OUT OF THE "+N$(1)+"
END ZONE":RETURN
118 Y$=STR$(ABS(YL)-50)+" YARDS
DEEP IN THE
"+N$(1)+" END ZONE":RETURN
119 Y$="ON THE "+N$(1)+"
GOAL LINE":RETURN
120 Y$="ON THE "+N$(1)+"
"+STR$(50+YL)+" YARD L
INE":RETURN
121 Y$="ON THE 50-YARD LINE":RET
URN
122 Y$="ON THE "+N$(2)+"
"+STR$(50-YL)+" YARD
LINE":RETURN
123 Y$="ON THE "+N$(2)+"
GOAL LINE":RETURN
124 Y$=STR$(ABS(YL)-50)+" YARDS
DEEP IN THE "
+N$(2)+" END ZONE":RETURN

```

↑ *Ball is*

```

125 Y$="OUT OF THE "+N$(2)+"
END ZONE":RETURN
126 FORDL=1TO500:NEXT:RETURN
127 FORDL=1TO1500:NEXT:RETURN
128 FORDL=1TO2000:NEXT:RETURN
129 IFMD=0THENGOTO127
130 IFMD<>0THENPRINT@449,"PRESS
ANY KEY"
131 PRINT@449,"":G$=INKEY$
132 IFG$=""THEN130ELSERETURN
133 REM 1000=KO,2000=SCR,3000=XP
134 YL=10:IFRU=1THENYL=15
135 IFK=99THENYL=30
136 K=0
137 IFBL=1THENYL=-1*YL
138 IFMD=0THEN142
139 IFMD=2THEN143
140 IFBL=1THENGOSUB157ELSEGOSUB1
61
141 GOTO144
142 GOSUB161:GOTO144
143 GOSUB157
144 CLS
145 GOSUB107
146 PRINT"THE BALL IS "+Y$
147 PRINTN$(BL)+" KICKING OFF"
148 PLAY"V31T202L10CEG03CP1002L2
0G03L2C":GOSUB127
149 IFBL=1THENBT=2ELSEBT=1
150 ONZN+1GOTO151,154
151 KL=30+RND(SR(BL,5)*20)+RND(1
0):KL=INT(KL)
152 IFKL>70THENKL=70
153 GOTO164
154 KL=15:KL=KL+RND(SR(BL,5)*10)
+RND(5):KL=INT(KL)
155 IFKL>70THENKL=70
156 GOTO164
157 GOSUB126:CLS:PRINTN$(BL):PRI
NT"CHOOSE ONSIDES KICK?(Y/N)":PR
INT:PRINT
158 G$=INKEY$:IFG$=""THEN158
159 IFG$="Y"THENZN=1ELSEZN=0
160 RETURN

```

*Hand
loops*

key

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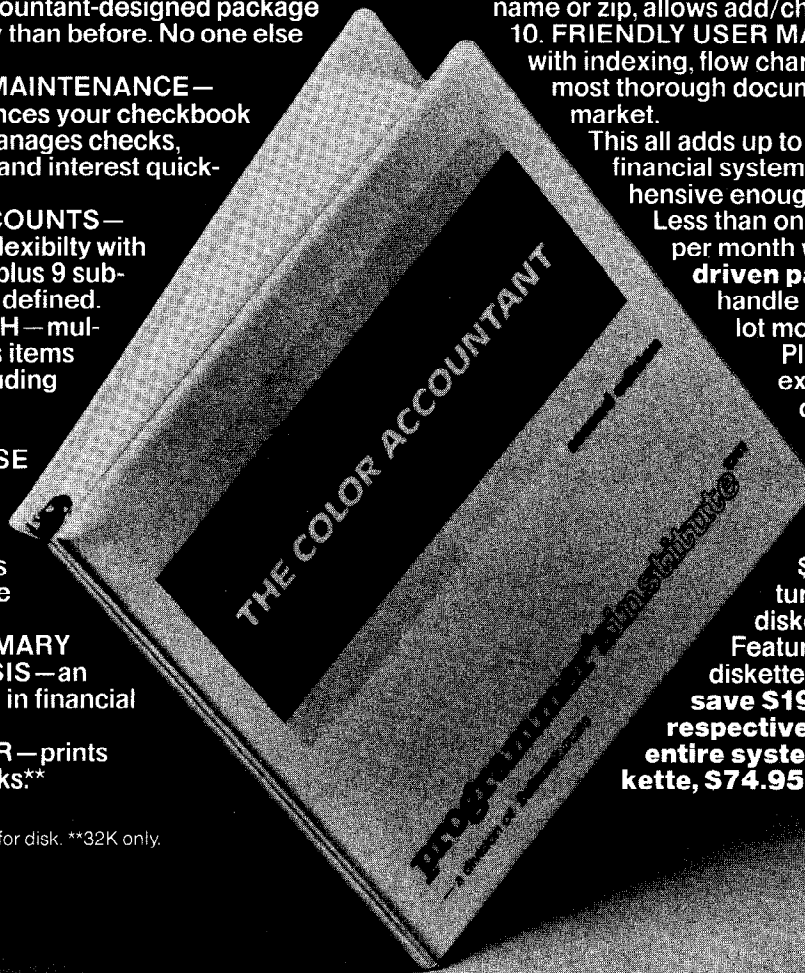
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```

161 ZN=0:IFTQ=4ANDBL=1ANDS(2)-S(
1)>7THENZN=1
162 IFTQ=4ANDBL=2ANDS(1)-S(2)>7T
HENZN=1
163 RETURN

```



```

164 CLS:PRINT"BALL TRAVELS ";KL;
" YARDS":IFBL=1THENYL=YL+KLELSEY
L=YL-KL
165 GOSUB107:PRINT"KICK TAKEN "+
Y$
166 GOSUB127
167 IFABS(YL)>=60THEN178
168 IFABS(YL)<60ANDABS(YL)>49THE
N182
169 IFBL=1THENBL=2ELSEBL=1
170 RL=0:FORI=1TO15:RL=RL+RND(43
):NEXTI
171 RL=INT(RL/16)+(SR(BL,5)-SR(B
T,5))*RND(8)
172 RL=INT(RL)
173 I=RND(10+SR(BL,5))
174 IFI=1ANDZN=0THENRL=-1
175 IFI<4ANDZN=1THENRL=-1
176 CLS
177 GOTO189
178 IFBL=1THENBL=2ELSEBL=1
179 YL=-30:IFBL=2THENYL=30
180 PRINT"TOUCHBACK .. BALL GOES
TO 20":GOSUB127:TP=0:GOSUB422
181 DN=1:L=2:YF=10:YT=0:TP=7:GO
SUB422:GOTO87
182 IFMD=0THEN178
183 IFBL=1THENBL=2ELSEBL=1

```

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```

184 IFMD=1ANDBL=1THEN186
185 IFMD=1ANDBL=2THEN179
186 PRINTN$(BL):PRINT" CHOOSE TO
  RUN THE BALL OUT?      (Y/N)"
187 G$=INKEY$: IFG$=""THEN187
188 IFG$="Y"THEN170ELSE179
189 IFRL=-1THEN203
190 IFBL=1THENYL=YL+RLELSEYL=YL-
  RL
191 IFBL=1ANDYL>=50THEN200
192 IFBL=2ANDYL<=-50THEN200
193 IFBL=1ANDYL<-50THEN179
194 IFBL=2ANDYL>50THEN179
195 DN=1:L=2:YF=10: IFBL=1THENYT=
  50-YLELSEYT=50+YL
196 IFYT<11THENYF=-1
197 PRINT:PRINT:PRINTN$(BL)+" RE
  TURNS IT ":PRINTRL;" YARDS AND I
  S DOWN"
198 GOSUB107:PRINTY$:GOSUB128
199 TP=24:GOSUB422:GOTO87
200 PRINTN$(BL)+" BREAKS A TACKL
  E          GOES ALL THE WA
  Y":GOSUB126
201 GOSUB462
202 S(BL)=S(BL)+6:YF=10:DN=1:L=3
  :TP=27:GOTO87
203 FORI=1TO8:CLS(I):SOUNDRND(25
  5),1:NEXTI:CLS:PRINT:PRINT"FUMBL

```

```

E...":GOSUB127
204 IFYL>49ANDBL=2THEN212
205 IFBL=1THENPRINTN$(2)+" RECOV
  ERS!"ELSEPRINTN$(1)+" RECOVERS!"
206 SOUND250,13:GOSUB127
207 TP=20:GOSUB422:DN=1:L=2:YF=1
  0
208 IFBL=1THENBL=2ELSEBL=1
209 IFBL=1THENYT=50-YLELSEYT=50+
  YL
210 IFYT<11THENYF=-1
211 GOTO87
212 PRINT" IN THE END ZONE..TOUC
  HBACK":GOTO179
213 IFBL=1THENYT=50-YLELSEYT=50+
  YL
214 IFBL=1THENBT=2ELSEBT=1
215 IFBL=1ANDMD<>0THEN226
216 IFBL=2ANDMD=2THEN226
217 ONDNGOTO218,220,222,224
218 IFTQ=4ANDT<30ANDYT<40ANDS(BT
  )-S(BL)<3THENPO=9ELSEPO=RND(7)
219 GOTO234
220 IFTQ=4ANDT<30ANDYT<40ANDS(BT
  )-S(BL)<3THENPO=9ELSEIFYF>10THEN
  PO=RND(3)+4ELSEPO=RND(7)
221 GOTO234
222 IF(TQ=4ORTQ=2)ANDT<30ANDYT<4
  0THENPO=9ELSEIFYF>6THENPO=RND(3)

```



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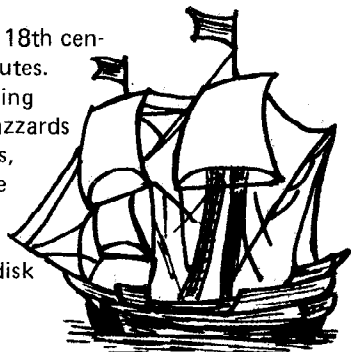
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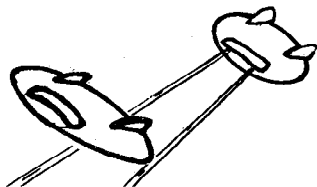
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```

+4ELSEPO=RND(4)
223 GOTO234
224 K=S(BT)-S(BL): IF(TQ=4ANDK>3A
NDYT<40) OR(TQ=4ANDK>3ANDYT<90AND
TM<2ANDYT>40) OR(YF<3ANDYT<20ANDK
>3) THENPO=1+RND(6) ELSEIF(TQ=4AND
K<4ANDK>0ANDYT<40) OR(TQ=2ANDK<8A
NDK>0ANDYT<40) OR(YT<37) THENPO=9E
LSEPO=8
225 GOTO234
226 CLS
227 PRINT
228 PRINTN$(BL):PRINT"SELECT OFF
ENSIVE PLAY":PRINT:PRINT"1=DIVE
s=SAVE":PRINT"2=TRAP
T=TIMEOUT"
229 PRINT"3=SWEEP":PRINT"4=REVER
SE":PRINT"5=SLANT PASS":PRINT"6=
CURL PASS":PRINT"7=FLY":PRINT"8=
PUNT":PRINT"9=FIELD GOAL"
230 G$=INKEY$: IFG$="" THEN230
231 PRINT@416,"*"
232 IFG$="s" THEN525ELSEIFG$="T" T
HEN406ELSEIFVAL(G$)<10RVAL(G$)>9
THEN230ELSEPO=VAL(G$)
233 GOTO234
234 IFBL=2ANDMD<>0 THEN237
235 IFBL=1ANDMD=2 THEN237
236 GOTO244

```

```

237 CLS:PRINT:PRINTN$(BT):PRINT:
PRINT
238 PRINT"SELECT DEFENSIVE PLAY"
:PRINT:PRINT"1 = 5-3 MAN-TO-MAN
":PRINT"2 = 4-4 ZONE"
239 PRINT"3 = 5-3 ZONE STRONG SI
DE":PRINT"4 = 4-4 BLITZ
s=SAVE":PRINT"5 = PREVENT
T=TIMEOUT"
240 G$=INKEY$: IFG$="" THEN240
241 IFG$="s" THEN525ELSEIFG$="T" T
HEN407ELSEIFVAL(G$)<10RVAL(G$)>5
THEN240ELSEPD=VAL(G$)
242 PRINT@416,"*"
243 GOTO246
244 IFTQ=4ANDS(BT)-S(BL)<6ANDT<1
30ANDYT<50 THENPD=5ELSEIFDN=3ANDY
F>5 THENPD=RND(3)+1ELSEPD=RND(4)
245 GOTO246
246 IFPO=8 THEN247ELSEIFPO=9 THEN2
75ELSE290
247 CLS:PRINTN$(BL)+" IN DEEP PU
NT FORMATION":GOS
UB127: I=RND(10): IFI=7 THEN248ELSE
259
248 IFBL=1 THENYL=YL-15ELSEYL=YL+
15
249 IFBL=1 THENBL=2ELSEBL=1
250 IFABS(YL)>=50 THEN255
251 DN=1:L=2:TP=10+RND(20):GOSUB
422
252 PRINT"THE KICK IS BLOCKED !!
":PRINTN$(BL)+" RECOVERS":SOUND2
50,13:GOSUB127
253 YF=10: IF(BL=1ANDYL>40) OR(BL=
2ANDYL<-40) THENYF=-1
254 GOTO87
255 PRINT"THE KICK IS BLOCKED !!
":PRINTN$(BL)+" RECOVERS IN THE E
ND ZONE":PRINT" IT'S A TOUCHDOW
N!!"
256 GOSUB462
257 S(BL)=S(BL)+6:DN=1:L=3:TP=10
+RND(15):GOSUB422
258 GOTO87
259 KL=RND(8)+7:KL=INT(KL*5)
260 PRINT"THE KICK IS AWAY":GOSU
B127
261 IFBL=1 THENYL=YL+KLELSEYL=YL-
KL
262 IFBL=1 THENBL=2ELSEBL=1
263 IFABS(YL)>=50 THEN179
264 I=RND(5): IFI=3 THEN265ELSE268
265 PRINT"FAIR CATCH CALLED":GOS
UB126:PRINTN$(BL)+" TAKES OVER":
GOSUB126
266 DN=1:L=2:TP=10+RND(20):GOSUB
422
267 GOTO253
268 GOSUB107:PRINTN$(BL)+" FIELD

```

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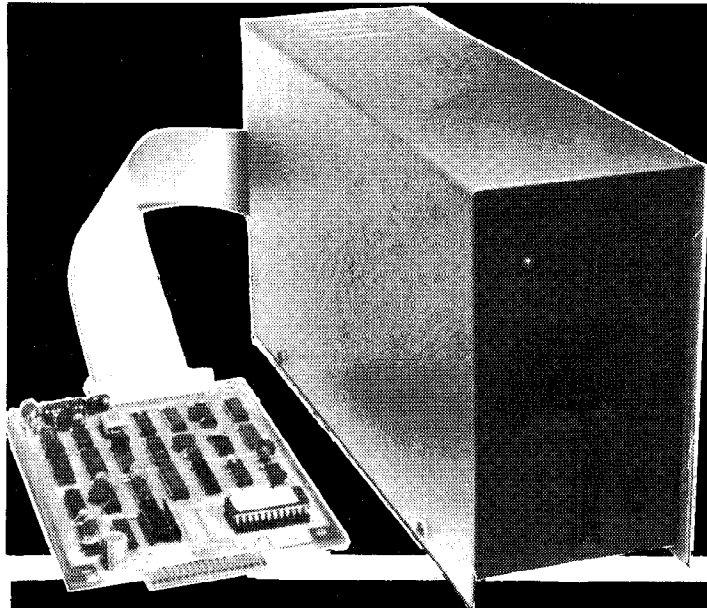
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```

S THE BALL":PRINT$:PRINT"AND RU
NS LEFT"
269 I=RND(8):IFI=8THENRL=55ELSEI
FI=7THENRL=80ELSERL=RND(20)
270 IFBL=1THENYL=YL+RLELSEYL=YL-
RL
271 IFABS(YL)>=50THEN274
272 DN=1:L=2:TP=15+RND(20):GOSUB
422:GOSUB107
273 PRINT"HE RETURNS IT TO":PRIN
TY$:GOSUB127:GOTO253
274 PRINT"HE'S GOT BLOCKERS":GOS
UB126:PRINT"HE'S GOING ALL THE W
AY !!":GOSUB126:GOTO201
275 IFBL=1THENRL=17+50-YLELSERL=
17+50+YL
276 CLS:PRINT"A ";RL;" YARD FIEL
D GOAL TRY":I=RND(11):IFI=7THEN2
48ELSE277
277 KL=SR(BL,5)+20+RND(10):KL=IN
T(KL)
278 I=ABS(YL)+KL:IFI>=50THEN279E
LSE285
279 PRINT"THE KICK IS UP...":GOS
UB127:PRINT"AND IT'S GOOD !!!"
280 CLS5:GOSUB463
281 YF=10:S(BL)=S(BL)+3:DN=1:L=1
:GOSUB126
282 IFRU=1THENYL=15ELSEYL=10

```

```

283 IFBL=1THENYL=INT(-1*YL)
284 GOTO87
285 PRINT"THE KICK IS UP...":GOS
UB126:PRINT"AND IT'S WIDE ... NO
GOOD.":SOUND250,13:GOSUB127
286 IF(BL=1ANDYL>30)OR(BL=2ANDYL
<-30)THEN178
287 IFRU=1THEN178ELSE288
288 DN=1:TP=18:GOSUB422:YF=10:L=
2:IFBL=1THENBL=2ELSEBL=1
289 GOTO87
290 YL=YL
291 IFBL=1THENBT=2ELSEBT=1
292 CLS:IFPD<>4THENPRINTN$(BT)+
" LINES UP IN A "+L$(PD+7)
ELSEPRINTN$(BT)+" LINES UP IN A
4-4 MAN-TO-MAN"
293 GOSUB126:IFPO<5THENPRINTN$(B
L)+" RUNS A "+L$(PO)ELSEPRINTN$(
BL)+" DROPS BACK TO PASS"
294 GOSUB126:IFPO<5THEN295ELSEPR
INT"IT'S A "+L$(PO)
295 GOSUB126:IFPO>4ANDPD=4THENPR
INT"THEY'RE COMING WITH A BLITZ!"
"
296 GOSUB440
297 IFK=200THEN301
298 IFK=100THEN315
299 J=RND(50):IFABS(YL)<45AND(J=

```

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```

370RJ=38) THEN409
300 IFK<0 THEN344ELSE324
301 IFPO=7 THENKL=RND(5)*10ELSEKL
=RND(3)*10
302 KL=INT(KL):PRINT"HE DELIVERS
":GOSUB126:PRINT"IT'S GOING AT L
EAST ";10*INT(KL/10);" YARDS"
303 PRINT"IT'S INTERCEPTED !!":G
OSUB127
304 IFBL=1 THENYL=YL+KLELSEYL=YL-
KL
305 IFBL=1 THENBL=2ELSEBL=1
306 IFABS(YL)>=50 THEN179
307 RL=RND(2)*10+RND(10):IFRL=15
THENRL=65
308 IFBL=1 THENYL=YL+RLELSEYL=YL-
RL
309 IFABS(YL)>=50 THEN200
310 DN=1:L=2:TP=20+RND(20):YF=10
311 IFBL=1 ANDYL>40 THENYF=-1
312 IFBL=2 ANDYL<-40 THENYF=-1
313 PRINT:PRINTN$(BL):PRINT"RET
URNS IT ";RL;" YARDS "
314 SOUND250,13:GOSUB127:GOSUB42
2:GOTO87
315 FORI=1TO8:CLS(I):SOUNDRND(25
5),1:NEXTI:CLS:PRINT" F U M B L
E !":GOSUB127
316 IFPO<=4 THENKL=RND(10)ELSEKL=
RND(25)
317 IFBL=1 THENYL=YL+KLELSEYL=YL-
KL
318 IFABS(YL)>=50 THEN322
319 IFBL=1 THENBL=2ELSEBL=1
320 L=2:DN=1:PRINTN$(BL)+" GETS
THE BALL !":TP=10+RND(5):YF=10:G
OSUB127
321 GOTO87
322 PRINT"THE BALL WAS PAST THE
PLANE OF THE GOAL LINE":GOS
UB127
323 GOTO201
324 IFK=0 ANDPO>4 THENPRINT" THE P
ASS IS INCOMPLETE"
325 GOSUB127
326 IFBL=1 THENYL=YL+KELSEYL=YL-K
327 IFABS(YL)>=50 THEN341
328 SOUND250,13:IFK<>0 THENPRINT"
IT'S A GAIN OF";K;" YARDS"ELSEP
RINT" NO GAIN ON THE PLAY"
329 GOSUB127
330 IFYF<>-1 ANDK>=YF THEN335
331 IFYF<>-1 THENYF=YF-KELSEYF=-1
332 DN=DN+1:IFDN>4 THEN338
333 L=2:TP=RND(20)+10:GOSUB422
334 GOTO87
335 DN=1:YF=10:IF(BL=1 ANDYL>=40)
OR(BL=2 ANDYL<=-40) THENYF=-1
336 TP=12+RND(20):GOSUB422:GOSUB
470

```

```

337 L=2:GOTO87
338 PRINT"BALL GOES OVER ON DOWN
S":GOSUB127
339 IFBL=1 THENBL=2ELSEBL=1
340 GOTO335
341 IFYF<>-1 THEN342ELSE343
342 PRINTN$(BL)+" BREAKS INTO TH
E SECONDARY":GOSUB126:PRIN
T"HE'S GOING TO GO ALL THE WAY!"
:GOSUB126:GOTO201
343 PRINTN$(BL)+" IS IN THERE!":
GOSUB126:GOTO201
344 IFBL=1 THENYL=YL+KELSEYL=YL-K
345 IFABS(YL)>49 THEN352ELSE346
346 IFDN=4 THEN338
347 IFYF<>-1 THENYF=YF-KELSEYF=-1
348 DN=DN+1:L=2:TP=10+RND(20):GO
SUB422
349 IFPO>4 THENPRINT"THE QUARTERB
ACK IS IN TROUBLE"
350 GOSUB126:IFPO>4 THENPRINT"HE'
S SACKED !"
351 SOUND250,13:PRINT"IT'S A LOS
S OF ";ABS(K);" YARDS":GOSUB127:
GOTO87
352 IFPO>4 THENPRINT"THE QUARTERB
ACK IS DROPPING BACK INTO THE END
ZONE HE'S HIT AND SACKED
FOR A SAFETY"ELSEPRINT"HE'S HIT

```

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```

HARD AND DRIVEN BACK FOR A SAF
ETY !!"
353 GOSUB127
354 IFBL=1THENS(2)=S(2)+2ELSES(1
)=S(1)+2
355 DN=1:YF=10:L=1:TP=10+RND(5):
GOSUB422
356 K=99:GOTO87
357 YL=YL:REM EXTRA POINT
358 IFBL=1ANDMD=1THEN376
359 IFMD=0THEN380
360 IFBL=2ANDMD=1THEN380
361 IFPO=3THEN369
362 IFBL=2ANDMD=1THEN384
363 IFMD=0THEN389
364 IFBL=1ANDMD=1THEN389
365 IFPO=3THEN369
366 IFPO=1THEN390
367 IFPO=2THEN394
368 GOTO358
369 CLS:PRINT"THE KICK FOR THE E
XTRA POINT":GOSUB126:PRINT"THE K
ICK IS UP...":I=RND(10):IFI=5THE
N373ELSE370
370 GOSUB127:PRINT" AND IT'S GOO
D !!"
371 GOSUB126
372 S(BL)=S(BL)+1:YF=10:YT=0:L=1
:DN=1:GOTO87

```

```

373 GOSUB127:PRINT" AND IT'S WID
E !! NO GOOD."
374 GOSUB126
375 YF=10:YT=0:L=1:DN=1:GOTO87
376 CLS:PRINTN$(BL)+" CHOOSE OFF
ENSIVE PLAY":PRINT:PRINT:PRINT"K
=KICK":PRINT"R=RUN":PRINT"P=PASS
"
377 G$=INKEY$:IFG$=""THEN377
378 IFG$="R"THENPO=1ELSEIFG$="K"
THENPO=3ELSEIFG$="P"THENPO=2ELSE
GOTO377
379 GOTO361
380 IFBL=1THENBT=2ELSEBT=1
381 IFRU=1THEN382ELSEIFTQ=4AND(S
(BT)-S(BL)=1ORS(BT)-S(BL)=2)THEN
383
382 PO=3:GOTO361
383 PO=RND(2):GOTO361
384 CLS:IFBL=1THENBT=2ELSEBT=1
385 PRINTN$(BT)+" CHOOSE DEFENSI
VE PLAY":PRINT:PRINT:PRINT"R=RUN
":PRINT"P=PASS"
386 G$=INKEY$:IFG$=""THEN386
387 IFG$="R"THENPD=1ELSEIFG$="P"
THENPD=2ELSEGOTO386
388 GOTO365
389 PD=RND(2):GOTO365
390 CLS:PRINT"THE BALL IS SNAPPE
D":PRINT"SWEEP AROUND LEFT END":
GOSUB126
391 IFPD=1THENI=RND(10)
392 IFPD=2THENI=RND(5)
393 IFI>4THEN402ELSE398
394 CLS:PRINT"THE BALL IS SNAPPE
D":PRINT"QUARTERBACK ROLLS RIGHT
":GOSUB126:PRINT" AND FIRES A
PASS":GOSUB126
395 IFPD=2THENI=RND(10)
396 IFPD=1THENI=RND(5)
397 IFI>4THEN402ELSE398
398 IFPO=1THENPRINT" HE'S IN THE
END ZONE IT'S GOOD !!"
399 IFPO=2THENPRINT" COMPLETE !!
IT'S GOOD"
400 GOSUB127
401 S(BL)=S(BL)+RU:YF=10:YT=0:L=
1:DN=1:GOTO87
402 IFPO=1THENPRINT"HE'S HIT AND
IS SHORT!"
403 IFPO=2THENPRINT"IT'S DEFLECT
ED .. NO GOOD"
404 GOSUB127
405 YF=10:YT=0:L=1:DN=1:GOTO87
406 FT=BL:GOTO226
407 IFBL=1THENFT=2ELSEFT=1
408 GOTO237
409 SOUND250,13:J=RND(2)
410 CLS:PRINT@132,"A FLAG IS DRO
PFED":PRINT:PRINT:GOSUB126:PRINT

```

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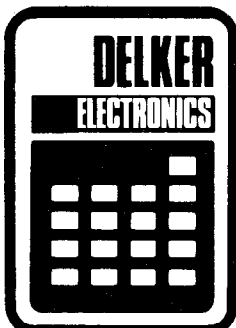


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```

" A PENALTY AGAINST "+N$(J)
411 GOSUB127:K=5+RND(2)*5:PRINT
412 IFK=5THENPRINT"ILLEGAL PROCE
DURE"ELSEIFK=10THENPRINT"HOLDING
"ELSEIFK=15THENPRINT"UNSPORTSMAN
LIKE CONDUCT"
413 PRINT"          IS THE CALL
":GOSUB127
414 IFJ=1THENI=50+YELSEI=50-YL
415 IFK>INT(I/2)THENK=INT(I/2)
416 IFBL=JTHENYF=YF+KELSEYF=YF-K
417 IFYF<=0THEN420
418 IFJ=1THENYL=YL-KELSEYL=YL+K
419 GOTO87
420 IFJ=1THENYL=YL-KELSEYL=YL+K
421 GOTO335
422 IFFT=1ORFT=2THENTP=10
423 IFFT<>0ANDQ(FT)=0THEN431
424 IFFT<>0THENQ(FT)=Q(FT)-1
425 IFFT<>0THENPRINTN$(FT)+" HAS
          ";Q(FT);" TIMEO
UT(S) LEFT"
426 GOSUB126
427 T=INT(60*TM+TS)-TP-RND(16):F
T=0
428 IFT<=0THEN432
429 TM=INT(T/60):TS=INT(T-TM*60)
430 RETURN
431 TP=20+RND(15):PRINTN$(FT)+"

```

```

HAS NO TIMEOUTS          LEFT":
GOSUB127:GOTO427
432 SOUND10,10:ONTOGOTO434,435,4
38,439
433 TQ=4:FLAG=-1:GOTO432
434 CLS:PRINT@64,"END OF FIRST Q
UARTER":GOSUB127:TQ=2:TM=15:TS=0
:RETURN
435 GOSUB479:TQ=3:TM=15:TS=0:YF=
10:YT=0:L=1:DN=1:Q(1)=3:Q(2)=3
436 IFFLAG=1THENBL=2ELSEBL=1
437 RETURN
438 CLS:PRINT@161,"END OF THIRD
QUARTER":GOSUB127:TQ=4:TM=15:TS=
0:RETURN
439 TQ=4:TM=0:TS=0:SOUND10,12:FL
AG=-1:GOTO87
440 RESTORE
441 IFBL=1THENBT=2ELSEBT=1
442 K=RND(20)
443 I=0
444 ONKGOTO445,446,446,447,447,4
48,448,448,448,449,449,449,449,4
49,450,450,450,450,450,450
445 I=I+1
446 I=I+1
447 I=I+1
448 I=I+1
449 I=I+1
450 I=I+1
451 N=INT((PD-1)*42+(PD-1)*6+I)
452 FORI=1TON:READK:NEXTI
453 IFPO<=4THEN458
454 IFK=0ORK=100ORK=200THENRETUR
N
455 I=SR(BL,2)-SR(BT,4)
456 K=INT(K+10*I*(RND(2)/2))
457 RETURN
458 IFK=100ORK=200THENRETURN
459 I=SR(BL,1)-SR(BT,3):IFI<0THE
NI=I/2
460 K=INT(K+4*I*(RND(2)/2))
461 RETURN
462 CLS5:PRINT@69,STRING$(21," "
);:PRINT@101," T O U C H D O W N
! ";:PRINT@133,STRING$(21," ");
463 PRINT@269,CHR$(202);CHR$(206
);CHR$(205);CHR$(197);
464 PRINT@301,CHR$(203);CHR$(192
);CHR$(192);CHR$(199);
465 PRINT@334,CHR$(192);CHR$(192
);
466 PRINT@366,CHR$(197);CHR$(202
);
467 PRINT@398,CHR$(197);CHR$(202
);
468 PLAY"T403L4AP16L2AL4GFL4CL3C
L4DFB-AP4FG04L4DC03AB-AAGL3B-L8A
L2F"
469 GOSUB127:RETURN

```

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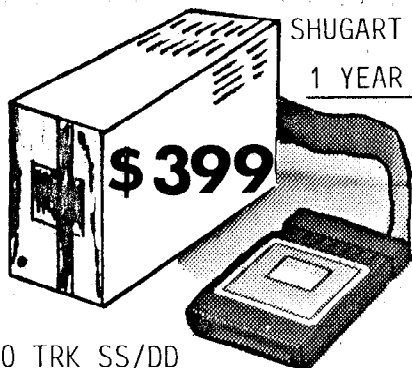
470 CLS5:PRINT@68,STRING$(23," "
);:PRINT@100," "N$(BL);"
";:PRINT@132," F I R S T D
O W N ! ";:PRINT@164,STRING$(23,
" ");
471 PRINT@270,CHR$(196);CHR$(205
);
472 PRINT@238,CHR$(205);
473 PRINT@302,CHR$(192);CHR$(192
);CHR$(195);CHR$(199);
474 PRINT@334,CHR$(192);CHR$(192
);
475 PRINT@366,CHR$(197);CHR$(202
);
476 PRINT@398,CHR$(197);CHR$(202
);
477 GOSUB127
478 RETURN
479 CLS(7):PRINT@70," H A L F T
I M E ";
480 FORI=256TO479:PRINT@I,CHR$(1
43);:NEXT
481 PRINT@299,CHR$(129);CHR$(131
);CHR$(131);CHR$(143);CHR$(129);
CHR$(131);CHR$(130);
482 PRINT@331,CHR$(133);CHR$(142
);CHR$(140);CHR$(143);CHR$(133);
CHR$(143);CHR$(138);
483 PRINT@363,CHR$(132);CHR$(140

```

```

);CHR$(136);CHR$(143);CHR$(132);
CHR$(140);CHR$(136);
484 PRINT@417,N$(1);" ";S(1)
485 PRINT@449,N$(2);" ";S(2);
486 PLAY"T402L4AP16A-AB-L3B-L4AL
2B-P4L4B-B-P16B-AB-03CL3CL402BL2
03CP403L4DFEDC02AFGA03L3C02L8B-L
4AGL2F"
487 GOSUB127:GOSUB127:GOSUB127
488 RETURN
489 CLS(8)
490 PRINT@38," S T R A T E G Y "
;:PRINT@106," F O O T B A L L ";
491 PRINT@168," BY R.K. TYSON "
;
492 PRINT@230,CHR$(254);STRING$(
18,CHR$(252));
493 FORI=262TO359STEP32
494 PRINT@I,CHR$(250);CHR$(239);
495 FORK=1TO5
496 J=I+2+(K-1)*3
497 PRINT@J,CHR$(133);CHR$(138);
CHR$(143);
498 NEXTK
499 PRINT@I+17,CHR$(181);CHR$(18
6);
500 NEXTI
501 PRINT@390,CHR$(251);STRING$(
18,CHR$(243));

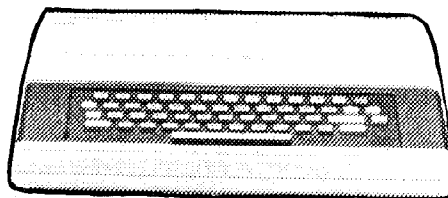
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502 PRINT@449,"DO YOU WANT A SAV
ED GAME(Y/N)?";
503 G$=INKEY$:IFG$=""THEN503ELSE
IFG$="Y"THEN504ELSEIFG$="N"THEN1
0ELSE503
504 CLS:PRINT@64,"ENTER":PRINT"1
= DISK":PRINT"2 = TAPE"
505 INPUTK
506 IFK=1ORR=2THEN508ELSE507
507 PRINT"INVALID ENTRY .. TRY A
GAIN":GOSUB127:GOTO504
508 IFK=1THENK=1ELSEK=-1
509 IFK=-1THENPRINT"INSERT TAPE;
PRESS <PLAY>; PRESS <ENTER
> WHEN READY"
510 IFK=-1THENGOSUB524
511 CLS:IFK=1THENPRINT"ENTER FIL
ENAME/EXT:DRIVE"ELSEPRINT"ENTER
FILENAME"
512 INPUTG$
513 IFK=1THEN!ON
514 OPEN"I",#K,G$
515 INPUT#K,S(1),S(2)
516 FORI=1TO2:FORJ=1TO5:INPUT#K,
SR(I,J):NEXTJ,I
517 INPUT#K,N$(1),N$(2)
518 FORI=1TO12:INPUT#K,L$(I):NEX
TI
519 INPUT#K,BL,RU,MD,YL,TQ,TM,TS

```

```

,TP
520 INPUT#K,YF,YT,FT,L,ZN,DN,BT,
FL,Q(1),Q(2)
521 IFK=1THEN!OFF
522 CLOSE#K
523 GOTO87
524 G$=INKEY$:IFG$=""THEN524ELSE
RETURN
525 CLS:PRINT@64,"ENTER":PRINT"1
= DISK":PRINT"2 = TAPE"
526 INPUTK
527 IFK=1ORR=2THEN529ELSE528
528 PRINT"INVALID ENTRY .. TRY A
GAIN":GOSUB127:GOTO525
529 IFK=1THENK=1ELSEK=-1
530 IFK=-1THENPRINT"INSERT TAPE;
PRESS <RECORD>; PRESS <ENTER
> WHEN READY"
531 IFK=-1THENGOSUB524
532 CLS:IFK=1THENPRINT"ENTER FIL
ENAME/EXT:DRIVE"ELSEPRINT"ENTER
FILENAME"
533 INPUTG$
534 IFK=1THEN!ON
535 OPEN"O",#K,G$
536 PRINT#K,S(1),S(2)
537 FORI=1TO2:FORJ=1TO5:PRINT#K,
SR(I,J):NEXTJ,I
538 PRINT#K,N$(1)
539 PRINT#K,N$(2):FORI=1TO12:PRI
NT#K,L$(I):NEXTI
540 PRINT#K,BL,RU,MD,YL,TQ,TM,TS
,TP
541 PRINT#K,YF,YT,FT,L,ZN,DN,BT,
FL,Q(1),Q(2)
542 CLOSE#K
543 IFK=1THEN!OFF
544 GOTO87
545 DATA 1,2,3,-2,16,100,1,7,5,-
2,15,100,-4,6,8,12,100,30,15,2,-
5,45,100,-13,0,15,7,0,25,200,4,0
,6,-6,200,12,34,0,0,200,-9,200
546 DATA 0,3,1,2,-3,100,8,5,3,-2
,100,27,8,6,17,-3,56,100,0,2,-6,
18,100,-20,17,-6,200,0,0,28,7,0,
-5,4,0,200,-7,0,200,0,49,-7
547 DATA 0,1,2,3,-3,100,-2,4,5,-
4,100,19,5,-1,0,2,14,100,7,34,1,
-9,100,-22,6,17,0,31,200,57,5,8,
0,3,-12,200,10,0,48,32,-15,200
548 DATA 1,-2,7,1,4,100,-2,3,5,-
3,5,100,5,-5,2,40,-17,100,2,1,-1
5,4,100,16,25,0,-9,37,8,200,20,5
,0,200,46,-6,53,0,-11,200,-8,35
549 DATA 2,3,5,-1,8,100,5,7,12,1
,26,100,12,7,2,6,100,23,5,6,1,2,
100,34,18,0,15,200,47,0,5,0,7,20
0,0,16,0,0,68,200,2,7
550 PCLEAR1:GOTO7

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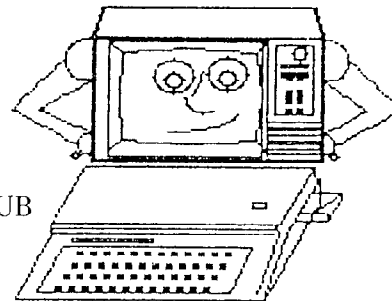
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COLOR COMPUTER MEMORY MAP

By BOB RUSSELL

This is the second installment in a comprehensive series of references on the Color Computer memory, and covers BASIC and Extended BASIC ROM.

This memory map has been created after many hours of research, investigation and experimentation. I probably have over 650 hours already invested in this project and I know I am not finished. I fully intend to offer periodic updates to this document. My wish is that this will become a living, growing document that you will also contribute to. I hope you will bring any errors to my attention and also share any unmapped discoveries you may have made.

Among those publications offering the most accurate and reliable memory information are Radio Shack's Service Manual, *Color Computer News* and *the Rainbow*. If you refer to these resources you will often find detailed information (sometimes even a commented listing that can be matched to a disassembled listing to really describe what is going on!). Throughout the Map, I will refer to some of these resources.

An *S* indicates a ROM or RAM based routine that you could potentially call from your own assembly language program. \$nnn is a notation for hexadecimal values.

Sources referred to in this map:

- 1) *Getting Started With Color BASIC*
Copyright 1981 Tandy Corp.
Fort Worth, TX 76102
- 2) *Going Ahead With Extended BASIC*
Copyright 1981 Tandy Corp.
Forth Worth, TX 76102
- 3) *Service Manual, TRS-80 Color Computer*
Catalog Number 26-3001/3002
- 4) *TRS-80 Microcomputer News*
(for TRS-80 users)
P.O. Box 2910
Forth Worth, TX 76113-2910
- 5) *Color Computer News*
REMarkable Software
P.O. Box 1192
Muskegan, MI 49443
- 6) *the Rainbow*
9529 U.S. Highway 42
P.O. Box 209
Prospect, KY 40059
- 7) *80 Micro*
80 Pine Street
Peterborough, NH 03458

If you don't want to cut up your *Rainbow* Magazine you may purchase copies of the Memory Map in its entirety, enclosed in an attractive cover, for \$9 (Wisconsin residents should add five percent for sales tax.). I invite dealer and computer club volume purchases at discounted prices.

For making inquiries or placing orders, write: Bob Russell, N5474 Stillwater Court, Fredonia, WI 53021.

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Beginning Ending
DEC HEX DEC HEX
ADDR ADDR ADDR ADDR

32768 8000 40959 99FF EXTENDED BASIC ROM[1]

33155 8183 33263 81EF Extended BASIC Command keyword - token table -
ASCII Characters Ref. [7] December 1982 Anniversary
Issue

CONTAINS CONVERTED TO

STRING TOKEN

33155 8183 33157 8185 DEL SB5
33158 8185 33161 8189 EDIT SB6
33162 818A 33165 818D TRON SB7
33166 818E 33170 8192 TROFF SB8
33171 8193 33173 8195 DEF SB9
33174 8196 33176 8198 LET SBA
33177 8199 33180 819C LINE SBB
33181 819D 33184 81A0 PCLS SBC
33185 81A1 33188 81A4 PSET SBD
33189 81A5 33194 81AA PRESET SBE
33195 81AB 33200 81B0 SCREEN SBF
33201 81B1 33206 81B6 PCLEAR SC0
33207 81B7 33211 81BB COLOR SC1
33212 81BC 33217 81C1 CIRCLE SC2
33218 81C2 33222 81C6 PAINT SC3
33223 81C7 33225 81C9 GET SC4
33226 81CA 33228 81CC PUT SC5
33229 81CD 33232 81D0 DRAW SC6
33233 81D1 33237 81D5 PCOPY SC7
33238 81D6 33242 81D7 PMODE SC8
33243 81D8 33246 81DB PLAY SC9
33247 81DF 33251 81E3 DLOAD SCA
33252 81E4 33255 81E8 RENUM SCB
33257 81E9 33258 81EA FN SCC
33259 81EB 55263 81EF USING SCD

33088 81F0 33309 821D

Table of Pointers to subroutine entry addresses
associated with Extended BASIC Command Keyword
Table defined at \$8183 to \$81EF. Ref. [7] December
1982 Anniversary Issue.

Contents For Command

33088 81F0 DEL
33090 81F2 EDIT
33092 81F4 TRON
33094 81F6 TROFF
33096 81F8 DEF
33098 81FA LET
33100 81FC LINE
33102 81FE PCLS
33104 8200 PSET
33106 8202 PRESET
33108 8204 SCREEN
33110 8206 PCLEAR
33112 8208 COLOR
33114 820A CIRCLE
33116 820C PAINT
33118 820E GET

Beginning Ending
DEC HEX DEC HEX
ADDR ADDR ADDR ADDR

32768 8000 40959 99FF EXTENDED BASIC ROM Cont. [1]

33120 8210 PUT
33122 8212 DRAW
33124 8214 PCOPY
33126 8216 PMODE
33128 8218 PLAY
33130 821A DLOAD
33132 821C RENUM

33310 821E 33365 8256 Extended BASIC Function keyword - token table -
ASCII characters. Ref. [7] December 1982
Anniversary Issue.

CONTAINS CONVERTED TO

STRING TOKEN

33310 821E 33312 8221 ATN SFF9A
33313 8222 33315 8223 COS SFF95
33316 8224 33318 8226 TAN SFF95
33319 8227 33321 8229 EXP SFF97
33322 822A 33324 822C FIX SFF98
33325 822D 33327 822F LOG SFF99
33328 8230 33330 8232 POS SFF9A
33331 8233 33333 8235 SQR SFF9A
33334 8236 33337 8239 HEXS SFF9C
33338 823A 33343 823F VARETR SFF9D
33344 8240 33348 8244 INSTR SFF9E
33349 8245 33353 8249 TIMER SFF9F
33354 824A 33359 824F PPOINT SFFA3
33360 8250 33365 8256 STRINGS SFFA1

33367 8257 33394 8272

Table of Pointers to subroutine entry addresses
associated with Extended BASIC Function Keyword
Table defined at \$321E to \$3256. Ref. [7] Dec 1982
Anniversary Issue.

Contents For Function

33367 8257 ATN
33369 8259 COS
33371 825B TAN
33373 825D EXP
33375 825F FIX
33377 8261 LOC
33379 8263 POS
33381 8265 SQR
33383 8267 SRR
33385 8269 VARPTR
33387 826B INSTR
33389 826D TIMER
33391 826F PPOINT
33393 8271 STRINGS

33465 82B9 33566 831E *S* Routine to look for BREAK or shift @ and do
some byte fetching after interpreter is done
with a BASIC statement Ref. [5] #6

33467 82BB 33538 8302 *S* Interpret loop to enable trace function

Beginning DEC ADDR	Ending HEX DEC ADDR	Description
32768 8000	40959 9FFF	EXTENDED BASIC ROM Cont. [1]
33656 8378		*S* Execution of "COS" Extended BASIC function (Token \$FF95)
33665 8381		*S* Execution of "TAN" Extended BASIC function (Token \$FF96)
33712 8390		*S* Execution of "ATN" Extended Basic function (Token \$FF94)
33862 8446		*S* Execution of "LOG" Extended BASIC function (Token \$FF99)
33920 8480		*S* Execution of "SQR" Extended BASIC function (Token \$FF9B)
34034 84F2		*S* Execution of "EXP" Extended BASIC function (Token \$FF97)
34084 8524		*S* Execution of "FIX" Extended BASIC function (Token \$FF98)
34099 8533		*S* Execution of "EDIT" Extended BASIC command (Token \$86)
34115 8543		*S* Edit Routine
34471 86A7		*S* Execution of "TRON" Extended BASIC command (Token \$87)
34472 86A8		*S* Execution of "TROFF" Extended BASIC command (Token \$88)
34476 86AC		*S* Execution of "POS" Extended BASIC function (Token \$FF9A)
34494 86BE		*S* Execution of "VARPRR" Extended BASIC function (Token \$FF9D)
34638 874E		*S* Execution of "STRING\$ " Extended BASIC function (Token \$FFA1)
34686 877E		*S* Execution of "INSRR" Extended BASIC function (Token \$FF9E)
34929 8871		*S* Execution of "DEF" Extended BASIC command (Token \$89)
35176 8968		*S* Execution of "TIMER" Extended BASIC function (Token \$FF9F)
35184 8970		*S* Execution of "DEL" Extended BASIC command (Token \$85)

Beginning DEC ADDR	Ending HEX DEC ADDR	Description
32768 8000	40959 9FFF	EXTENDED BASIC ROM Cont. [1]
35337 8A09		*S* Execution of "RENUM" Extended BASIC command (Token \$CB)
35805 8BDD		*S* Execution of "HEX\$" Extended BASIC Function (Token \$FF9C)
35864 8C18	36282 8DBA	*S* Execution of "DLOAD" Extended BASIC command (Token \$CA). DLOADM Ref [5] #13. Note experience has indicated DLOADM does not work, DLOAD does, will try to determine error later.
36284 8DBC		*S* Input RS232 character
36326 8DE6		*S* Get bit or timeout
36343 8DF7		*S* Delay one bit time
36358 8E06		*S* Send RS232 character
37519 928F	37772 938C	*S* Get line data and Setup Graphics. Ref. [5] #8
37519 928F		Find byte/bit routine
37542 92A6		Set up for Pmodes 0,2,or 4
37570 92C2		Setup for Pmodes 1,or 3
37597 92DD		Table for 1 bit/point
37605 92E5		Table for 2 bit/point
37689 9339		*S* Execution of "PPOINT" Extended BASIC function (Token \$FA0)
37729 9361		*S* Execution of "PSET" Extended BASIC command (Token \$8D)
37733 9365		*S* Execution of "PRESET" Extended BASIC command (Token \$8E)
37819 938B		*S* Execution of "LINE" Extended BASIC command (Token \$8B)
37956 9444		*S* Draw Horizontal line. Ref. [5] #8
37996 946C		*S* Draw Vertical line. Ref. [5] #8
38049 94A1	38177 9521	*S* Draw sloped line routine. Ref. [5] #8

Beginning DEC ADDR	Ending HEX DEC ADDR	Description
40960	A000	BASIC ROM [1]
40961	A000	Address of routine to poll keyboard for a character POLCAT[2] (SA1C1) Z=1,A=0 NO KEY Z=0,A=KEY FOR KEY
40962	A002	Address of routine to Output char in REG A to current output device (all registers but CC are preserved) CHROUT[1] (\$A2A7)
40964	A004	Address of routine to start cassette-turns on motor and read header/gaps (gets into bit sync CSRDN[2]) (\$A77C)
40965	A006	Address of routine to read a block from cassette into tape buffer BLKIN[2], cassette must be on and in bit sync X=CBUPAD[2]+BKLEN[2] interrupts are masked U and Y are preserved all others modified (\$A70B)
40968	A008	Address of routine to write a block to cassette from tape buffer BLKOUT[2] X=CBUPAD[2]+BKLEN[2] all registers modified (\$A7F4)
40970	A00A	Address of routine to sample joystick pots and store their values in \$15A (\$46) to \$15D (\$49). Y is preserved all others modified JOVIN[1] (\$A0DE)
40972	A00C	Address of routine to turn cassette on and write leader/gap/ \$35'S WRTLEDR[2] (\$A7D8)
40974	A00E	Cold start routines
40999	A027	*S* Performs reset when reset button is pressed
41126	A0A6	Check for extended Disk ROM and branch; Basic ends up here after Extended Basic initializes and reconfigures the system to include Extended Basic functions. Then a check is made to see if Disk Basic ROM is present; if \$C000 contains \$44 and \$C001 contains \$4B then jump is made to \$C002
41163	A0CB	Check for extended Basic ROM and branch; Basic ends up here after completing cold start; a check is made to see if extended Basic ROM is present; if \$8000 contains \$45 and \$8001 contains \$58 then jump is made to \$8002.

Beginning DEC ADDR	Ending HEX DEC ADDR	Description
32768	8000	EXTENDED BASIC ROM Cont. [1]
38114	94E2	Draw line loop
38150	9506	Move right
38157	950D	Move up
38164	9514	Move left
38171	951B	Move down
38194	9532	*S* Execution of "PCLS" Extended BASIC command (Token \$B3)
38214	9546	*S* Execution of "COLOR" Extended BASIC command (Token \$C1)
38433	9621	*S* Execution of "PMODE" Extended BASIC command (Token \$C8)
38512	9670	*S* Execution of "SCREEN" Extended BASIC command (Token \$BF)
38539	968B	*S* Execution of "PCLEAR" Extended BASIC command (Token \$C0)
38672	9710	*S* Compare 2 point. Ref. [5] #8
38691	9723	*S* Execution of "PCOPY" Extended BASIC command (Token \$C7)
38741	9755	*S* Execution of "GET" Extended BASIC command (Token \$C4)
38744	9758	*S* Execution of "PUT" Extended BASIC command (Token \$C5)
39148	98EC	*S* Execution of "PAINT" Extended BASIC command (Token \$C3)
39458	9A22	*S* Execution of "PLAY" Extended BASIC command (Token \$C9)
40118	9CB6	*S* Execution of "DRAW" Extended BASIC command (Token \$C6)
40605	9E9D	*S* Execution of "CIRCLE" Extended BASIC command (Token \$C2)

Beginning Ending
 DEC HEX DEC HEX
 ADDR ADDR ADDR ADDR
 40960 A000 49151 BFFF

 Description

 BASIC ROM[1] Cont.

41175 A0D7 *S* Displays version of BASIC ROM \$A000-\$BFFF.
 41192 A0E8 *S* Warm restart (pointers not reinitialized)
 41205 A0F6 *S* Default IRQ handler
 41229 A100 BASIC Initialization data
 41285 A146 41328 A170 Logo text
 41329 A171 *S* Get character from keyboard or cassette and put
 into REG. A. Set bit 8=0 and parity off
 41334 A176 *S* Get character from keyboard or cassette and put
 into REG. A. no modification
 41350 A186 *S* Get character from cassette and put into REG. A
 41393 A1B1 *S* Display cursor and wait for input character
 from keyboard and put character into REG. A.
 41409 A1C1 *S* Check for character at keyboard (8 bit =0 if
 character is not there; 8 bit =1 if character
 is there)
 41606 A2BF *S* Send character in REG. A. to current output
 device
 41730 A302 *S* Delay half bit time
 41872 A390 *S* Line input
 42006 A416 *S* Execution of "CLOSE" BASIC command (Token \$9A)
 42060 A44C *S* Execution of "CSAVE" BASIC command (Token \$98)
 42136 A498 *S* Execution of "LOAD" BASIC command (Token \$97)
 42302 A53E *S* Execution of "EXEC" BASIC command (Token \$A2)
 42340 A584 *S* Execution of "INKEYS" BASIC function (Token
 \$FF92)
 42304 A59A *S* Transfer block
 42446 A5CE *S* Execution of "EOF" Basic function (Token \$FF8C)
 42476 A5EC *S* Execution of "SKIPF" command (Token \$A3)
 42486 A5F6 *S* Execution of "OPEN" command (Token \$99)

Beginning Ending
 DEC HEX DEC HEX
 ADDR ADDR ADDR ADDR
 40960 A000 49151 BFFF

 Description

 BASIC ROM[1] Cont.

42537 A629 *S* Open a tape file for input
 42625 A681 *S* Find a file specified by filename \$1D2 - \$1D9
 42750 A6FE *S* Blink Corner of the screen
 42753 A701 *S* Read one record from tape with motor control
 (sync, read gap, read block)
 42763 A70B *S* Plain read block from cassette only; motor must
 be on and in bit sync; \$7C holds block type,
 \$7D holds blocksize; U and Y are preserved; if
 no errors Z is 1, A is 0, X = buffer start +
 block length; if checksum error Z is 0, A is 1,
 X points beyond bad address; if memory error Z
 is 0 and A is 2.
 42825 A749 *S* Read one byte
 42837 A755 *S* Read one bit
 42876 A77C *S* Turn on tape motor synchronize data (read
 gap/\$55's); U and Y are preserved; IRQ and IRO
 are masked
 42941 A7BD *S* Execution of "MOTOR" command (Token \$9F)
 42954 A7CA *S* Turn on tape motor
 42961 A7D1 *S* 500 millisecond delay
 42968 A7D8 *S* Turn on tape motor and write leader/gap/\$55's
 42981 A7E5 *S* Write one record to tape with motor control
 42985 A7E9 *S* Turn off tape motor
 42996 A7F4 *S* Write Block; tape should be up to speed and
 leader of \$55's already written in 1st block;
 \$7E contains the buffer address; \$7C contains
 the block type; \$7D contains number of data
 bytes in block; X= buffer address + number of
 data bytes; all registers modified
 43050 A82A *S* Write one byte
 43100 A85C Sine table
 43136 A880 *S* Execution of "SET" command (Token \$9C)
 43185 A8B1 *S* Execution of "RESET" command (Token \$9D)
 43253 A8F5 *S* Execution of "POINT" Basic function (Token
 \$FF91)

Beginning Ending
DEC HEX DEC HEX
ADDR ADDR ADDR ADDR

Description

40960 A000 49151 BFFF BASIC ROM[1] Cont.

43280 A910 *S* Execution of "CLS" command (Token \$9E)
 43304 A928 *S* Clear screen to blanks and home cursor
 43339 A943 *S* Execution of "SOUND" command (Token \$A0)
 43350 A956 *S* Generate a sound determined by pitch and sound
 43408 A990 *S* Execution of "AUDIO" command (Token \$A1)
 43426 A9A2 *S* Select joystick routine
 43462 A9C6 *S* Execution of "JOYSTK" Basic function (Token \$PRD)
 43486 A9DE *S* Read positions of joysticks
 43546 AA1A 43550 AA28 *S* ROM part of get next character routine called from \$00A8. Ref. [5] #12.
 43561 AA29 43600 AA50

Table of Pointers to subroutine entry addresses associated with Basic Function Keyword Table defined at \$B1A to \$B66. Ref. [7] Dec 1982 Anniversary Issue.

Contents For Function

43561 AA29 SBC7A SGN
 43563 AA2B SBC7E INT
 43565 AA2D SBC93 ABS
 43567 AA2F \$0112 USR
 43569 AA31 SBF1F RND
 43571 AA33 SBF78 SIN
 43573 AA35 SBF50 PERK
 43575 AA37 SB681 LEN
 43577 AA39 SB4FD STRS
 43579 AA3B SB716 VAL
 43581 AA3D SB6A0 ASC
 43583 AA3F SB68C CHR\$
 43585 AA41 SA5CE EOF
 43587 AA43 SA9C6 JOYSTK
 43589 AA45 SB6AB LEFTS
 43591 AA47 SB6C8 RIGHTS
 43593 AA49 SB6CF MIDS
 43595 AA4B SA8F5 POINT
 43597 AA4D SA564 INKEYS
 43599 AA4F SB4EE MEM

43622 AA66 43801 AB19

BASIC Command keyword - token table - ASCII Characters Ref. [7] December 1982 Anniversary Issue

CONTAINS CONVERTED TO
 STRING TOKEN
 FOR \$B0
 GO \$B1
 REM \$B2
 *

43622 AA66 43624 AA68
 43625 AA69 43626 AA6A
 43627 AA6B 43629 AA6D
 43630 AA6E

Beginning Ending
DEC HEX DEC HEX
ADDR ADDR ADDR ADDR

Description

40960 A000 49151 BFFF BASIC ROM[1] Cont.

43631 AA5F 43634 AA72 ELSE \$B4
 43635 AA73 43636 AA74 IF \$B5
 43637 AA75 43640 AA78 DATA \$B6
 43641 AA79 43645 AA7D PRINT \$B7
 43646 AA7E 43647 AA7F ON \$B8
 43648 AA80 43652 AA84 INPUT \$B9
 43653 AA85 43655 AA87 END \$BA
 43656 AA88 43659 AA8B NEXT \$BB
 43660 AA8C 43652 AA8E DIM \$BC
 43663 AA8F 43656 AA92 READ \$BD
 43667 AA93 43659 AA95 RUN \$BE
 43670 AA96 43676 AA9C RESTORE \$BF
 43677 AA9D 43682 AAA2 RETURN \$B0
 43683 AAA3 43686 AAA6 STOP \$B1
 43687 AAA7 43690 AAAA POKE \$B2
 43691 AAA8 43694 AAAE CONT \$B3
 43695 AAAF 43698 AAB2 LIST \$B4
 43699 AAB3 43703 AAB7 CLEAR \$B5
 43704 AAB8 43706 AABA NEW \$B6
 43707 AAB9 43711 AABF CLOAD \$B7
 43712 AAC0 43716 AAC4 CSAVE \$B8
 43717 AAC5 43720 AAC8 OPEN \$B9
 43721 AAC9 43725 AACD CLOSE \$BA
 43726 AACE 43730 AAD2 LIST \$BB
 43731 AAD3 43733 AAD5 SET \$BC
 43734 AAD6 43738 AADA RESET \$BD
 43739 AADB 43741 AADD CLS \$BE
 43742 AADE 43746 AAE2 MOTOR \$BF
 43747 AAE3 43751 AAE7 SOUND \$B0
 43752 AAE8 43756 AAEF AUDIO \$B1
 43757 AAE9 43760 AAF0 EXEC \$B2
 43761 AAF1 43765 AAF5 SKIPF \$B3
 43766 AAF6 43769 AAF9 TAB \$B4
 43770 AAF7 43771 AAFB TO \$B5
 43772 AAF8 43774 AAFE SUB \$B6
 43775 AAF9 43778 AB02 THEN \$B7
 43779 AB03 43781 AB05 NOT \$B8

43622 AA66 43801 AB19

BASIC Command keyword - token table - ASCII Characters Ref. [7] December 1982 Anniversary Issue

CONTAINS CONVERTED TO
 STRING TOKEN
 STEP \$A9
 OFF \$AA
 + \$AB
 - \$AC
 * \$AD
 / \$AE
 AND \$B0
 OR \$B1
 > \$B2
 = \$B3
 < \$B4

43782 AB06 43785 AB09
 43786 AB0A 43788 AB0C
 43789 AB0D
 43790 AB0E
 43791 AB0F
 43792 AB10
 43793 AB11
 43794 AB12 43896 AB14
 43797 AB15 43898 AB16
 43799 AB17
 43800 AB18
 43801 AB19

Beginning DEC ADDR	Ending HEX ADDR	Description
40960	A800 49151 BFFF	BASIC ROM[1] Cont.
43802	AB1A 43878 AB66	BASIC Function keyword - token table - ASCII Characters Ref. [7] December 1982 Anniversary Issue
43802	AB1A 43804 AB1C	CONTAINS
43805	AB1D 43807 AB1F	STRING
43808	AB20 43810 AB22	SGN SFF80
43811	AB23 43813 AB25	INT SFF81
43814	AB26 43816 AB28	ABS SFF82
43817	AB29 43819 AB2B	USR SFF83
43820	AB2C 43823 AB2F	RND SFF84
43824	AB30 43826 AB32	SIN SFF85
43827	AB33 43830 AB36	PEEK SFF86
43831	AB37 43833 AB39	LEN SFF87
43834	AB3A 43835 AB3C	VAL SFF88
43837	AB3D 43840 AB40	ASC SFF89
43841	AB41 43843 AB43	CHR\$ SFF9A
43844	AB44 43849 AB49	EOF SFF9B
43850	AB4A 43854 AB4E	JOYSTICK SFF9C
43855	AB4F 43864 AB54	LEFT\$ SFF9D
43861	AB55 43864 AB58	RIGHT\$ SFF9E
43865	AB59 43869 AB5D	WIDTH\$ SFF9F
43870	AB5E 43875 AB63	POINT SFF91
43876	AB64 43878 AB66	INKEY\$ SFF92
		MEM SFF94

43879 AB57
43881 AB59
43883 AB63
43885 AB69
43887 AB6F
43889 AB71
43891 AB73
43893 AB75
43895 AB77
43897 AB79
43899 AB7B
43901 AB7D
43903 AB7F
43905 AB81
43907 AB83
43909 AB85
43911 AB87
43913 AB89
43915 AB8B
43917 AB8D
43919 AB8F
43921 AB91
43923 AB93

Contents For Command
SAD47 FOR
SAE86 GO
SAEE3 REM
SAEE3
SAEE3 ELSE
SAP14 IF
SAEE0 DATA
SB8F7 PRINT
SAE42 ON
SAFF5 INPUT
SAE02 END
SB0F8 NEXT
SB34E DIM
SB046 READ
SAE75 RUN
SADE4 RESTORE
SAEC0 RETURN
SAE09 STOP
SB757 POKE
SAE30 CONT
SB764 LIST
SAE41 CLEAR
SAD17 NEW

Beginning DEC ADDR	Ending HEX ADDR	Description
40960	A800 49151 BFFF	BASIC ROM[1] Cont.
43925	AB95	CLOAD
43927	AB97	SA44C CSAVE
43929	AB99	SA5F6 OPEN
43931	AB9B	SA416 CLOSE
43933	AB9D	SB75E LLIST
43935	AB9F	SA8B0 SET
43937	ABA1	SA8B1 RESET
43939	ABA3	SA910 CLS
43941	ABA5	SA7BD MOTOR
43943	ABA7	SA94B SOUND
43945	ABA9	SA990 AUDIO
43947	ABAB	SA53E EXEC
43949	ABAD	SA5EC SKIPF
44064	AC20	*S* Routine to move a block of memory; \$41-\$42 holds destination top address; \$43-\$44 holds source top address; \$45-\$46 holds destination bottom address; \$47-\$48 holds source bottom address.
44102	AC46	*S* Not enough room error message routine
44147	AC73 44189 AC9D	*S* Entry to command level of BASIC. This is the idle loop. Print "OK", close files, tokenize line, then JMP \$ADCO. Ref. [5] #12
44313	AD17	*S* Execution of "NEW" BASIC command (Token \$96)
44359	AD47	*S* Execution of "FOR" BASIC command (Token \$80)
44446	AD9E 44484 ADC4	*S* Interpret loop Ref. [5] #12
44486	ADC6 44542 ADFE	*S* Execute line Ref. [5] #12
44516	ADE4	*S* Execution of "RESTORE" BASIC command (Token \$8F)
44546	AE02	*S* Execution of "END" BASIC command (Token \$9A)
44553	AE09	*S* Execution of "STOP" BASIC command (Token \$91)
44592	AE30	*S* Execution of "CONT" BASIC command (Token \$93)
44609	AE41	*S* Execution of "CLEAR" BASIC command (Token \$95)
44661	AE75	*S* Execution of "RUN" BASIC command (Token \$8E)
44678	AE86	*S* Execution of "GO" BASIC command (Token \$81)
44736	AE00	*S* Execution of "RETURN" BASIC command (Token \$90)
44768	AEE0	*S* Execution of "DATA" BASIC command (Token \$85)
44771	AEE3	*S* Execution of "REM or !" BASIC command (Token \$83)
		S Execution of "ELSE" BASIC command (Token \$84)

Beginning DEC ADDR	Ending HEX ADDR	Description
40960	A000 49151 BFFF	BASIC ROM[1] Cont.
46935	B757	*S* Execution of "POKE" BASIC command (Token \$92)
46942	B75E	*S* Execution of "LLIST" BASIC command (Token \$93)
46948	B764	*S* Execution of "LIST" BASIC command (Token \$94)
47042	B7C2 47349 88F5	Tokenize & Untokenize Routines Ref. [5] #7
47042	B7C2 47136 B820	*S* Untokenize Routine
47042	B7C2	RAM Hook from untokenize routine
47078	B7E6	Untokenize one token
47137	B821 47349 88F5	*S* Tokenize Routine
47137	B821	RAM Hook from tokenize routine
47250	B892	Tokenize one word
47351	B8F7	*S* Execution of "PRINT" BASIC command (Token \$87)
47532	B9AC	*S* Print a space
47545	B9B9	*S* Floating point subtract FPAC1=[X]-FPAC1
47554	B9C2	*S* Floating point add FPAC1=[X]+FPAC1
47818	BACA	*S* Floating point multiply FPAC1=[X]*FPAC1
48015	BB8F	*S* Floating point divide FPAC1=[X]/FPAC1
48259	BC7A	*S* Execution of "SGN" Basic function (Token \$FF80)
48275	BC93	*S* Execution of "ABS" Basic function (Token \$FF82)
48366	BCE6	*S* Execution of "INT" Basic function (Token \$FF81)
48588	BDC0	*S* Display decimal value in D
48927	BF1F	*S* Execution of "RND" Basic function (Token \$FF84)
49016	BF78	*S* Execution of "SIN" Basic function (Token \$FF85)
49138	BFF2 49151 BFFF	Interrupt and reset vectors
49138	BFF2 49139 BFF3	SWI3 Vector
49140	BFF4 49141 BFF5	SWI2 Vector
49142	BFF6 49143 BFF7	FIRQ Vector
49144	BFF8 49145 BFF9	IRQ Vector
49146	BFFA 49147 BFFB	SWI1 Vector
49148	BFFC 49149 BFFD	NMI Vector
49150	BFFE 49151 BFFF	RESET Vector

Beginning DEC ADDR	Ending HEX ADDR	Description
40960	A000 49151 BFFF	BASIC ROM[1] Cont.
44820	AF14	*S* Execution of "IF" BASIC command (Token \$85)
44866	AF42	*S* Execution of "ON" BASIC command (Token \$88)
44937	AF89	*S* Execution of "LET" Extended BASIC command (Token \$8A)
45045	AFF5	*S* Execution of "INPUT" BASIC command (Token \$89)
45126	B046	*S* Execution of "READ" BASIC command (Token \$8D)
45304	B0F8	*S* Execution of "NEXT" BASIC command (Token \$8B)
45607	B277	*S* Get operand
45902	B34E	*S* Execution of "DIM" BASIC command (Token \$8C)
46061	B3ED	*S* INTCNV[2] convert floating point number to a 16 bit 2's complement integer; if number exceeds + or - 32768 an overflow error will occur and a return to Basic.
46324	B4F4	*S* Returns an integer to BASIC from D loaded with 2's complement
46333	B4FD	*S* Execution of "STR\$" BASIC function (Token \$FF88)
46445	B56D 46605 B60C	Garbage collection routines Ref. [5] #10
46445	B56D	Allocate String in string buffer
46481	B591	Garbage Collection
46552	B5D8	Process a descriptor
46575	B5EF	Compact a string
46721	B681	*S* Execution of "LEN" BASIC function (Token \$FF87)
46732	B68C	*S* Execution of "CHR\$" BASIC function (Token \$FF8B)
46763	B6AB	*S* Execution of "LEFT\$" BASIC function (Token \$FF8E)
46764	B6AC	*S* Execution of "ASC" BASIC function (Token \$FF8A)
46792	B6C8	*S* Execution of "RIGHT\$" BASIC function (Token \$FF8F)
46799	B6CF	*S* Execution of "MID\$" BASIC function (Token \$FF90)
46870	B716	*S* Execution of "VAL" BASIC function (Token \$FF89)
46928	B750	*S* Execution of "PEEK" BASIC function (Token \$FF86)

Elite*Calc: Impressive Spreadsheet For Home, Business

By Stuart Hawkinson

*Elite*Calc* is a great spreadsheet program! This professional quality program has the performance required for serious home applications as well as small businesses. The number of features in this offering from Elite Software is impressive. It has all the functions you need to perform sophisticated "what if" business projections and prepare tabular reports, to maintain home records and to balance your checkbook.

Electronic spreadsheet programs offer such a natural application of personal computers that most owners of micros should become familiar with their use. You can set up a data worksheet with pre-programmed relationships between columns or rows, and interact with your calculations to explore alternative strategies. Since the calculations follow directly from entering or changing the data, you are spared the drudgery of manual arithmetic. In addition, once the relationships are defined, no computational errors are made.

As in most spreadsheet programs, *Elite*Calc* allows you to directly address columns and rows in your table. The columns are designated by letters and the rows by numbers,

the same convention used by the popular electronic spreadsheets like *VisiCalc* and *SuperCalc*. The program allows up to 255 columns and rows. The actual number that can be effectively used depends on the size of your computer's memory and the amount of room used by each entry.

*Elite*Calc* maximizes the amount of usable space available to you. The program is written in machine language and makes extensive calls to Color Computer Extended BASIC (and Disk BASIC if you are using the disk version). This also means that you have some very powerful numerical functions and editing features at your command.

*Elite*Calc* is designed to provide most of the features found in the "higher priced spreads." Furthermore, it has a number of unique features that are unavailable in programs like *VisiCalc*, or found only in the expensive "advanced" versions. The program's built in *help* facility gives you two pages of command summaries. This frees you from reading the manual soon after learning the basics of operation. In addition to automatically advancing to the next cell in the sheet after each entry, the program also provides extensive editing capabilities. This is unique to *Elite*Calc*. The familiar Extended BASIC line editor is used to edit formulas and titles, making the system quick and easy to master. You use the same editing commands as in BASIC!

The full range of functions available in Extended BASIC are provided for establishing relationships among the data. You can use the common arithmetic operations of +, -, * and / as well as exponentiation and square root. The trigonometric functions and logarithms are also available. A very welcome feature of *Elite*Calc* is the incorporation of the IF—THEN—ELSE statement of BASIC, along with the full range of conditional expressions. This is necessary for doing

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This is the **UPLOAD** side of **DLOAD** and **DLOADM** in Extended Color Basic. Send a basic or machine program to another ECB Color Computer. Programs can be passed directly or by phone if both computers are hooked to modems (not supplied). Uploaded program arrives at the receiving end ready to save, run, or execute. Patch to correct the flaw in **DLOADM** is supplied in public domain.

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Program produces a sorted list of variables and line numbers used in your basic program. Following each variable or line number will be a listing of the numbers of the basic lines which contain the variable or line number. **RUN**ning the basic program is not required. Bonus! Global search of basic program for a variable, a text string, or a basic keyword.

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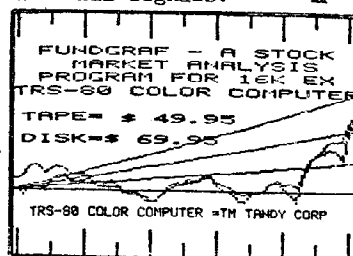
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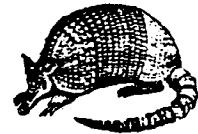
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many types of projections and decision making calculations, expanding the types of problems you can solve. Most simplified spreadsheets lack this capability.

Besides the normal arithmetic functions, *Elite*Calc* also provides some functions which are unique to spreadsheet programs. These include COUNT, SUM and AVERAGE for doing table calculations. You can also find MIN and MAX values or LOOKUP a value from any column or row. The only missing functions are those supplied with more expensive spreadsheets, specialized financial calculations like NPV (net present value) and IRR (internal rate of return). Also, you cannot code a value as NA (not available) in *Elite*Calc*, useful if your data are incomplete.

*Elite*Calc* allows you to enter an expression in place of a value. This means that you can practically dispose of your pocket calculator. If you need to enter the monthly principal on a three year, ten thousand dollar loan, just enter +10000/36. *Elite*Calc* will supply the correct result. Another unique feature of *Elite*Calc* provides a separate page of user-defined constants. You can keep *pi* or other necessary constants in a separate table, freeing up space in the spreadsheet for entries which are specific to your application.

The most remarkable feature of *Elite*Calc* is its sort function. Sort by either row or column, and the related rows or columns are rearranged accordingly. This feature is an expensive (\$100-\$250) add-on to many of the more popular spreadsheets. The sort will also work with text entries, allowing you to alphabetize a report, or other text items. This feature, in conjunction with *Elite*Calc's* extensive formatting functions, easily prints reports which would normally require a sophisticated data base program.

*Elite*Calc* in the disk version is also well integrated into the CoCo's disk operating system. You can call for a directory listing before loading or writing a file. This feature is useful to recall the filename you need. Another friendly feature of *Elite*Calc* is the ability to switch from numeric to text mode for entering labels and headings. Calculations can be suspended while entering data to speed up the operations significantly. If more programs included these features, our frustrations with computers would soon disappear.

The program I reviewed is supplied on disk and is easily backed up for the user's protection. To run the program simply type RUN"CALC." The program automatically adjusts itself to your CoCo's memory size. The manual supplied with the program describes all of its functions in detail. (All functions except the conditional expressions, that is. What could be more important than IF statements for doing "what if" calculations? I only found out about them through reading the accompanying advertising. Their description was missing from the manual.) Included with the disk and manual are three applications with which to practice: a check ledger, a loan amortization schedule, and a sales report. The manual does not do much to teach you about spreadsheets in general. I recommend that you either obtain one of the many good books on *VisiCalc* or *SuperCalc*, or work with a friend's spreadsheet program to explore tutorial material. It will then be easy to adapt to *Elite*Calc's* slightly different command structure.

My overall impression of *Elite*Calc* is very favorable: easily one of the best spreadsheets available for the Color Computer. It provides all the features that are required to do really serious work. *Elite*Calc* is a well designed piece of personal software. At \$44.95 it's a steal.

(Elite Software, P.O. Box 11224, Pittsburgh, PA 15238,
(412) 795-8492, 16K, 32K or 64K Color Computer disk or
tape, \$44.95)

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To really enjoy *Nerble Force*, you need to psych yourself into imagining that you're one of the last human survivors on the planet Nerble (I think it's one of those tiny stars in the Milky Way, but I wouldn't bet on it). All of your comrades are on the surface of the planet, while you are in the only remaining friendly spaceship. Your goal is to defend the humans on the planet against the *Nerble Force* (they've probably learned what happened to the American Indians) who are out to get you and your friends.

The game is quite similar to one called Planet Raiders by Aardvark, except that a distinguishing feature, the bottom third of the screen, is a long-range scanner that allows you to detect the enemy beyond the screen perimeters. My seven-year-old son and I found the device to be quite intriguing useful in our continuing episodes against the Nerbloids.

There actually are six types of Nerbloids, with various kinds of responses that keep you confused and panicky the first few runs through the game. The Grabbers attempt to kidnap your friends. If a Grabber is successful in getting to the top of the screen with his catch, the Grabber mutates into a Wiggler. Both Grabbers and Wigglers are worth 150 points. If you shoot a Grabber while he is carrying a man,

you get 500 points—and another 500 if you catch your friend and return him to the ground safely.

Then there are the Miners, who move up and down leaving explosive mines, and are worth 500 additional points. The Groupers, worth 150 points, try to ram your ship from the side when it is nearby. The Groupers are formed from Space Eggs (worth 1,000 points) when shot.

The Chasers are the ones who will eventually get you because they follow your ship at all times. They're the hardest to knock down and you only receive 200 points when you are successful.

There are eight waves per level, which end when you have knocked out eight Grabbers or Wigglers. You are awarded 100 points for each surviving man after each wave.

If you get too excited during the course of the game, you can press the letter "T" to freeze the action (it works, too, if you merely need to answer the phone). Pressing "U" allows you to resume play.

I found the graphics to be the redeeming feature of the game, and the use of the long-range scanning device was fascinating (you could, and we did, manage to play using only the radar). It's a game for active youngsters really, and they will play for hours—long after you have tired of it and are anxious to try out some of your utilities.

(Computerware, P.O. Box 668, Encinitas, CA 92024, \$24.95 tape, \$29.95 disk)

—Charles Springer

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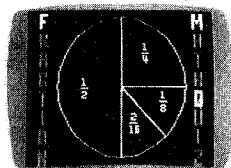


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Get More From Your Modem With *UPLOAD*

When CompuServe added their version of World Book Encyclopedia to their services, I finally had the excuse needed to convince my beloved spouse, and recent computer widow, that a modem was something we just had to have. After all, it was "for the children's education." She fell for it.

After a month of paging around CompuServe and after receiving my first month's bill and Ma Bell's charges (I live in the boonies and have to access the local number via long distance) my time on line was severely curtailed. Just when I was questioning the utility of a modem for my applications, along came *UPLOAD*.

UPLOAD is a program, actually a series of three programs, which provide the Extended Color Computer the ability to transfer programs to another 80C.

Initially I was confused about the operation of *UPLOAD*, but I had the opportunity to meet the author, James Hornsby, at *Rainbowfest* and he walked me through the program. Drifting away from the review, it seems that all the principles of Color Computerdom were at *Rainbowfest*. The trek from California was well worth it. The points which caused my confusion will be clarified in a revised instruction manual.

UPLOAD does not require a terminal program to operate. Your CoCo and a modem (300 or 1200 bps) can transfer

BASIC or machine language programs to another without editing. The programs arrive at the receiving end ready to run. *UPLOAD* is actually a group of three programs: *UPLOAD*; *DLOAD-MPC*; and *UPLOAD-D*.

Here's how they work. For a program written in BASIC, the sender loads *UPLOAD* and *EXECutes* the program. *UPLOAD* then asks the sender to type in the name of the programs to be transferred. After entering this name and positioning the tape with the program, *UPLOAD* will search the tape until it finds the desired program. The program is then loaded into the computer ready to be transmitted.

The receiver then types *DLOAD* "Program name," and a 0 if a 300 Baud modem is being used. The program transfer will start and continue to completion. Completion is signaled by an "OK" and control is returned to BASIC at both ends. The receiver can then *SAVE*, *LIST*, *PRINT* or *RUN* the program.

During transfer *UPLOAD* sends and monitors the transmission. It sends data in blocks of 128 characters and checks for errors. If an error occurs that block will be resent. Transmission will abort after a block fails self-check five times, a situation I have not encountered.

To send a machine language program, the receiver must first load the second program, *DLOAD-MPC*, into his 80C. If the receiver does not have the program, no problem—it's a BASIC program and can be sent using the previous method, and then have the receiving computer *LOAD* and *RUN* it.

The transfer is almost identical to transferring a BASIC program, except for adding *M* to the *DLOAD* code. During transfer, the three pertinent locations of the machine language program are displayed on the sending screen. This info enables the receiver to *CSAVEM* the program after it is received.

BASIC programs can also be sent using *DLOAD-MPC* at the receiving end. The BASIC program is then "tokenized" and transmission time is cut about 20 percent. Using this method, the BASIC program is actually sent as a machine language program.

The third program, *UPLOAD-D*, is the disk version of *UPLOAD*. *UPLOAD* only transfers programs saved on tape, whereas *UPLOAD-D* only transfers programs saved on disk. All three programs are supplied on cassette tape.

Jim stated that *UPLOAD* is "not designed as a method to transfer protected programs." It may or may not transfer programs which have an auto run machine language loader added. Transfer time when using a 300 Baud modem is at least five times the loading time of a cassette.

The program is user friendly and self-prompting. Errors are self-correcting and unintentional input errors do not result in a program dump.

ML 'USR Software has placed the BASIC language receiving program *DLOAD-MPC* in the public domain for use by anyone. The sending programs *UPLOAD* and *UPLOAD-D* are copyrighted and transferring it to another is illegal.

The programs are so good and easy to use, they may become a "standard" in inter-Color Computer transfer. If you have a 16K minimum 80C, a modem and know someone who has the same, get this program.

(ML 'USR Software, 115 Rising Sun, Ft. Mitchell, KY 41017, \$16.95)

—Bruce C. Rothermel

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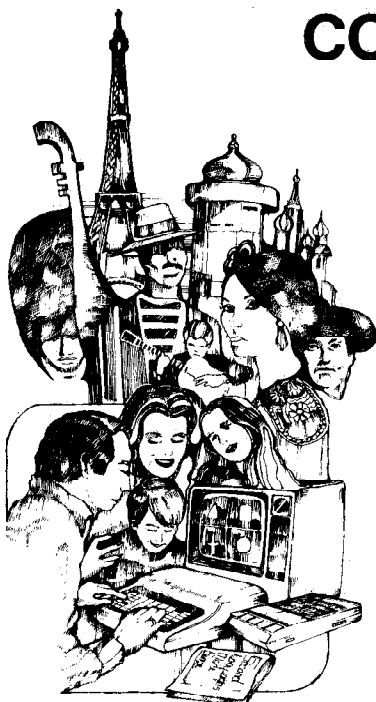
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Blackjack Royale Beats Them At Their Own Game

By Thomas C. Roginski, Ph.D.

I really jumped at the chance to review this program! In addition to being an environmental chemist, I am the co-author of a major book on Blackjack, *Playing Blackjack in Atlantic City* and have given lectures on gambling on local television and at civic groups. *Blackjack Royale* (which I will call *BR* to save space below) is just the type of program that the Color Computer needs. While other programs for the CoCo may play Blackjack, this is the only program which provides a training aid for the proper way to win at the game.

First, I think it might be of value to explain certain features of the game of Blackjack which make it different from other casino games. All of us who have been to the large casinos at Las Vegas and Atlantic City can marvel at gaudy buildings such as the Roman Empire had never seen. These buildings were not built by winners but by losers. They are there to separate you from your money. Inside you lose all sense of time and value. Even the rest rooms are hard to find for all the flashing machines.

The only game which gives the player an even (and actually the expert player a better than even) play is Blackjack. While I was in graduate school in the mid '60s, a math

professor named Thorp published the first book on how to beat the game. "Card counting" was born. Card counting is a method of keeping track of the types of cards which have been played and tells the player how to bet and play each hand to obtain the maximum yield on each hand. Since the time of Thorp many advances have been made to aid the casino and the player. Thorp's original method would not win in a modern casino.

During the 20 years since it has been known that the game could be beat, the number of total gambling spots in Nevada has doubled but the number of Blackjack spots has increased by a factor of 10. Remember that these were not built by winners but by losers! The paradox is resolved when you realize that people read that the game CAN be beat so they think that THEY can beat it. All major casino Blackjack can be beaten today. When people ask me how to do it they want a sure fire and quick (especially quick) way of doing it. When they hear that they must spend 10 to 20 hours to get even with the house and 100+ hours to get 1½ percent advantage, many lose interest. If there were an easy and quick method of beating the house all of the time and I knew about it, I wouldn't tell you and neither would anyone else.

This brings us back to the program *Blackjack Royale*. This game is designed for 32K Extended BASIC and no joysticks. If I want to compare this tape with others I must go to programs for other computers because no other such program exists for the CoCo. Jerry Patterson has an excellent program for the Model III which costs somewhat more and is limited by less graphics available on that machine. Jerry's program provides the ability for several players to play at the same time while *BR* does not. Otherwise, the two programs are about equal (at least in the variation that I saw). Stanford Wong has a program for the IBM PC which I have not seen, but which does cost about \$225 more than the price for the CoCo program reviewed here.

The graphics for *BR* are excellent. My wife and kids were thrilled by the neat high-res cards and the funny faces on the face cards. Because of the need to save space even in a 32K machine, *BR* uses diamonds as the only card suit. This is okay because the suits mean nothing in Blackjack. It is important to show cards that look like cards to get the experience with rapid card recognition. *BR* does that well. The diamonds are shown as black suits in PMODE4 by this program. It might have been better to use clubs or spades or use the "false color" red in PMODE4.

The nicest feature of *BR* is the possibility of setting rules for most of the major casinos and any counting system you wish to try. I tried several: simple, intermediate, and advanced systems. This program keeps a perfect count (except as noted below in the bugs). My system, like the system by Wong, uses halves of points for certain cards (2 and 7 = ½). *BR* kept up with it. The count is not shown to you unless you call for it on the text screen. The text screen also shows the numbers of each card that has been dealt. This is a count which not even the best of counters can do! It is good that the count is not shown on the main screen because you must learn to count without this help at the tables. Use this feature less and less as you get experience. This program is better practice than endless dealing of cards because of this check feature. After you get enough experience to win, you will find the deal a little slow. The real game is faster, especially in Atlantic City.

The documentation of *BR* is acceptable in format (printer VII printout I believe). The content is excellent, however, and explains all of the nice features clearly. I disagree with

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ARIZIN
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the author on a few technical points but nothing major. For the multi-deck games, the computer will shuffle much too soon. I think that is what line 205 does. The default game given in the program is listed as a typical casino game in the write up. This game is very uncommon today. The one thing that is lacking is a "Basic Strategy." A Basic Strategy is that method of play of the cards and is modified by the count. You cannot play correct Blackjack without this. The author of *BR* lists four books to try for this, but Thorp's book is obsolete. To this list I would add Wong's "Professional Blackjack." Modesty forbids me from mentioning "Playing Blackjack in Atlantic City" by Chambliss and Roginski. The author of *BR* could not publish a basic strategy, because these are copyrighted. If there is enough interest, *Rainbow* might be talked into publishing one which I could donate.

This software has an amusing protection method. This was a little annoying until solved because of the bugs which are still present.

Well, nothing is perfect. A few bugs still are present in this otherwise superb program. Most of these are minor; one is serious. My description of these is rather technical if you do not know the rules of casino Blackjack. Read one of the books mentioned for the rules. The surrender option used at a few casinos is not played correctly by this program. A new dealer's hand should be dealt as well as a new players hand. When you try to resplit pairs (an option in Nevada but not in Atlantic City) the program cheats so don't do it. To input your bet the computer uses the VAL expression of the INKEY\$. If you type a letter instead of a number, the program takes it as a zero and may goof on your bet. If you try to double after splitting pairs (a common rule in Atlantic City), the program will sometimes goof and take one of your bets.

There is one major flaw that must (and I am sure will) be changed. When you run through several hands and the program shuffles, the variable DPV (deck point value) is not reset in some paths through the program. This means that the point count given on the text screen is absolutely wrong. One way to reset this is to bet all of your money on the new hand, lose, and then reinput the parameters for a new game. This is very time wasting. Do not let this problem stop you from the purchase of this fine program. I am sure that the author will make a change in future versions of the program.

If you want to have fun and make money at the house's expense, play Blackjack when you go to a casino. This fine program and a good Blackjack book are a *must* for the CoCo Blackjack player.

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Software Review

Electronic Calligrapher: Simple Yet Elegant

One of the more interesting but yet vastly under-used capabilities of most printers is in the use of dot graphics. Using this mode of printing, it should theoretically be possible to print anything desired. So far, the only use of this mode that I have seen is in some graphic screen print programs. This might be due to the fact that the printer manuals that I have seen discuss the printing of dot graphics in a manner that is confusing at best. Wouldn't it be nice if someone came up with another use for dot graphic printing?

Electronic Calligrapher is a disk-based utility program that will turn your otherwise dull printer into a fancy, old fashioned scribe. It is written in BASIC and is designed for use with the Radio Shack Line Printers VII and VIII, or equivalent. With it, you can print fancy lettering in either the *Old English* or *Chancery Cursive* fonts. The letters printed are approximately three to four times larger than those printed in the normal mode of operation, and you can print up to 26 characters (including spaces) per line. The text printed is automatically centered on the line unless you tell the program not to center it. Although special characters are not supported, the entire alphabet, including both upper and lower case as well as numerals can be printed.

Using *Electronic Calligrapher* is about as easy and straightforward as you can get. The first thing that you have to do after you *RUN* the program is to enter the text that you want to be printed. The next thing you do is decide which of the two fonts you want your text to be printed in. Pretty easy so far, right? Once you have finished with these rigorous (?) preliminaries, about all you have to do is to make sure that your printer is turned on and that it has some paper in it. This is my kind of program (it does all the work).

Electronic Calligrapher is about to do its thing. Your disk drive starts up, and begins to spin, whirr, and click like mad, as the program reads the necessary data from disk, in order to properly format the letters. Printing is accomplished in three to five passes, depending on the letters being printed. After the first pass, the only thing that you can see is the very tops of the letters. As each pass is completed, more and more of the letters become evident as they begin to take form. When the printing is completed, you can either start all over again, or end the program.

Electronic Calligrapher is a nifty utility program whose time has come. The quality and detail of the printing is excellent, and the program performs impeccably. The documentation, which is skimpy at best, nonetheless explains everything you need to know, and in fact, is hardly necessary. If you would like to jazz up your printing, you should buy this program. Would anyone care to try to come up with a version in true script?

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—Gerry Schechter

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Disk Money Minder: A Home Budget Ledger

Disk Money Minder is a home budget program that allows you to keep a family budget ledger. It can also be used for a variety of financial record keeping chores. You need a 32K Color Computer with Radio Shack's disk system. The program represents a substantial enhancement of Harmonyc's cassette-based program *Money Minder II*.

The program is designed to divide your checkbook balance into as many as 56 different categories. This allows you to track expenses in each category, while keeping current balances. The program will display or print the balances in each category. Once you have established a model system, you can enter checks, with their numbers, and charge them against the various budget categories.

A whole session with *Disk Money Minder* can be recorded to disk. Errors in entries (ie, the amount of a check) can be corrected by re-entering the amounts charged to each category. The names of categories can be edited during any session. However, the labels of the entries (ie, the check numbers) cannot be edited. Consequently, you can wind up with entries without any associated dollar amounts.

The program will search through the disk files to find a particular series of check entries. (The program also searches through tape files created by *Money Minder II*, so you won't have to re-enter your data if you are upgrading from

tape to disk.) It then sums the checks' contributions to each category and prints a summary. Thus, you can make permanent records of your budgeting progress. However, an option to print a list of checks found is not available.

The program is distributed on an unprotected disk, and you are encouraged to make backup copies. I like that aspect, and think we should all respect the manufacturer's willingness to provide unprotected, copyrighted software. The program comes with a 20-page manual which includes a complete program listing. The first three chapters describe the program's capabilities and general use. The fourth chapter describes all the commands in detail. The final chapter gives a complete demonstration of the program with three sample sessions. The directions carefully lead you through each command and procedure as you practice a sample budget. The manual also includes a glossary of terms and an index to all the topics covered.

For certain tasks, I found the program difficult to use. I expected to be able to edit the budget until I could see the whole picture. With *Disk Money Minder*, this is hard to accomplish. The program doesn't allow much flexibility in distributing deposits into the various categories, and it doesn't keep a running total of funds left to distribute. Other problems include the lack of a decimal point in dollar amounts (so they are really "cent amounts") and it has no feature to clear entries, deposits or the whole working data set, to start a new trial budget. When you try to reread a data file, the program adds to the category totals already in memory. This is fine if you are summing monthly deposits, but doesn't help if you are trying to get some sense of budget adjustments necessary.

I also had problems with the file handling capabilities of the program. Admittedly, Disk BASIC for the Color Computer doesn't give you much help. But I would like to see at least a list of files to be read. If you mistype the name of a file, the program creates a new empty file by that name and doesn't tell you that the file wasn't found. This quirk is due to the use of random access files, which are not necessary for this application.

The design of the printed summaries could also be improved. The number of entries in a category should be included, not just the balance. This avoids getting a listing of unlabeled categories with zero balances. The method for searching the check records is likewise inadequate. Only a series of check numbers is used for the search. One often needs to search by date, or for a specific party on the check. A little more work is needed in this part of the program.

My overall impression is that *Disk Money Minder* is a pretty fair home budget program, provided it meets your specific idea of the budgeting process. However, it isn't adaptable to many unanticipated needs. Balancing a checkbook is easier with a program designed specifically for that purpose. Setting up a budget and exploring various alternatives is easier with a spreadsheet program which gives you complete flexibility in experimenting with ways to spend your money.


(Harmonyc, P.O. Box 1573, Salt Lake City, Utah 84110,
32K disk, \$19.95)

—Stuart Hawkinson

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

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Direct File Transfer Excellent Transmission Utility

If you've just written a BASIC or machine language program or have a data file and want to get it over to your friend's house as quickly as possible, do you worry about snow storms, the fragile state of your cassette in the mail or if a certain employee of the post office might eat your data for lunch? Well, here is a "Pony Express" system for your data transmission that can't be beat.

The name of this workhorse is *Direct File Transfer (DFT)*. It is a machine language utility program which will handle the complete uploading and downloading of any type of data or program that you could possibly have including BASIC, machine language, ASCII, data text files, etc., to another CoCo running *DFT*. What makes this program so excellent is that you do not have to set up any parameters or define the length of your file or specify what kind of data you are going to send. *DFT* will figure it all out for you. With other programs that do this sort of thing, you must know the load, end and exec address of your ML files. That is not the case here. *DFT* will take care of everything. This utility is divided into a few different parts which I will explain separately.

The heart of *DFT* lies in the ability to send *any* type of program over the phone lines with the use of a modem.


Think about this: an ASCII file from a word processor, a game you wrote, a mailing list, etc. What if you have to rush out that new inventory sheet and the closest friend who has a printer lives 25 miles away? Do you cry? Do you scream? Do you kick your dog? No—with *DFT* you can send the file over the phone to a friend who has the printer and he can do it! No wait. No lines. No four days later...no Excedrin headache.

When you load the program from disk all parameters are set up for the most popular configurations (300 Baud and half duplex). Before you can send your data you must choose option 5 and load into your buffer the data that you wish to send from tape or disk. You can send a file straight off disk without loading it into your buffer first but it is not recommended. Once loaded, the bottom of your screen will state that this was done successfully and what type of program it is. If you have a bad file you will get an I/O error. If you so choose you can change from half duplex to full duplex for special needs on other systems. When you have the desired material in your buffer you can go into the transmission mode and begin.

This is the procedure for sending (or receiving) a file. Once you place your call in the usual fashion and when you are both set up it must be determined who will place their modem in "originate" and who in "answer." (This is the most difficult part in using *DFT*!) When this is done and both parties have turned on their modems you can hang up the phone and select the send or receive option. *DFT* will take it from here. The program will first wait for an "inquiry" from the sender and an "acknowledgement" from the receiver before proceeding. After this you are in "sync" and your data begins its journey over the phone lines in blocks (batches of 255 bytes). In the upper right hand portion of your screen there is a black cursor signaling each block as it is being sent. Also the program will inform you "sending block 6...receiving block 14..." on the screen. Now listen to this: If there is some noise on the line, or your sister picks up the phone to order a pizza, *DFT* will resend the block and so advise you visually! This means that there can be no errors in your transmission because the program monitors itself to see that each block of data that is received is the same as the original one that is sent from the opposite end! No errors ever! You can even be out of the room and *DFT* will "signal" you with an audible beep when the file transmission is finished! This is a nice touch, seeing that a long file can take 10 or more minutes to complete. So, you can be elsewhere during transmission and the program makes sure all is okay. After the complete file has been sent, each party will be advised of a "normal transmission" and it will "page" you back. You can then save the received data to tape or disk with option 6 as many times as you like. You can load your file from tape or disk likewise.

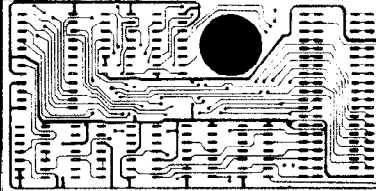
Another feature of *DFT* is the "chat mode" similar to that found on the CB section of Compuserve. With this you can type back and forth to another computer. The chat mode also allows the user to use the program as a communications terminal, wherein you can communicate with bulletin boards such as The Electronic Rainbow. I, however, did not try this function, since I use a smart terminal package for this.

File transmission to another TRS-80 such as the model I or model III can also be accomplished because *DFT* does internal conversions of the BASIC "tokens." However *please* do not misunderstand this to mean that you can download a file into your buffer from another computer and




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then run it. Yes, you can receive the data from, let's say a model III, but it is not guaranteed to run. Screen locations are different, graphics, etc. If you receive a machine language file from another computer it is guaranteed NOT to run but to lock up your computer; however *DFT* will handle the transmission aspect of it.

Other options include the ability to inspect your disk directory and see what is on any given disk and how many free granules you have. Option 8 will end *DFT* and return to BASIC. Another feature is the "bell" which you can sound by pressing the clear key. This is useful to get the attention of the party of the opposite end. Also, you will hear the bell when a file is finished transmitting. If for some reason you wish to abort the transmission, you can do so by pressing the break key and each party will be so advised by a message on the screen stating who requested the abort.

As an added bonus there is another program on the disk that is not included with the tape version. It's called "Fconv" or file convert. This is another utility with which you can convert a binary file to ASCII/Hex format and vice versa. It also allows you to compute the checksum of a specific file.

DFT is truly an outstanding communications package that will handle all of your file transmission needs. Rarely have I come across such a complete piece of work. The program is very user friendly and you are always informed of everything that is happening with screen prompts. If you never sent a file over the phone lines before, this utility will make you feel comfortable and in charge while at the same time handling all the complex functions that a program like this entails. The documentation is an informative 15 half-pages with a nice outer cover. The disk is not protected which is important for backup purposes. And the price of this utility makes it one of the best buys on the software market. With *DFT* you can't go wrong. This program also comes in a tape version which is identical to this except for the disk commands.

The only minor problem I came across was when I loaded a BASIC file into my buffer. The manual states that because *DFT* is made to be compatible with all TRS-80s, it must do internal conversions which may sometimes cause the computer to seem "locked-up." This is not a problem, but if you plan to load two consecutive files from tape the motor may not shut off in time and run into the second file. Anyway, you can avoid this by doing an "audio on" and listening for the pause manually, but the audio on will defeat the tone feature.

(Computer Shack, 1691 Eason, Pontiac, MI 48054, \$24.95 tape, \$29.95 disk)

—Steve Schechter

Software Review

Space Shuttle Simulator Requires Skill, Patience

Have you flown your computer lately? Well, you ought to try this simulator. Tom Mix has produced another fine software package called *Space Shuttle*. The graphics are quite excellent.

The program requires 32K Extended Color BASIC and is supplied on a cassette. Therein lies my only complaint. The program will not work at all if your disk drives are attached. For those of you who do not own disk drives, there is no problem. But it would be convenient to have a disk based version of the software.

The package includes a 10 page instruction manual. My first impulse, with any game, is to ignore the instructions and just try the game. Forget that! The Shuttle mission is quite complex. There is little chance of completing the maneuvers without preflight education.

The mission requires you to successfully pilot the Shuttle into orbit, park next to a malfunctioning satellite, retrieve the satellite with the robot arm, perform re-entry and landing. Performance scores are accumulated for each phase of the maneuvers. Believe me, it's not easy, even for me, an experienced commercial and instrument pilot with a flight instructor certificate. On the other hand, the neighbor kid next door didn't seem to have any more trouble than I did. Are these video games preparing our kids for careers in aviation? Maybe!

The program features a full function instrument panel and a simulated "look" out the cockpit windows. I thought the final approach to landing simulation was particularly impressive.

Interestingly, this program is *not* pure machine language. It is written in Extended Color BASIC with machine language subroutines to take care of some of the simulation. The displays are nonetheless, quite realistic.

This program was very popular at *Rainbowfest*. In fact, the Tom Mix booth was so overcrowded that I never did have a chance to meet the man. Maybe next time, Tom.

One final note: this is not your typical arcade style "shoot 'em up" game. If you are looking for an attack from Proxima Centauri, keep looking. This simulation requires considerable skill and patience.

(Tom Mix Software, 3424 College N.E., Grade Rapids, MI 49505, \$28.95 tape)

—Dr. Laurence D. Preble

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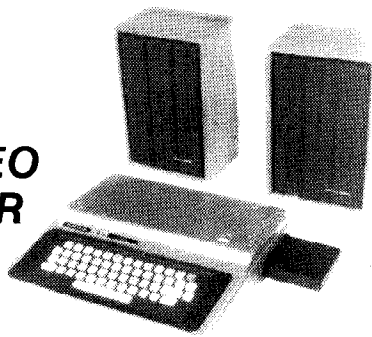
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The **STEREO COMPOSER** produces music in stereo. Of the 4 voices produced, 2 are directed to each channel. This ability alone increases the realism of the music. You can even move the voices between speakers as the music plays.

The **STEREO COMPOSER** comes assembled, tested, burned in, with all the software and hardware to allow you to immediately start enjoying your music. A complete manual and examples are provided to give you everything you need.

The **STEREO COMPOSER** is completely compatible with the Radio Shack disk system. Any expansion unit will allow you to have both a disk and the **STEREO COMPOSER** operating.

Requires Extended BASIC and Minimum of 16K

STEREO COMPOSER (Hardware, Cassette and Disk)\$89.95



THE COMPOSER



The **COMPOSER** is a 4 voice music compiler which easily allows one to develop high quality music. Each voice is programmed separately. In addition, each voice uses its own waveshape table which means a unique sound for each of the 4 voices.

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The **COMPOSER** allows the music to be played at any tempo and in any key. And believe it or not, the tempo and key can be modified as the music plays. This gives the user tremendous versatility in developing music. Key modification also allows the user to move the music up or down one or more octaves.

The **COMPOSER** displays a constantly changing random kaleidoscope pattern as the music plays. In addition, the number of the note being played is displayed which aids one in finding sour notes during music development. Both of these displays can be disabled to allow any screen to be displayed while the music is playing. In this way, one can show the words to a song or display a picture as the music plays.

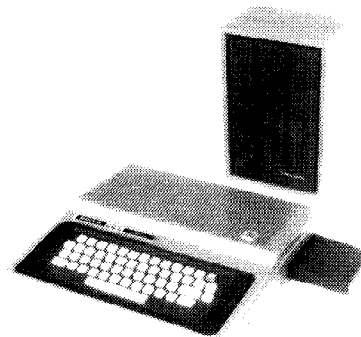
The **COMPOSER** develops a machine language position independent subroutine that can be Saved, Loaded, and Executed independent of all other software. This means that you can share your music with friends. In fact, you can write your own BASIC programs that call and play the music. Software vendors may include the music in their own product.

The **COMPOSER** is menu driven making it extremely easy and friendly to use and operate. A thick operating manual is provided as well as 20 minutes of music. Many examples are given to aid the user in getting started. All you need is provided, no additional hardware is necessary. Don't let the price fool you, the **COMPOSER** has got to be heard to be appreciated. For reviews see June '83 *RAINBOW*, p. 192 and May '83 *Color Computer News*, p. 74.

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THE VOICE



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CORRECTIONS

The "64K Modification For 'D' Board" article by B. H. Alsop, which appeared in our March issue, requires one correction. In the section headed "Problems," the reader is directed to cut pin 4. The correct pin to be cut is pin 5.

* * *

In his commentary "If It's Not The 'F' Board, How About The '285'?" (June 1983), Mike Reilly forgot to mention that capacitor C64 should be removed as well as the seven other capacitors named in the article in order to convert a "285" board to 64K. If your computer already has 32K, these capacitors should already have been removed by the factory.

* * *

Reaffirmation, rather than correction. While many readers have reported various problems with William G. Franklin's "Flying The Sopwith CoCo" (June 1983), the listing is correct as it appears in the magazine. Most often, an OD error in line 170 has been reported. If this seems to be your problem, recheck your *DATA* statements in lines 7000, 7010 and 7020. Make sure commas aren't semicolons, etc.

Those with disks may encounter a problem, however, in that Bill has used "AS" as a variable in lines 390, 400, 405, 410, 1190, 1510 and 8030. *AS* is a reserved word in Disk BASIC. Just rename the *AS* variable to something else, say *VQ*.

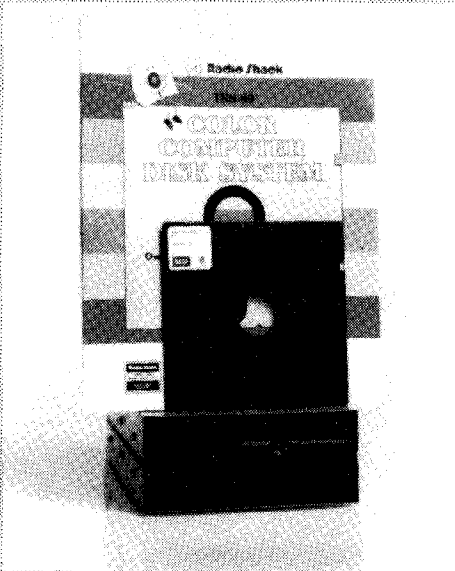
* * *

In his article, "Using *VARPTR*, BASIC's Hidden Command" (June 1983), Ron Mummaw neglected to mention that immediately after typing in the first BASIC program (the one with *DATA* statements) you should: 1) *SAVE* the program, 2) *RUN* it, and 3) press the *BREAK* key to get out of it. It is *only after* running the program that the *AS* will change from a string of slashes to the tokenized command words. *SAVE* it *before* you *RUN* it.

Due to an error at *Rainbow*, the assembly language source code referred to in the article was omitted. That listing follows:

```

0001 0600 10E061B      LDY #TABLE      GET Y ADDR
0002 0604 8E04CE      LDX #4CE        SCREEN LOC
0003 0607 A6A0        START LDA ,Y+      GET CHR
0004 0609 8101        CMPA #01        IS IT A 1
0005 060B 2605        BNE CK2         GO IF NOT 1
0006 060D 30881C      LEAX 20,X       DO NEXT ROW
0007 0610 20F5        BRA START       GOTO START
0008 0612 8111        CK2  CMPA #11     IS IT #11
0009 0614 2601        BNE PRINT       IF NOT THEN
0010 0616 39          RTS             GOTO BASIC
0011 0617 A700        PRINT STA ,X+    PUT CHR ON SCN
0012 0619 20EC        BRA START       GOTO START
0013 061B FFFFFFFF    TABLE FCB $FF,$FF,$FF,$FF
0014 061F 01FF0800    FCB $01,$FF,$00,$00
0015 0623 FF01FF00    FCB $FF,$01,$FF,$00
0016 0627 00FF01FF    FCB $00,$FF,$01,$FF
0017 062B FFFFFFF1    FCB $FF,$FF,$FF,$11
    
```



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Alter Your Programs With

Revfield

By Ray Gauvreau

You've been trying to solve the *Adventure Mystery of the Haunted Laundromat* for hours. Your eyes cry for some rest but the bright green screen shows no mercy. Each time you try to move you're told "you can't go that way." By the time you figure out what to do you've forgotten just where you were, and wouldn't you know, that information has been scrolled off the top of the video screen! Finally, as a last resort, you decide to list the @#%\$&!*! program to have a look at the *DATA* statements for clues. You boldly enter a *LIST* command. The program whizzes past at the speed of light while your groping fingers try in vain to reach the shift and @ keys at the same time.

Well, I've had these problems, and a little while ago I decided to do something about them. Out came my new Radio Shack *EDTASM+* and my 6809 assembly language programming book and a few short months later *Revfield* was completed. This machine language (ML) utility routine is designed to do the following:

- 1) Reverse video in your BASIC programs (that's green characters on a dark background)
- 2) Control the printing rate during the *RUNning* and *LISTing* of programs
- 3) Set up a "video window" (this creates a protected area on the alpha numeric screen that will not be affected when a program scrolls)

There are three program listings. Listing 1 is a BASIC loader program which reads the machine language instructions from the *DATA* statements and then *POKEs* these numbers into high memory. Listing 2 is an object file which is to be used by those with Editor Assemblers. Both create

(For the past 17 years, Ray has been involved in the performing and visual arts as a professional musician and a studio potter. Three years ago he caught the computer bug and is now taking a computer engineering course at Sault College.)

machine language routines, but in very different ways. The third program listing is a short BASIC demonstration which allows you to see what this ML routine can do.

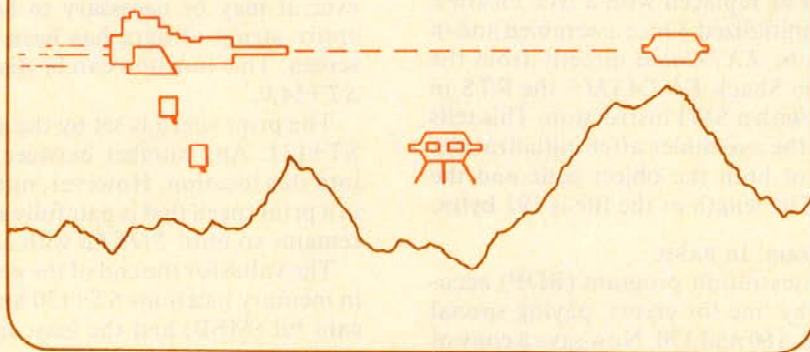
"Revfield . . . is designed to reverse video in your BASIC programs, . . . control the printing rate during the running and listing of programs, (and) set up a 'video window'."

The variable "ST" always refers to the start memory location of the ML routine and is typically 16160 for a 16K and 32544 for a 32K computer. All numbers described in this article are in decimal.

Creating The ML Routine with BASIC

The program of Listing 1, which is written in BASIC, creates the ML routine when it is *RUN*. It does this by reading the ML code stored in the *DATA* statements one at a time and then storing these instructions in high memory. *ENTER* this listing into your computer exactly as it appears. When finished, check what you now have in memory line by line, paying special attention to lines 180 to 370. These *DATA* statements contain the ML program and they must be exact if the routine is to operate properly. These decimal numbers are actually a program which is very unlike the BASIC programs you are probably used to. In order for it to work properly, each digit must be correct. Please spend a little time checking your work now. I assure you, it will be

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worth the effort. Before *RUNning* this loader program, save it on tape or disk. You should *CSAVE* more than one copy just in case there is a glitch or bad spot on the tape.

RUN this program answering the prompts as they appear. Once the routine has been created you will be asked how many times you would like it saved on tape. Have it saved at least twice.

For Those With Assemblers

The position independent code in Listing 2 can be keyed in using any 6809 Editor Assembler. The origin (line 50) can be changed to whatever value you wish, but be sure to *CLEAR* from this memory location when using the routine from BASIC. The *JMP* instruction on line 420 is followed by a dummy location. It will be replaced with a true location once the routine has been initialized. Once assembled and in memory, the routine can be *EXECuted* directly from the assembler. With the Radio Shack *EDTASM+* the *RTS* in line 160 must be replaced with a *SWI* instruction. This tells the program to return to the assembler after initialization. Save a couple of copies of both the object code and the assembled code on tape. The length of the file is 191 bytes.

The Demonstration Program, In BASIC

Key in this BASIC demonstration program (BDP) accurately, then check it line by line for errors, paying special attention to lines 40, 80, 90, 160 and 170. Now save a copy of this on tape. Congratulations, you are now ready to try out this Demo on the machine language routine. The first thing you must do is protect the area of memory where the ML routine is to go. Do this by typing *CLEAR 200,16160 ENTER* for a 16K computer, or *CLEAR 200,32544 ENTER* for a 32K machine. Now load in the ML routine you have

saved on tape. Do this by typing *CLOADM "REVFIELD" ENTER*. Don't worry about the BASIC Demo program. It will be left unharmed by loading this machine language program. With the ML routine now in place you can *RUN* the BASIC demonstration program.

It's a good idea to keep Listing 3 in front of you as the Demo runs. Try to correlate what you see on the screen with what you read in the listing. Answer the first prompt with the correct memory size for your computer. The next thing that should happen is that the screen will clear to dark green. This occurs every time an "EXEC ST" is encountered in your BASIC code (see line 50). The variable "ST" equals the location of the ML routine set in line 40. The *BREAK* key will completely disable the routine any time you wish; however, it may be necessary to hold this key down until an entire string of data has been completely printed on the screen. This function can be disallowed by a simple *POKE ST+54,0*.

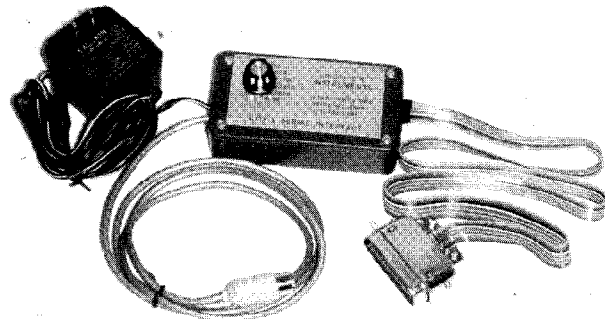
The print speed is set by the number in memory location *ST+121*. Any number between 0 and 255 can be *POKEd* into this location. However, numbers greater than 80 result in a print speed that is painfully slow. Once this value is set, it remains so until *POKEd* with another number.

The value for the end of the protected window area is held in memory locations *ST+130* and *ST+131*, the most significant bit (MSB) and the least significant bit (LSB) respectively. Lines 130 and 140 input a screen location which correspond to the print @ location (see page 277 of your "Getting Started With Color BASIC" manual). The value is then checked at line 150 to see that it is within the limits of the screen. Then line 160 converts your number to the MSB and LSB which are *POKEd* into memory locations *ST+130* and *ST+131* on line 170.

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In Your BASIC Programs

This ML routine can be added to your BASIC programs by appending lines 50 to 80 and 160 to 370 from Listing 1, or the routine can be loaded in by a *CLOADM* before *RUNning* your BASIC program. A simple *EXEC* command can be used every time you wish to clear the screen. The print speeds can be varied throughout as well as the "window" size being changed within a running program.

Having the routine operating while writing your programs is most helpful because of the ease on your eyes and the control of the printing speed. BASIC code could have been used to create these screen features but this could only have been used while the BASIC program was running. Much more memory would have been required and it would not be as user transparent or automatic.

Listing 1:

```
10 CLS:PRINT"THIS PROGRAM POKES  
THE ROUTINE INTO HIGH MEMORY":P  
RINT  
20 PRINT" DO YOU HAVE -":PRINT,"  
1) 16K":PRINT,"2) 32K"  
30 INPUT " CHOOSE 1 OR 2";K  
40 IF K=2 THEN CLEAR 200,32544 :  
ST=32544 :ELSE CLEAR 200,16160 :  
ST=16160  
50 FOR L=ST TO ST+191  
60 READ D  
70 POKE L,D  
80 NEXT L
```

```
140 .....0203  
220 .....0372  
END .....0627
```

```
90 CLS:PRINT"THE ROUTINE IS NOW  
READY TO BE SAVED TO TAPE. INSE  
RT A BLANK TAPE PRESS RECORD A  
ND PLAY"
```

```
100 INPUT"WHEN READY ENTER THE N  
UMBER OF TIMES YOU WISH TO SAVE  
IT";N
```

```
110 FOR T=1 TO N
```

```
115 PRINT"SAVING COPY";T"OUT OF"  
;N
```

```
120 CSAVEM"REVFIELD",ST,ST+191,S  
T
```

```
130 MOTORON:FOR R=1 TO 500:NEXT  
R
```

```
140 NEXT T:MOTOROFF:PRINT
```

```
150 PRINT"THE PROGRAM IS NOW SAV  
ED WITH A STARTING LOCATION OF";  
ST
```

```
160 PRINT"AND AN ENDING LOCATION  
OF"ST+191
```

```
170 PRINT"THE EXEC ADDRESS IS";S  
T
```

```
180 DATA 52, 54, 141, 26, 48, 14  
1, 0, 40, 188, 1
```

```
190 DATA 104, 39, 14, 16, 190, 1  
, 104, 191, 1, 104
```

```
200 DATA 48, 141, 0, 61, 16, 175  
, 132, 53, 54, 57
```

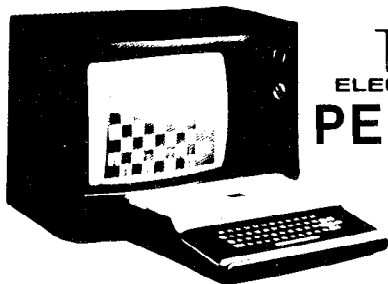
```
210 DATA 16, 142, 2, 0, 142, 4,
```

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0, 159, 136, 134
 220 DATA 32, 167, 128, 49, 63, 3
 8, 250, 57, 52, 52
 230 DATA 246, 1, 84, 193, 191, 3
 9, 38, 158, 136, 129
 240 DATA 8, 39, 41, 129, 13, 39,
 87, 129, 64, 37
 250 DATA 16, 129, 96, 37, 42, 14
 0, 6, 0, 38, 2
 260 DATA 141, 47, 53, 52, 126, 1
 7, 17, 167, 128, 159
 270 DATA 136, 134, 10, 32, 236,
 174, 141, 255, 242, 191
 280 DATA 1, 104, 32, 227, 16, 14
 2, 32, 32, 16, 175
 290 DATA 130, 159, 136, 134, 10,
 32, 221, 128, 64, 16
 300 DATA 142, 1, 1, 49, 63, 38,
 252, 32, 214, 142
 310 DATA 4, 0, 230, 136, 32, 231
 , 128, 140, 5, 224
 320 DATA 38, 246, 159, 136, 198,
 32, 231, 128, 140, 6
 330 DATA 0, 38, 249, 57, 150, 13
 7, 129, 32, 37, 4
 340 DATA 128, 32, 32, 248, 198,
 32, 231, 128, 140, 6
 350 DATA 0, 38, 4, 141, 210, 32,
 7, 76, 129, 32

360 DATA 38, 238, 159, 136, 53,
 52, 198, 1, 134, 10
 370 DATA 32, 148

Listing 2:

			00010 * RAY GAUVREAU
			00020 * PRINT REVERSE FIELD
			00030 * CREATE PROTECTED WINDOW
			00040 * PRINT DELAY
3F20		00050	DRG #3F20
3F20 34	36	00060	START PSHS X,Y,D
3F22 8D	1A	00070	BSR BLC
3F24 30	8D 002B	00080	LEAX PRINT,PCR
3F28 BC	0168	00090	CM PX \$168
3F2B 27	0E	00100	BEQ FPULL
3F2D 10BE	0168	00110	LDY \$168
3F31 BF	0168	00120	STX \$168
3F34 30	8D 003D	00130	LEAX 1+RETURN,PCR
3F38 10AF	84	00140	STY ,X
3F3B 35	36	00150	FPULL PULS X,Y,D
3F3D 39		00160	RTS
3F3E 10BE	0200	00170	BLC LDY ##200
3F42 8E	0400	00180	CLRIT LDX ##400
3F45 9F	88	00190	STX \$88
3F47 86	20	00200	LDA ##20
3F49 A7	80	00210	CLSNX STA ,X+
3F4B 31	3F	00220	LEAY -1,Y
3F4D 26	FA	00230	BNE CLSNX
3F4F 39		00240	RTS
3F50 34	34	00250	PRINT PSHS B,X,Y
3F52 F6	0154	00260	LDB \$154
3F55 C1	BF	00270	CM PB ##BF
3F57 27	26	00280	BEQ BRKEY
3F59 9E	88	00290	LDX \$88
3F5B 81	08	00300	CM PA ##8
3F5D 27	29	00310	BEQ BACKSP
3F5F 81	0D	00320	CM PA ##0D
3F61 27	57	00330	BEQ ENTER
3F63 81	40	00340	CM PA ##40
3F65 25	10	00350	BLO BLACK
3F67 81	60	00360	CM PA ##60
3F69 25	2A	00370	BLO GREEN
3F6B 8C	0600	00380	PULL CM PX ##600
3F6E 26	02	00390	BNE PULL2
3F70 8D	2F	00400	BSR SCROLL
3F72 35	34	00410	PULL2 PULS B,X,Y
3F74 7E	1111	00420	RETURN JMP \$1111
3F77 A7	80	00430	BLACK STA ,X+
3F79 9F	88	00440	FIXCUR STX \$88
3F7B 86	0A	00450	LDA ##0A
3F7D 20	EC	00460	BRA PULL
3F7F AE	8D FFF2	00470	BRKEY LDX \$1+RETURN,PCR
3F83 BF	0168	00480	STX \$168
3F86 20	E3	00490	BRA PULL
3F88 10BE	2020	00500	BACKSP LDY ##2020
3F8C 10AF	82	00510	STY ,-X
3F8F 9F	88	00520	STX \$88
3F91 86	0A	00530	LDA ##0A

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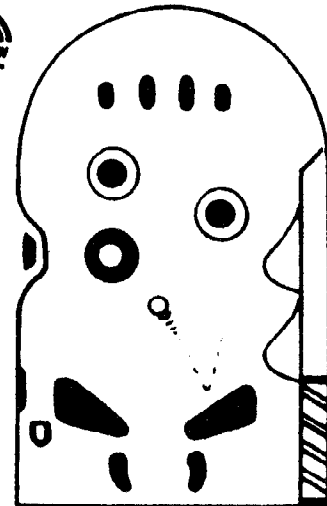
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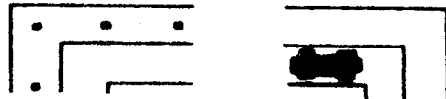
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```

3F93 20 DD 00540 BRA PULL2
3F95 80 40 00550 GREEN SUBA ##40
3F97 108E 0101 00560 LDY ##0101
3F98 31 3F 00570 DLAY LEAY -1,Y
3F9D 26 FC 00580 BNE DLAY
3F9F 20 D6 00590 BRA BLACK
3FA1 8E 0400 00600 SCROLL LDX ##400
3FA4 E6 88 20 00610 NXSCRO LDB $20,X
3FA7 E7 80 00620 STB ,X+
3FA9 8C 05E0 00630 CMPX ##5E0
3FAC 26 F6 00640 BNE NXSCRO
3FAE 9F 88 00650 STX $88
3FB0 C6 20 00660 LDB ##20
3FB2 E7 80 00670 FINSCTR STB ,X+
3FB4 8C 0600 00680 CMPX ##600
3FB7 26 F9 00690 BNE FINSCTR
3FB9 39 00700 RTS
3FBA 96 89 00710 ENTER LDA $89
3FBC 81 20 00720 COMPI CMPA ##20
3FBE 25 04 00730 BLD ENTI
3FC0 80 20 00740 SUBA ##20
3FC2 20 F8 00750 BRA COMPI
3FC4 C6 20 00760 ENTI LDB ##20
3FC6 E7 80 00770 STB ,X+
3FC8 8C 0600 00780 CMPX ##600
3FCB 26 04 00790 BNE INCR
3FCD 8D D2 00800 BSR SCROLL
3FCF 20 07 00810 BRA GOODIT
3FD1 4C 00820 INCR INCA

```

```

3FD2 81 20 00830 CMPA ##20
3FD4 26 EE 00840 BNE ENTI
3FD6 9F 88 00850 FINIT STX $88
3FD8 35 34 00860 GOODIT PULS B,X,Y
3FDA C6 01 00870 LDB ##1
3FDC 86 0A 00880 LDA ##0A
3FDE 20 94 00890 BRA RETURN
0000 00900 END

```

90..... 01E5
END...03CC

Listing 3:

```

10 CLS:PRINT"BEFORE RUNNING THIS
   DEMO BE SUREYOU HAVE THE ROUTIN
   E LOADED IN MEMORY AT 16160 OR
   32544":PRINT
20 PRINT" DO YOU HAVE -":PRINT,"
   1) 16K":PRINT,"2) 32K"
30 INPUT " CHOOSE 1 OR 2";K
40 IF K=2 THEN CLEAR 200,32544 :
   ST=32544 :ELSE CLEAR 200,16160 :
   ST=16160
50 EXEC ST
60 PRINT"THIS ROUTINE CAN BE COM
   PLETELY REMOVED FROM OPERATION
   ANY TIME YOU WISH BY PRESSING TH
   E BREAK":PRINT
70 INPUT"INPUT A NUMBER BETWEEN
   0 AND 255FOR THE PRINT SPEED";SP
80 IF SP<0 OR SP>255 THEN PRINT"
   ***** SPEED OUT OF RANGE *****"
   :GOTO 70
90 POKE ST+121,SP
100 PRINT"***SPEED NOW SET ***":
   PRINT
110 PRINT"TO CLEAR THE SCREEN AT
   ANY TIME SIMPLY USE THE EXEC CO
   MMAND IN YOUR PROGRAM":INPUT"PR
   ESS ENTER TO CONTINUE";A$
120 EXEC
130 PRINT"INPUT A SCREEN LOCATIO
   N BETWEEN 0 AND 479"
140 INPUT"THIS WILL RESERVE A PR
   OTECTED WINDOW ABOVE THIS LOCA
   TION";W
150 IF W<0 OR W>479 THEN PRINT"I
   NVALID SCREEN LOCATION !":GOTO 1
   30
160 M=FIX(W/256) : L=W-M*256:M=M
   +4
170 POKE ST+130,M :POKE ST+131,L
180 LIST
190 'ST = START OF THE ROUTINE
   EITHER 16160 FOR 16K
   32544 FOR 32K
200 END

```

SOFTWARE-HARDWARE

FOR RADIO SHACK'S TRS-80 MODEL 1/3
TRS-80 COLOR COMPUTER

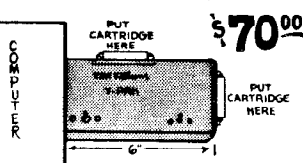
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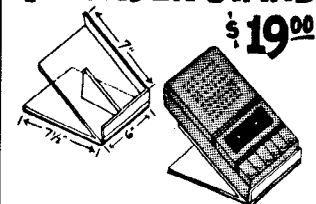
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"TRS-80 COLOR COMPUTER PRODUCTS"

"ENHANCED 1248-EP EPROM PROGRAMMER"

The list of directly compatible EPROMs increases by one, now including: 2508's, 2758-0/1's, 2516's, 2716's, 2532's, 2732's, 68732-0/1's, 68764's, and 68766's.

NEW FEATURES INCLUDE:

- 1) Intelligent algorithm that reduces programming time to as little as 1/6 that of fixed cycle programmers.
- 2) Diagnostic routines to isolate defective EPROMs, or locate differences.
- 3) A feature that guards against EPROM type entry errors.
- 4) Diagnostic routines that prevent keyboard entry errors from causing disastrous consequences.

FIRMWARE FEATURES

- | | |
|--------------------------|-----------------------|
| 1) EPROM ERASED! | 4) BYTE PROGRAMMING! |
| 2) COMPARE EPROM TO RAM! | 5) DUMP EPROM TO RAM! |
| 3) BLOCK PROGRAMMING! | 6) JUMP! |

Firmware is "stack-oriented", "position independent", and "menu driven". Supplied in an EPROM, it can also be stored on disc or tape for execution from RAM if desired.

STANDARD HARDWARE FEATURES

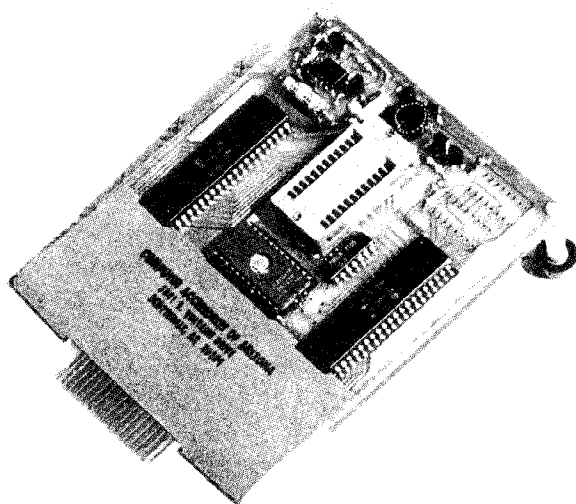
- 1) It has its own "on-board" 25 volt programming supply.
- 2) A quality textool "zero insertion force" (ZIF) socket.
- 3) Socket for firmware on-board.

A PIA port is also available on the programmer. This 8 bit parallel I/O port with handshake lines, can be used for many applications, such as a parallel printer port. Details on how to use this port as a printer interface are included in the instruction manual.

The instruction manual describes how to take full advantage of the power of this versatile programmer. We think you'll agree, that never before was an EPROM programmer so easy to use, and feature packed as is the 1248-EP.

The enhanced 1248-EP costs only \$129.95.

Firmware upgrades are available to our previous 1248-EP customers, in EPROM, for just \$29.95.



* TRS-80 is a trademark of TANDY CORP.
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- | | |
|---------------------------|---------------------------------|
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| 2) EXPAND RAM FROM 2-16K! | 5) PROVIDES FOR BATTERY BACKUP! |
| 3) YOU WRITE PROTECT RAM! | 6) LOW COST! |

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The A/D-80C is a 16+ channel analog to digital converter with two 8 bit PIA ports plus handshake lines.

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- *For robotics!

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2532 EPROM	4K by 8 bit,	\$6.50 ea.
6821P	P.I.A.	\$3.50 ea.
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Socket	Textool "Zero Insertion Force"	\$9.00 ea.
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Could there be a fortune waiting for you in this locked safe? To find out, all you need is the CoCoCombination. That might take a little time, though, so you'd better. . .

'GET CRACKING'

By Ted Hasenstaub

For those of you who enjoy guessing games, Theodore Hasenstaub's *Safecracker* is a program which allows you to guess the three numbers of a combination that will open a safe for you. The graphics and sound are good quality.

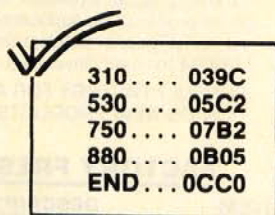
To use *Safecracker*, simply *CLOAD* and *RUN* the program. After the title screen, the program prompts for your name and the number of tries you would like in order to figure out the safe's combination. The safe has three numbers in its combination from 1 to 63. They could be all the same. To change the numbers on the dial simply move the right joystick slowly to the left or right. As the dial turns, you will hear a clicking sound. When the number you want appears, press the joystick button until you hear a tone. Release the button quickly or you will get three tones and it will register this as your first guess at all three numbers. The screen will then display your three guesses, and give you hints as to how you fared. I think you will enjoy this program, so get "cracking."

The listing:

```

10 ' SAFECRACKER
20 '
30 ' BY: TED HASENSTAUB
40 ' 4/11/83
50 '
60 CLS
70 CLEAR 600
80 DIM N$(10), A$(10)
90 N$(0) = "R4U6L4D6BR9": ' 0
100 N$(1) = "BR1R4BL2U6G1BR6BD5": '
1
110 N$(2) = "BU5U1R4D2G4R4BR3": ' 2

120 N$(3) = "R4U3NL2U3L4BR8BD6": ' 3
130 N$(4) = "BR4U6BL4D3R3BD3BR5": '
4
140 N$(5) = "R4U3L4U3R4BR4BD6": ' 5
150 N$(6) = "R4U3L4U3D6BR8": ' 6
    
```



```

160 N$(7) = "BR4U6L4D1BD5BR8": ' 7
170 N$(8) = "U6R4D3NL3D3L3BR7": ' 8
180 N$(9) = "BR5U6L4D3R3BD3BR5": ' 9
190 A$(0) = "U8R8D8L8BR12": ' 0
200 A$(1) = "BU4U4R8BD4L8BR8D4L8BR
12": ' S
210 A$(2) = "U8R8D4L8BR4F4BR4": ' R
220 A$(3) = "U8BR8G4L4BR4F4BR9" : '
K
230 A$(4) = "U8R8BD4L8BD4R8BR4": ' E
240 A$(5) = "U8F4E4D8BR4": ' M
250 A$(6) = "U8R8BD8L8BR12": ' C
260 A$(7) = "U8R8D4L8BR8D4BR4": ' A
270 A$(8) = "BR10": ' SPACE
280 A$(9) = "U8R8BD4L8BD4BR12": ' F
290 SA$ = A$(7) + A$(6) + A$(5) + A$(4) +
A$(8) + A$(1) + A$(7) + A$(9) + A$(4) + A$
(8) + A$(6) + A$(0)
300 XX$ = A$(1) + A$(7) + A$(9) + A$(4) +
A$(6) + A$(2) + A$(7) + A$(6) + A$(3) + A$
(4) + A$(2)
310 GOSUB 890
320 CLS
330 D1 = RND(62) + 1: D2 = RND(62) + 1: D3
    
```


COLORSOFT™

ESCAPE

A 3-D GRAPHICS ADVENTURE WITH SOUND (Machine Language for Fast Action)

This is NOT the usual "find the treasure" adventure. In **ESCAPE**, you are trapped on the top floor of a skyscraper and the only way out is by using a very unusual elevator. You must give the elevator the correct code or else the ride down is a real killer. The maze-like halls seem to come to life due to the fantastic 3-D graphics. Search the halls for rooms which contain clues to the correct code. Clues must be deciphered to learn the elevator's secret code. Game times depends on the skill of the player, but it is typically 8-10 hours. **ESCAPE** is suitable for group play. A mentally stimulating experience.

16K BASIC

\$18.95

RECIPE FILE

A CASSETTE BASED STORAGE AND RETRIEVAL SYSTEM

This program permits storage of your favorite recipes for retrieval by your computer. Once a recipe has been recalled, then the computer can adjust the ingredient measure for serving the desired number of persons. Each recipe can contain special comments on preparation as well as the full instructions for using the recipe. Included is a line oriented text editor for creating and editing the variable length files. Completely menu driven and very user friendly. Easily modified by the user for use in keeping track of record, coin or stamp collections or whatever your interest. Screen or printer output.

16K Ext. BASIC

\$21.95

SPECIAL: A collection of 30 recipes covering main meals to snacks. Only \$3.95 with program.

SQUIRE

SQUIRE is a challenging game of asset management. The player must manage a country estate and contend with crop failure, investment losses, taxes and other such headaches. The object of the game is to increase the estate's value while providing for the peasant workers. The starting assets are computer selected so that each game offers different challenges. Great experience for the kids or aspiring executives.

16K Ext. BASIC

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HOUSEHOLD EXPENSE MANAGER

This menu driven program package is designed for creating and maintaining a data file on cassette of 30 household expense categories for a 12-month period. It also keeps cumulative totals and a separate total of tax deductible expenses. A comparative analysis program provides a graphic presentation of relative expenses between any two months during the year. The user can change categories by modifying program code. Screen or printer output.

16K Ext. BASIC

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A fun and challenging version of the Othello™ type board games. This version includes options for play solely by the computer, one player against the computer, or two players against each other. The computer can play on four skill levels. Very colorful with plenty of sound. Fun for kids and challenging for adults. Great for parties.

16K Ext. BASIC

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```

=RND(62)+1
340 G=0
350 PMODE4,1:PCLS
360 P=0:Q=0:R=0
370 DRAW"S4;BM48,15;R122F24L122H
24D130F6U8F12D8F6U130BD6BR6R110D
110L110U110BL6D124R6U8R112D8H6U2
D2F6R4U130"
380 DRAW"BM184,64;R4D10L4U10"
390 DRAW"BM184,126;R4D10L4U10"
400 CIRCLE(132,105),20,1
410 CIRCLE(132,105),9,1
420 CIRCLE(90,105),4,1
430 DRAW"BM88,108;D14R4U14"
440 DRAW"S3;BM82,60;"+SA$
450 SCREEN1,1
460 X=JOYSTK(0)+1:IF X=64 THEN X
=63
470 IF PEEK(65280)=126 OR PEEK(6
5280)=254 THEN GOTO 670
480 IF B=X THEN 540
490 IF B>X THEN S=(B-X)/4 ELSE I
F B<X THEN S=(X-B)/4
500 FOR C=1 TO 5
510 SOUND 255,1
520 FOR D=1 TO 10:NEXT
530 NEXT C
540 B=JOYSTK(0)+1:IF B=64 THEN
B=63
550 I=INT(B):S$=STR$(I)

```

```

560 IF VAL(S$)>9 THEN GOTO 620
570 H=ABS(I)
580 DRAW"C5;S4;BM130,94"+N$(H)
590 FORV=1TO 355:NEXT:
600 DRAW"C0;BM130,94"+N$(H)
610 GOTO 460
620 B1=VAL(LEFT$(S$,2)):B2=VAL(R
IGHT$(S$,1))
630 DRAW"C5;S4;BM126,94"+N$(B1)
+N$(B2)
640 FOR V=1 TO 355:NEXT
650 DRAW"C0;BM126,94"+N$(B1)+N$
(B2)
660 GOTO 460
670 SOUND 200,8
680 IF P=0 THEN P=B:GOTO 460
690 IF Q=0 THEN Q=B:GOTO 460
700 IF R=0 THEN R=B:G=G+1
710 SCREEN0,0
720 CLS
730 PRINT@71,"RESULTS OF TRY #";
G
740 IF P=D1 AND Q=D2 AND R=D3 THE
N GOTO 1020
750 '
760 IF P=D1 THEN PRINT@133,"1RST
#";P;" IS CORRECT" ELSE IF P>D1
THEN PRINT@133,"1RST #";P;" IS
TOO LARGE" ELSE PRINT@133,"1RST
#";P;" IS TOO SMALL"

```

VOICE RECOGNITION

For your 16K TRS-80 Extended Basic Color Computer

By Cary D. Perttunen

Using your cassette recorder's condenser microphone, the COLOR TALK TO ME software package can let you use your own voice as an alternate means of input for any of your BASIC programs. Over 200 words can be stored in 16K RAM. With a little practice, you can attain from 80% to over 90% accuracy for most applications.

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 1. VOICE CALC- Use your voice to enter arithmetic problems and VOICE CALC will display the solution.
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11764 Raintree Ct.
Utica, MI 48087

```

770 IFQ=D2 THEN PRINT@197,"2ND
#";Q;" IS CORRECT" ELSE IF Q>D2
THEN PRINT@197,"2ND #";Q;" IS T
OO LARGE" ELSE PRINT@197,"2ND #
";Q;" IS TOO SMALL"
780 IF R=D3 THEN PRINT@261,"3RD
#";R;" IS CORRECT" ELSE IF R>D3
THEN PRINT@261,"3RD #";R;" IS
TOO LARGE" ELSE PRINT@261,"3RD
#";R;" IS TOO SMALL"
790 IF G=AT THEN PRINT@321,"THAT
WAS YOUR LAST TRY ";NM$
800 IF AT=G THEN PRINT@386,"THE
CORRECT COMBINATION WAS"
810 IF AT=G THEN PRINT@426,D1;D2
;D3:GOTO 1050
820 IF G>=1 THEN PRINT@450,"YOU
HAVE";(AT-G);"TRY(S) LEFT ";NM$
830 PRINT@484,"PRESS <C> KEY TO
CONTINUE"
840 Q$=INKEY$:IF Q$="" THEN GOTO
840
850 GOTO350
860 PMODE4,1:SCREEN 1,1:PCLS
870 DRAW"S4;BM48,15;R122F24L122H
24D130F6U8F12D8F6U130BD6BR7R110F
40D101L4U101R4BL5H40D101F40H40BU
108BR10D10BD 99BL12L102U102BL6BD

```

```

124R8U10R102D10R6U16BD16BL6H8BU2
2BR6H21U72BD72L78"
880 GOTO880
890 PMODE 3,1:PCLS
900 DRAW"BM20,100;" +XX$
910 CIRCLE(180,100),55,2
920 CIRCLE(180,100),15,2
930 DRAW"SB;C7;BM167,70;" +N$(3)+
N$(7)
940 SCREEN1,1
950 FOR Q=1 TO 5:FOR W=1 TO A:SO
UND 255,1:A=RND(9)+4:NEXT W:FOR
T=1 TO 150:NEXT T:NEXT Q
960 SCREEN 0,1
970 PRINT"ENTER YOUR FIRST NAME"
980 INPUT NM$
990 PRINT"ENTER NUMBER OF TRY(S)
";NM$
1000 INPUT AT:IF AT<1 THEN AT=1
1010 RETURN
1020 CLS:PRINT@132,"CONGRATULATI
ONS ";NM$:
1030 PRINT@195,"YOU HAVE SOLVED
THE SAFES"
1040 PRINT@258,"COMBINATION IN";
G;"ATTEMPTS!"
1050 FOR Q=1 TO 4000:NEXT:GOTO 6
0

```



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SOUTHERN SOFTWARE SYSTEMS

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Turn Your CoCo Into A Pool Parlor With 8-Ball

Eight-Ball is a very realistic computer simulation of the popular pool game of the same name. The game is played in real time, using joysticks and the computer keyboard to control the game. The joystick is used to select the angle you wish to hit the cue ball. A solid line projecting from the cue ball indicates the position of the cue stick. A blinking line radiating from the cue ball shows the projected path of the cue ball. These lines help you aim the shot. As in a real pool game, aiming distant shots is more difficult than lining up for close shots. After selecting the desired angle, push the fire button to lock in the angle. At this time, a circle with a dot and a *power-bar* indicator will be displayed above the pool table. The circle represents the cue ball. You can position the dot, using your joystick, to the desired position you wish to strike the cue ball. This allows you to put English (spin) on the cue ball. For example: Positioning the dot at the top center of the circle causes the cue ball to have forward or overspin. English is transferred to any balls which the cue ball strikes. After selecting the desired English, press and hold the fire button. The *power-bar* indicator is now activated. Release the fire button when the desired striking force is indicated. Randomly, the cue ball is struck before you release the fire button. This simulates mis-hitting the cue ball.

Pressing the *ENTER* key starts a new game after completing a game. Hitting the R key will stop an in progress game, "rack" the balls and start a new game. The V key turns on or off the cue stick line during the aiming portion of your shot. Pressing the *BREAK* key restarts the current shot routine.

This allows you to select a new shot angle and English. *8-Ball* is designed for two player use; however, pressing the *spacebar* forces a change of turns. This allows the game to be played by one person.

Most standard *8-Ball* rules apply to this game. If no balls are struck on the break, play will be switched to the other player. After the first ball is sunk, the computer identifies the player with the solid color balls and the player with the striped balls. If you fail to sink one of your balls, play reverts to your opponent. A player loses his/her turn and one ball is returned to the pool table when the cue ball goes into a pocket (scratches). A player loses the game if he/she sinks the 8-ball before sinking all of his/her own balls or if a player scratches while attempting to sink the 8-ball. You can win the game by sinking all of your balls and then sink the 8-ball before your opponent does.

Eight-Ball has very good high resolution color (black, blue, orange and buff) graphics. The sound effects are good. Ball reaction and movement is excellent. This game requires the use of Radio Shack joysticks or equivalent. WICO joysticks do not work with this game. I am not your average pool player. As a matter of fact, I have not played a game of pool in years. I can honestly say I enjoyed playing this game. *Eight-Ball* is another good addition to the growing Color Computer library of software.

At the present time, *8-Ball* is only available in ROM Pack. The *8-Ball* ROM Pack seems to be constructed to the same excellent standards found on Radio Shack ROM Paks. A well written instruction booklet explains the operation of the game. *Eight-Ball* is produced by ANTECO Software and can be bought only through dealers. See ANTECO Ad in *the Rainbow*.

(ANTECO Software, Inc., P.O. Box 14728, 4220 Clay Ave., Fort Worth, TX 76117, 16K, \$29.95 on ROM Pack)

—Gabriel Weaver

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Klendathu: Arachnoid War With Good Graphics, Sound

In trying to come up with a new program for the CoCo community, there are several ways that you could go about it. You could come up with an original idea, or try to "build a better mouse trap" out of an existing one. You could also adapt a game or pastime to CoCo, without having to strain your brain (I've done this before, and found it to be the easy way out). A more creative approach, however, would be to adapt a theme from a movie, or better yet, a book.

Klendathu, one of the latest cassette based offerings from the Shack, is one of the more creative programs to come along in a while. It is based on the novel "Starship Troopers," by Robert A. Heinlein, which tells the story of infantrymen of the future.

You are a trooper in the mobile infantry. Your mission is to search out and destroy all of the enemy bugs (spiders) on the planet Klendathu, before they gain strength and overrun the Federation. The bugs have burrowed their way deep into the core of the planet, so you will have to rely on your spatial sensors to seek them out. Your "power suit" has all the firepower you will need, and enough energy to repel a substantial onslaught. Don't get overconfident, though, because the bugs have you outnumbered by about 1,000 to one. Your mission is not without its rewards, however. There is extra pay for each bug that you kill, and some quick field promotions are a definite possibility. Your orders have just come through: "No prisoners are to be taken. Destroy all bugs on sight."

When the program is *RUN*, the title screen appears, and you get your first glimpse at the bugs as they march their way down the screen. You then choose from two difficulty levels, and five different periods of time to be spent on the planet's surface. When you get to the surface, and have found some bugs, you are ready to do battle.

The bugs begin to appear slowly at first, but soon begin to swarm. Before you have a chance to orient yourself, they are all over the place. The warrior bugs are the only ones that fire upon you, and it uses up your energy as they do. If they get close enough to you, they can kill you. The queen bug is worth the most amount of money, but she is always escorted by several warriors. If things get too hot to handle, you can retreat for a while, but you will lose time in the process. In order to kill the bugs, you must get right up to them and activate your torch. This was the part of the game I felt was too realistic. Not only do the bugs stop dead in their tracks when torched, but they writhe in pain as they are burned to a crisp. A little too gruesome for a game, if you ask me. It was this realism that got to me, since I have certainly killed my share of space invaders without a problem.

Meanwhile, you have to make sure that you have enough time and energy to make it back to your ship before it takes off without you. If you run out of either, you will have "bought the farm." When you do make it back to the ship, your energy and time are renewed, and you are ready for another encounter.

Klendathu is a very good game, with excellent graphics and sound effects. Although it is written in BASIC, you would never know it because of the machine language sub-

outines used. The documentation is the best I have ever seen for a game, and includes a nice background of the story on which it is based. If you have small children around the house, you might want to keep this one away from them. Otherwise, it can be enjoyed by all, in the spirit I'm sure it is intended. Funny, I didn't notice any cobwebs.

(Available at Radio Shack, Cat. No. 26-2567, 16K, tape, \$14.95)

— Gerry Schechter

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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the *Seal*. And, while that's certainly *their* business, it seems to me that—judging from all the others who *do* use it, that publication is performing a disservice to both its readers and to its advertisers. We're not trying to "gain an advantage" with the *Seal*, we are just trying to help protect you.

From that standpoint, I would like to voice my appreciation to Bill Sias of *Color Computer News*, Larry Williams of *68 Micro Journal*, Wayne Green of *80-Micro and Hot CoCo*, and Mike Schmidt of *Basic Computing* (formerly *80-U.S. Journal*) for cooperating, unasked, in this consumer protection program. It, frankly, would have been easy for them (as one magazine has) to make up an excuse not to allow the use of the *Seal* in advertising in their publications. That *they* choose not to do so speaks well, I believe, for the kind of spirit of CoCo Community I write about here. It also speaks well for their interest in you, as a member of the CoCo Community, who may wish to use the *Seal* as a guide to purchases.

The results of our informal poll on reader service cards are in, and the result was overwhelming in opposition to them. The most-voiced comment was that if you were really interested in a product, you would write or call the vendor directly. Said one correspondent: "If I want to buy something, I call or write; if I want to get a lot of mail I'll use a reader service card. But I don't *buy* from a reader service card, it is just too slow."

By way of "finally," I'd like to introduce you to several new members of *the Rainbow's* staff.

I'm really pleased to be able to announce that Charlotte Ford has joined us as advertising manager. Charlotte brings a wealth of planning and organizational experience to *the Rainbow* and I am sure our advertisers will be pleased to have the opportunity to work with her.

We also have another new "member" of the ad staff, Jack Garland of John A. Garland and Associates. Jack and his staff will be representing *the Rainbow* and *PCM — The Portable Computing Magazine* in the eastern United States. He can be reached at P.O. Box 314, Duxbury, MA 02332 or by phone at (617)934-6464. His firm has an excellent reputation in the computer field and will be assisting advertisers located east of the Mississippi River.

Also new to *the Rainbow* are Peggy Henry, who joins our art staff, and Susan Remini, who is the newest member of our editorial staff. Yes, we're growing. Thanks to you all.

—Lonnie Falk

CoCo Goes CAD!

Are you into stubs? How about betas? Do you know what a mho is? No, these are not things worshipped by a new California cult, but are electronic terms used by (*gasp!*) non-digital electronics people.

These and many other strange sounding terms are used by engineers, ham radio operators, and hobbyists to describe the parameters of linear circuits they design (a linear circuit is one that has a linear voltage-current relationship). These circuits are usually designed by one of two methods.

The first method, and the one widely used by the hobbyist, is the cut-and-try method. This means building a circuit and physically measuring its performance. If it doesn't work right, then it is necessary to change one or more of the components and see if it performs any better. If it still doesn't work right, change some more parts and try again. You keep doing this until (if ever) the circuit performs correctly.

Obviously, this is not a very efficient method for circuit design, but most hobbyists don't have the tools needed for the second method which is *computer aided design* (CAD).

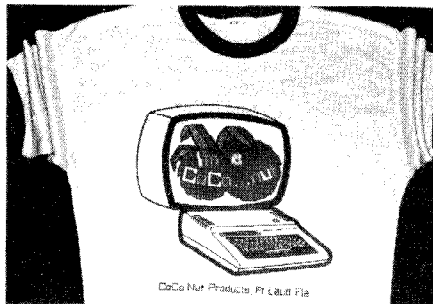
With the second method, parameters are fed into a computer program which does a series of complex mathematical studies of the circuit design and then tells the designer how the circuit will perform with the given parameters. If it's not right, the parameters are changed and the program gives new results. By the time the designer actually builds the circuit, odds are pretty good it will perform as expected.

What tools does the hobbyist/designer usually lack? Some don't know or understand the mathematics involved, others find it tedious to solve all the equations with paper and calculators and, until recently, very few have had access to computers to solve the equations.

With the arrival of the home computer, the latter two groups now have the tools they need and, with the recent introduction of a program called *TNT-ALYZ*, the problems of the first group are being addressed.

TNT-ALYZ, from TNT Software, is a linear circuit analysis program written in Extended BASIC for a 32K, cassette-based CoCo. Its major features are

- menu driven commands
- built-in screen editor
- save and load circuit parameters (cassette only)
- list results to screen or printer



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- 30-day return policy

The use of *TNT-ALYZ* assumes you have some knowledge of circuit design. While the manual covers the use of the program and its limitations, it is not a tutorial on the subject.

The program will analyze a circuit containing 10 different common circuit elements (resistors, capacitors, inductors, bipolar transistors, field effect transistors, transformers, transmission lines, open stubs, shorted stubs, operational amplifiers).

A typical design session using *TNT-ALYZ* would run something like this:

Draw a diagram of the circuit to be considered, numbering all the nodes and picking component values.

Load and run *TNT-ALYZ*.

From the menu, pick #1, EDIT CIRCUIT.

Input each circuit element description and node numbers into the editor.

Back at the menu, pick #2, ANALYZE CIRCUIT.

The program now checks the information typed into the editor for gross errors. If no errors are found, a series of questions are asked: input and output nodes, start and stop frequency, plot output (if yes, skips next question), number of data points and log or linear scale, output to printer or screen. After a period of time, the requested information is displayed.

Now, the information can be analyzed to determine if the circuit is doing what it was designed to do. If it is, you can

save the parameters to cassette. If you want to change a value or two, just re-enter the editor, change the values and re-analyze the circuit.

The manual included with this program is quite comprehensive, containing 12 sections and 28 pages. Besides giving the usual information about the system requirements, it describes the rather nice screen editor, the format for inputting the circuit element parameters, and a simple "getting started" example. It also describes the circuit models used for some of the more complex elements, including the transformer, FET, transistor, transmission lines and op amps.

The manual also describes a complex circuit and its analysis, showing all the results obtained. One of the most notable features of this manual is its description of the program's limitations. An explanation is given for the assumptions made and some general hints on how to correct for the limitations. The last item in the manual explains TNT Software's 30-day return policy; if you don't like the program you can return it for a full refund.

I ran a couple of circuits through this program including the examples from the manual and found it to perform very well. A few idiosyncracies of the program surfaced during its use.

While the editor and error checking parts of the program worked well, they can't detect typos if the format of the entry is correct. I managed to crash the program twice, once with a ?FC error and once with an ?I/O error. The manual does describe how to re-enter the program without losing the data you typed into the editor if the program crashes or you have to push the reset button. Be warned, you must type in the information carefully and make sure the nodes are defined correctly.

The complex circuit example, a two-pole, RC active filter, I ran took slightly over 10 minutes to be analyzed and the results displayed. This was with the speedup *POKE* active, which is an option from the menu, by the way. While this is substantially faster than I could have done by hand, be prepared to have a cup of coffee while waiting for the results, especially if you can't use the speedup *POKE*.

The graphics used to display the results are low resolution *SET*, *RESET* blocks and character on the text screen. This limits the details and frequency range of the plotted information. I wish TNT Software would have made better use of CoCo's graphics capabilities.

The equivalent circuit models used by this program are rather simplistic and ideal. They also assume small-signal characteristics, a medium frequency range, no losses and steady state conditions. These constraints limit the usefulness of this program. Most of these problems can be overcome by adding elements to correct the deficiencies of the circuit models, but this limits the number of real circuit elements you can use (10 nodes and 28 circuit elements, maximum).

Given the limitations and constraints, I would still recommend trying this program to any serious circuit designer, especially if you don't have a full fledged CAD system at your disposal. Besides, if you find *TNT-ALYZ* doesn't fill your needs you can always return it.

(TNT Software, Rt. 2 Box 76D, Manor, TX 78653, \$29.95 cassette)

—C.L. Pilipauskas

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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:

Rubicon II, a 32K upgrade to **Across The Rubicon**, the Battle for the Huertgen Forest during WWII. Objective: control American forces and win by capturing pillboxes, cities, and an airfield in under 20 turns. Ark Royal Games, P.O. Box 14806, Jacksonville, FL 32238, tape \$24.95.

Tape Utility, a 16K versatile menu driven program, which permits the user to easily maintain, backup, and catalog both tape and disk programs. Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, disk \$24.95 plus \$3 S/H.

Hidden Basic 1.0, a program written in an effort to protect BASIC programs while not affecting speed, ability or performance of any program. Once a program is modified (hidden) these commands will not function: CLOAD or CLOADM, CSAVE or CSAVEM, DEL, EDIT, EXEC, LIST or LIST, MEM, TROFF or TRON. Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, tape \$19.95.

Fast Lane, a machine language space game. Objective: you must cross the space traffic lane, sneak aboard the ship transporting powerful weapons to the Empire, dodge the century robots and electrified walls, get the turbo laser gun and return to your ship. Every time you steal a weapon, the Empire adds a security measure to prevent more weapons from being stolen. Acesoft Computer Products, 1680 North Page Drive, Deltona, FL 32725, tape \$24.95.

Cassette Controller, a 3 x 2 x 1½ inch box with a plug in cord and knob settings for Auto and Manual positions which when hooked up to your computer and cassette player allows you to hear cassettes from the cassette player without unplugging cables. Vidtron, 4418 E. Chapman, Suite 284, Orange, CA 92669, \$25.

Stereo Composer, a 16K Extended BASIC music synthesizer which allows one to produce music with four-voice music compiler and a seven-octave range. It supports dotted and double-dotted notes, eighth, quarter and standard triplet notes, sixteenth and thirty-second notes. Music can be played at any tempo, can be modified as the music plays and can be hooked up to play on your home stereo system. Stereo composer also displays constant random kaleidoscope patterns to stereo music. Comes assembled with complete hardware and software, an instruction manual and a 15-page operating manual with examples for producing music. Speech Systems, 38 W. 255 Deerpath Road, Batavia, IL 60510, cassette or disk, \$119.95.

Color Scribe, a 32K printing program that allows you to use both the upper and lower case features of your CoCo and provides the ability to print your letters or programs on a printer attached to the RS-232 I/O connector. It has change and search commands, and the ability to copy or move sentences or paragraphs to different locations within your file. Computerware, Box 668, Encinitas, CA 92024, disk \$49.95.

LCINT32, Lower Case Interpreter, a 16K/32K machine language program that will enter lower case command words and also allows a single key-stroke pause function. You can also single step through listings as well as through disk directories. Jarb Software, 1636 D Avenue, Suite C, National City, CA 92050, tape \$10.95.

SPDUMP, a screen dump routine of 360 bytes of relocatable machine language code. SP Software, 1012 Biltmore, Lynchburg, VA 24502, tape \$16.

CONCPOLY, a 16K menu-driven program which draws and designs a variety of colorful patterns, suitable for dump to a printer. Includes examples and instructions. SP Software, 1012 Biltmore, Lynchburg, VA 24502, tape \$8.

SIXFOURK, a 64K program which allows you to inspect RAM, move ROM to RAM and run it there, disable DISK or EXT-BASIC, and make setups with graphics, program, strings, and USR in upper or lower RAM. Includes tutorials and instructions. SP Software, 1012 Biltmore, Lynchburg, VA 24502, tape \$20.

Rotworld, a 64K program which displays a rotating color globe of the earth, including 20 frames of a PMODE1 globe which is loaded into 60K of RAM by a driver program, plus an instruction program. SP Software, 1012 Biltmore, Lynchburg, VA 24502, disk \$25.

Program File, a 16K Extended BASIC program that will produce and maintain a file system of your cassette programs. The file may be listed to screen or printer. Owls Nest Software, P.O. Box 579, Ooltewah, TN 37363, tape \$14.95.

3-D Tic-Tac-Toe, a 16K strategy game of tic-tac-toe played on four planes, each plane divided into a 4x4 grid. Objective: get four markers in a row on one plane, or four in a row with one marker on each plane. Oelrich Publications, 4040 N. Nashville Avenue, Chicago, IL 60634, tape \$16.95.

Peek Copy, a 16K ML program to copy machine language tape programs, even most autostart. Displays start, end, execute addresses and memory. Allows you to change or insert machine code. Oregon Color Computer Systems, P.O. Box 11468, Eugene, OR 97440, tape \$11.95.

The Talking Wizard, a 16K Extended BASIC talking version of the popular Wizard game. Objective: input any question and the Talking Wizard writes and speaks an amusing answer. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape \$19.95.

Ghost, a 16K Extended BASIC educational spelling game for two to six players. Includes two skill levels for ages eight to adult. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape \$11.95.

Music Drill, a 16K Extended BASIC music note game. Objective: You will hear a musical note and must identify it. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape \$19.95.

Multiplication, a 16K Extended BASIC step-by-step tutorial for the skills needed in multiplication. Three skill levels. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape \$14.95.

Long Division, a 16K Extended BASIC step-by-step tutorial for the skills needed in long division. Three skill levels. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tape \$14.95.

Vocabulary Builder I, II, III, three 32K Extended BASIC word knowledge programs with 200 questions, 1000 words in a four part, multiple-choice format. Level 1—grades 3-5, Level 2—grades 6-8; Level 3—grades 9-12. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tapes \$19.95 each.

Mathfact, a 16K Extended BASIC educational math program with two skill levels. Includes addition, subtraction, multiplication and division. B5 Software, 1024 Bainbridge Place, Columbus, OH 43228, tape \$16.95.

MSI Color Finance, a 32K budget program which will maintain all financial records with reports similar to those used in business where expense accounting is essential. Includes a 52-page manual. Delker Electronics, Radio Shack Dealer #D223, P.O. Box 897, Smyrna, TN 37167, disk \$59.95.

Essential Mathematics, Level 3, Number Concepts addition, subtraction, multiplication, division, and fractions, a 32K educational program that provides drill and practice on essential mathematical skills for grades 6.5-8. Includes lessons 30-39 and a 30-page ringbound instruction manual. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disks \$87.50.

Autodialer, a 16K Extended BASIC program that will dial your phone list at fast speeds accurately. Stores approximately 50 names and dialing is done by way of the pause plug from the cassette port of the computer. Soundworks Productions, 26 E. 7th Street, Patchogue, NY 11772, tape \$24.95.

ELCIRCAN, an Electronic Circuit Analyzer, a 16K program that will test a circuit's performance over as many frequencies as you like, without manual calculations. Digital-Linear Systems Engineering, P.O. Box 754, National City, CA 92050, tape \$34.95, disk \$49.95.

Bugger, a 16K Extended BASIC high resolution graphics arcade style game with three skill levels. Objective: you are a little bug who has fallen into a web which is inhabited by six large spiders. Eat all the tidbits and avoid all the spiders in this maze. Mr. R's, 68 Kelly Road, S. Windsor, CT 06074, tape \$14.95.

2FER, two 16K Extended BASIC games on one cassette. **Gondola**—Objective: pilot your balloon over the mountains and safely amongst the trees. Wind, gravity and mother nature are factors to consider. **Copy-Cat**—Objective: match the computer in a Simon-type game. Mr. R's, 68 Kelly Road, S. Windsor, CT 06074, tape \$9.95.

Catacomb!, a 16K high resolution graphics space game. Objective: travel the hyperspace corridor to your mothership as you avoid enemy patrols while getting fuel for your escape from the Catacomb. Oregon Color Computer Systems, P.O. Box 11468, Eugene, OR 97440, tape \$19.95.

SCORE-EZ, a 16K Extended BASIC dice game for up to six players. Objective: achieve the highest possible score based on the roll of five dice until you have completed your score card. Jarb Software, 1636 D Avenue, Suite C, National City, CA 92050, tape \$15.95.

Beyond Words I, II, III, a three part 32K Extended BASIC menu-driven program with tutorials, grade-appropriate subtests and reviews. Contains 400 questions, 800 words and is modifiable. **Beyond Words I**—grades 3-5; **Beyond Words II**—grades 6-8; **Beyond Words III**—grades 9-12. Computer Island, 227 Hampton Green, Staten Island, NY 10312, tapes \$19.95 each.

Kaleidophone, a 16K program which produces animated designs and pictures on your television screen in beat to music when it's connected to a stereo music source (Hi Fi, FM radio, cassette recorder, PA system, etc.) and to a Radio Shack Color Computer. Comes fully assembled and includes installation and operating instructions, KP-4 Kaleidophone, KP83 display system cassette and a reference manual. New Salem Research, West Main Street, New Salem, MA 01355, tape and hardware \$49.95.

Ninja Warrior, a 16K arcade style game for one to six players with 16 skill levels. Objective: guide your Ninja through boulders, fire, pitfalls, flaming meteors, and Ninja masters to attain the ultimate achievement—Ninja Grandmaster. The Programmers Guild, P.O. Box 66, Peterborough, NH 03458, tape \$29.95.

Math Facts Games I, a 32K educational program for practicing math. The program includes four games which can be played after correctly answering a math fact question. Includes three skill levels and a 15-page, ringbound instruction manual. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disk \$39.80.

Math Facts Games II, a 32K educational program for practicing math. This program includes four games which can be played after correctly answering a math fact question. Includes three skill levels and a 37-page ringbound instruction manual. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disk \$39.80.

Facts Match—Addition, a 32K educational program for ages six to eight, intended to help the user learn to recognize the word names and numerals for numbers 0-18 and the sums of the basic addition facts. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disk \$29.50.

Spelling in Context, Level 2, a 32K educational spelling program which provides the user the ability to learn and spell a word in the context of a sentence and the meaning of the word. Includes lessons 1-40 and a 34-page ringbound instruction manual. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disk \$49.50.

Number Match, a 32K educational program for ages four to six. This program enables the user to develop the concept of number, learn to count from one to nine, and to recognize the numerals for these numbers. Includes a 17-page ringbound instruction manual. Micro School Programs, Bertamax, Inc., 101 Nickerson, Suite 202, Seattle, WA 98109, disk \$29.50.

Match and Spell, a 16K Extended BASIC educational program for one or two players, designed to build and improve spelling skills in a format similar to the television game of Concentration. Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110, tape \$11.95.

Spell Rite, a 32K Extended BASIC spelling verifier designed specifically for cassette operation, supports any word processor or text editor that generates ASCII tape files such as Color Scripsit, Telewriter-64, and Super Color Writer. Spell-Rite will verify a 1,000 word document in under nine minutes. Includes a 19-page user's manual, a 10,000-word dictionary with the ability to build multiple special purpose dictionaries, and an index generator that automatically sorts indexes in alphabetical order. Eigen Systems, Box 180006, Austin, TX 78718, tape \$59.95.

Flash Cards, a 16K Extended BASIC program designed for ages six and up, uses attention-getting sounds, and repetition in order to reinforce items of study that can best be learned by memorization. Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110, tape \$11.95.

Tic Tac Toe Math, a 16K Extended BASIC educational game for ages four and up. Objective: improve basic math skills in addition, subtraction, multiplication and division in a tic tac toe game format. Harmonycs, P.O. Box 1573, Salt Lake City, UT 84110, tape \$11.95.

THAT'S INTEREST-ing, a 16K Extended BASIC program that will help you deal with a number of problems requiring interest calculations. The present value and rate of return parts of the program allow the user to define all of the money flows in his problem. The bond yield and amortization parts of the program use a question/answer sequence to guide the user through the problem. Custom Software Engineering, Inc., 807 Minutemen Causeway, Cocoa Beach, FL 32931, tape \$29.95.

Jail, a 16K three-program tape where you can control the degree of difficulty. **Jail**, an educational game for one or two players. Objective: try to logically determine the given word. If you fail, then it's off to jail. Includes three word lists. **Scrambled Eggs**—Objective: given a word in a scrambled sequence, try to correct the order and hence determine the correct word. **Wordlist**, a program to enable the user to create word lists for Jail and Scrambled Eggs. Mr. R's, 68 Kelly Road, S. Windsor, CT 06074, tape \$16.95.

Talking Speller, a 16K program which allows the teacher or parent to record a list of spelling words and play them back, by closely resembling a spelling test. Superior Graphic Software Projects, P.O. Box 451, Canton, NC 28716, tape \$19.95.

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

CoCo Clubs

new clubs

Now a C.C. Users' Group in eastern Pennsylvania area. We have members from the Allentown, Bethlehem, Easton, Penn., and Phillipsburg, N.J., areas. For more information call Bill Jones at (215) 253-5733 or Jerry Behler at (215) 434-6387. Contact Jerry Behler, 1231 Walnut Street, Allentown, Penn., 18102, phone (215) 434-6387.

Jerry Behler

I would like you to tell your readers about the Twin Cities C.C. Users' Group which currently meets the second and fourth Tuesdays each month. For information and location call Pat Moos at 533-5144, Bob Brose at 588-2116, or Bill Tyler at 698-8779. Or leave a message on the NC System Bulletin Board at 533-1957. No dues, no formality, lots of fun with CoCos.

Bill Tyler

I would like to start a C.C. Club in and around Baton Rouge, La. Anyone interested can write to Gary Cash, 8929 Metairie Drive, Baton Rouge, La., 70810, or call (504) 293-7799.

Gary Cash

Forming a C.C. Users' Group in the Simi, Westlake, Agoura, Woodland Hills, Thousand Oaks, Calif., area. If interested, please contact Bruce Rothermel, 3220 N. Medicine Bow Ct., Westlake Village, Calif., 91362, phone (805) 497-7268.

Bruce Rothermel

I'd like to inform all C.C. users in the Mississauga area of the Official 80C Club. Anyone interested in joining may write to 2422 Old Carriage Road, Mississauga, Ontario, Canada L5C 3G4.

Vincent Lok and Roland Hindel

Broome County (New York State) now has an organized and fully-functioning users' group for C.C. owners. The club meets the first Thursday of each month at 7:15 p.m., NYSE&G Corp. Service Center, Old Vestal Road, Binghamton, N.Y. Each meeting consists of a brief business session followed by a planned program/demonstration and "chat" session. Membership is open to individuals or families at \$12 per year. Contact Bucky Helmer, President, 57 Front Street, Binghamton, N.Y., 13905, phone 723-8223 or 724-5726.

Bucky Helmer

Please help pass the word. The Indy C.C. Club meets in Indianapolis, Ind., the first and third Thursdays of each month. For more information, call Mike Davis at (317) 257-3300, or write: P.O. Box 68702, Indianapolis, Ind., 46268

Mike Davis

I would like to announce a new CoCo Club. The EBCCC (East Bay C.C. Club). We've met only once and are situated in the East San Francisco Bay area. The meetings are probably going to be in Oakland. It's not an official organization and so, to find out about it, log onto one of the BBSs and ask around. Call Datacom/80 (415) 895-8980 or Model 1 System/80 (415) 895-0699. Justin Paola, 2745 Stuart Street, Apt. #2, Berkeley, Calif., 94705.

Justin Paola

I'm looking for a group of people in the Edmonton, Alberta, Canada area who I can talk CoCo with and exchange programs and ideas. Contact John Gaudin, 5204-90 Ave, Edmonton, Alberta, Canada T6B 0N9, phone 469-2012.

John Gaudin

Co Community

We are compiling a list of Color Computer Clubs because of the many requests we have received. The CoCo Clubs may want to exchange newsletters, share ideas for topics of discussion at monthly meetings, etc.

Please let us know if we have omitted any clubs and send us complete, up-to-date addresses. Also, please notify us if you wish to add or delete any names on this list. Send your information to:

Color Computer Clubs
c/o Suzanne Kurowsky
the Rainbow
9529 U.S. Highway 42
P.O. Box 209
Prospect, KY 40059

ALABAMA

Joseph Bell, Jr., P.O. Box 335, Gardendale, AL 35071, phone (205) 631-3320 or 798-2355

Ed Rutledge, P.O. Box AK, University, AL 35486

ALASKA

Alaska C.C. Users' Group, Rick McDannet, 816 N. Pine, #2, Anchorage, AK 99504, phone (907) 274-5778

- ARIZONA**
Phoenix C.C. Club, 6619 W. Palo Verde Avenue, Glendale, AZ 85302, phone (602) 939-5666
Tucson 6809 C.C. Club, Michael A. Watts, 902 S. Kolb Road, Tucson, AZ 58711, phone (602) 747-8233
- CALIFORNIA**
L.A.C.C. Users Group, Mark Mooneyham, 2227 Canyon Road, Arcadia, CA 91006, phone (213) 355-6111
Joe Bennett, 1169 Florida Street, Imperial Beach, CA 92032, phone (619) 474-6213
Silicon Valley C.C. Club, Shawn Jipp, President, P.O. Box 61593, Sunnyvale, CA 94088, BBS (408) 733-6809 Serves Area
South Bay C.C. Club, Karen Schlotzhauer, 2545 W. 225th Place, Torrance, CA 90505, phone (213) 539-2439
- COLORADO**
Lowry Microcomputer Club/CoCo Users' Group, Chuck Hohn, Chairman, Lot D-71 LMHP, Lowry AFB, CO 80230
- DISTRICT OF COLUMBIA**
Jack Darling, P.O. Box 8827, Washington, D.C. 20003, phone (703) 780-6159
- FLORIDA**
Keys User Group, A.T. Woodland, P.O. Box 331, Islamorada, FL 33036, phone (305) 664-9230
William H. Brown, III, 2411 Hirsch Avenue, Jacksonville, FL 32216, phone 721-0282
Ernie Johnston, 1040 S.W. 61st Avenue, Margate, FL 33068
Dade County C.C. Users Group, George McVay, Miami, FL, phone (305) 274-8727
C.C. Club of Sarasota, Ernie Bontrager, 4047 Bee Ridge Road, Sarasota, FL 33582, phone (813) 921-7510
C.C. Users Group of South Florida, Suzanne Spahn, 11950 N.W. 29th Manor, Sunrise, FL 33323
- GEORGIA**
Roy Green, Atlanta, GA, phone (404) 953-6395
- ILLINOIS**
Shirley Elma, 12004 E. Kildare, Alsip, IL 60658
Ray Myers, 184 Southgate Estates, Bloomington, IL, phone (309) 828-4671
Richard L. Greer, 5461 S. Kenwood Avenue, Chicago, IL 60615
North County TRS-80 Computer Users Club, Dennis A. Church, 624 St. Louis Road, Collinsville, IL 62234, phone (618) 344-6284
John Sevcik, 1187 Fairwood Drive, Elgin, IL
No. Illinois C.C. Club, Robert Dooman, 3061 Knollwood, Glenview, IL 60025
No. Illinois C.C. Club, Dave Hooper, President, 4490 N. Mumford Drive, Hoffman Estates, IL 60195
So. Sub. CoCo, Bill Wright, P.O. Box 576, S. Holland, IL 60473
CoCo Users Group of Marissa, David Mercer, Secretary, 62 SN Bess, Marissa, IL 62257, phone (618) 295-2907
Rockford C.C. Club, John Picot, 724 Irving, Rockford, IL 61103, phone 963-9187
Quad City C.C. Club, John E. Grive, 4211 Seventh Avenue, Rock Island, IL 61201, phone (309) 786-8187
Motorola Microcomputer Club, Steve Adler, President, 1301 Algonquin Road, Schaumburg, IL 60196, phone (312) 576-3044
- INDIANA**
Indy C.C. Club, Mike Davie, P.O. Box 68702, Indianapolis, IN 46268, phone (317) 257-3300
Robert Carr, 1937 N. Emerson Avenue, Indianapolis, IN 46218
Andrew Thomas, 2804 E. 55th Place, Suite Q, Indianapolis, IN 46220
- IOWA**
S. P. Chapler, R.R. #6, The Woods, Iowa City, IA 52240
- KENTUCKY**
Roger Idstrom, 2603 Garden Lake Lane, Louisville, KY 40220, phone (502) 491-1853
Stephen Hess, 2820 Del Rio Place #27, Louisville, KY 40220
- MASSACHUSETTS**
New England C.C. Users Group, Christopher E. Sweet, P.O. Box 255, Harvard, MA 01451, phone (617) 456-8291
Jason Rahaim, Spring Street, Lunenburg, MA 01462
- MICHIGAN**
Greg Miller, P.O. Box 365, Haslett, MI
Midland C.C. Club, Neil Drake, 709 Coolidge, Midland, MI 48640, phone (517) 631-2939
John Herbert, 50211 Peggy Lane, New Baltimore, MI 48047, phone 949-4842
WOCUG (Color), Mike Sussman, 5275 Langlewood Drive, Westbloomfield, MI 48033
- MISSISSIPPI**
Singing River C.C. Club, Jerry P. Lowe, Sr., 2500 Fairley Road, Gautier, MS 39553
- MONTANA**
Billings C.C. Club, Jayne Kenyon, 4306 Phillip, Billings, MT 59101
- NEW JERSEY**
Bryan McPhee, 418 Virginia Trail, Browns Mills, NJ 08015, phone (609) 893-5120
Bud Lavin, 73 B Wavecrest Avenue, Winfield, NJ 07036, phone (201) 925-1827
- NEW YORK**
C.C. Club of Central N.Y., Joseph Short, 248 S. Fourth Avenue, Ilion, NY 13357, phone (315) 895-7730
Ray Nomandeanu, P.O. Box 854, Times Square Station, New York, NY 10108, phone (212) 392-1267
- NORTH CAROLINA**
John Becker, 6613 Summerline Pl., Charlotte, NC 28211, phone (704) 365-3653
Mike Mundy, 2419 Lane Street, Kannapolis, NC 28081, phone (704) 932-6653
- OHIO**
C.C. Club of Youngstown, Larry Codman, P.O. Box 478, Canfield, OH 44406, phone (216) 788-4218, BBS (216) 788-7910
Central Ohio C.C. Club, John Eichenlaub, 294 Eastwood Avenue, Delaware, OH 43015
Cincinnati TRS-80 Users Group, R.A. White, 44 Dow Court, Fairfield, OH 45014
Susan Davis, Reynoldsburg, OH, phone (614) 861-0565
Miami Valley C.C. Club, Donald H. Gray, 1435 S. Barnhart Road, Troy, OH 45373
- OKLAHOMA**
Southern Lawton Users Group, Dan Goddard, Geronimo, OK, phone (405) 355-7254
C.C. Club of Central Oklahoma, Doug Moller, 1402 Allen, Yukon, OK 73099, phone (405) 354-3342
- OREGON**
Brian James, 1850 Bailey Hill Road, Eugene, OR 97405
Portland Area Users Group, Louis Bybee, P.O. Box 20273, Portland, OR 97220
Central Oregon C.C. Club, Debra J. Campton, P.O. Box 833, Redmond, OR 97756, phone (503) 548-6953
- PENNSYLVANIA**
A. Arnold Weiss, Kennedy House, Apt. 1626, 1901 J.F. Kennedy Blvd., Philadelphia, PA 19103, phone 567-4276
Shippensburg C.C. Club, c/o Shippensburg University, Dept. of Math/Computer Science, Shippensburg, PA 17257
- RHODE ISLAND**
Andy Nulman, 38 Cooke Street, Providence, RI 02906
New England CoCo Nuts, Robert J. Sullivan, 100 Keri Lyn Road, Warwick, RI 02886, phone (401) 739-8743
- SOUTH CAROLINA**
Ed Schlorhorst, 6016 Yorkshire Drive, Columbia, SC 29209
Metropolitan Greenville C.C. Club, Ed Lowe, Gray Court, SC, phone (803) 876-3928
- TENNESSEE**
Jim Perkins, 3617 Cline Road, East Ridge, TN 37412, phone (615) 867-5682
Ben Barton, 4903 Warrington Road, Memphis, TN 38118
- TEXAS**
David Karam, 1809 Dexter, Austin, TX 78704, phone (512) 442-6317
Aggie C.C. Group, Louise Darcey, 1301 Francis, College Station, TX 77840, phone (409) 696-1656
R.V. Scott, 925 Live Oak Court, DeSoto, TX 75115, phone (214) 464-6999 or 224-4444
- UTAH**
Ogden CoCo, Kathy Rush, 4535 S. 2600 W., Roy, UT 84067
- VIRGINIA**
CoCo Nuts, Randy Graham, Richmond, VA, phone 320-0019
- WASHINGTON**
Sea-Tac C.C. Club, Michael Nugent, Oakhurst-S-121, 1851 Central Place, Kent, WA 98031
Kids Only C.C. Club, Chris Nitz, 6118 83rd Street Ct. E., Puyallup, WA 98371
- WEST VIRGINIA**
Steven Smith, 13 Riverside Drive, S. Charleston, WV 25303
C.C. Users Group, Donald G. Barber, Jr., P.O. Box 295, Granville, WV 26534, phone (304) 599-4493
Robert Cox, 614 11th Avenue, Huntington, WV 25701, phone (304) 522-2872
Mil-O-Bar C.C. Club, Jim Lemaster, Milton, WV, phone (304) 743-4752
- WISCONSIN**
C.C. Milwaukee Users Group, Steve Koszuta, Secretary, 2547 S. 11th Street, Milwaukee, WI 53215
Theresa Worachek, Reedsville Public School, Reedsville, WI
Dave Buehn, 829 Hickory Road, Twin Lakes, WI 53181, phone (414) 877-2989
Tom Fandre, 2420 Misty Lane, Waukesha, WI, phone (414) 542-0600
- CANADA:**
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Medley Computer & Electronics Club, John Plaxton, P.O. Box 2914, Medley, Alberta, Canada T0A 2M0, phone 594-2755
- NOVA SCOTIA**
Bob Hamilton, 1094 Wellington Street, #703, Halifax, Nova Scotia, Canada B3H 2Z9
- ONTARIO**
Brent Boyle, 1249 Northshore Blvd., Apt. 1005, Burlington, Ontario, Canada L7S 1C4
Pierre Berthiaume, 1686 Pl. Dauphin, Chambly P.Q., Canada J3L 4M7, phone 658-3087
ALGOMA C.C. Club, Jim Payette, P.O. Box 250, Echo Bay, Ontario, Canada P0S 1C0
Toronto C.C. Club, Geoff Wells, 21-12 East Avenue North, Hamilton, Ontario, Canada L8L 5H2
K-W C.C. Club, Peter Karowski, 23 Hudson Cr., Kitchener, Ontario, Canada N2B 2V7, phone (519) 579-2953
Durham 80-C Computer Club, Gary Collins, P.O. Box 1387, Station B, Oshawa, Ontario, Canada L1J 6P8
Patricia Jackson, 33 Killdeer Cres., Toronto, Ontario, Canada M4G 2W7, phone (416) 425-1116
Toronto C.C. Users Group, Gordon Dueck, 2 Waring Court, Willowdale, Ontario, Canada M2N 4G7, phone (416) 225-5811
- FINLAND**
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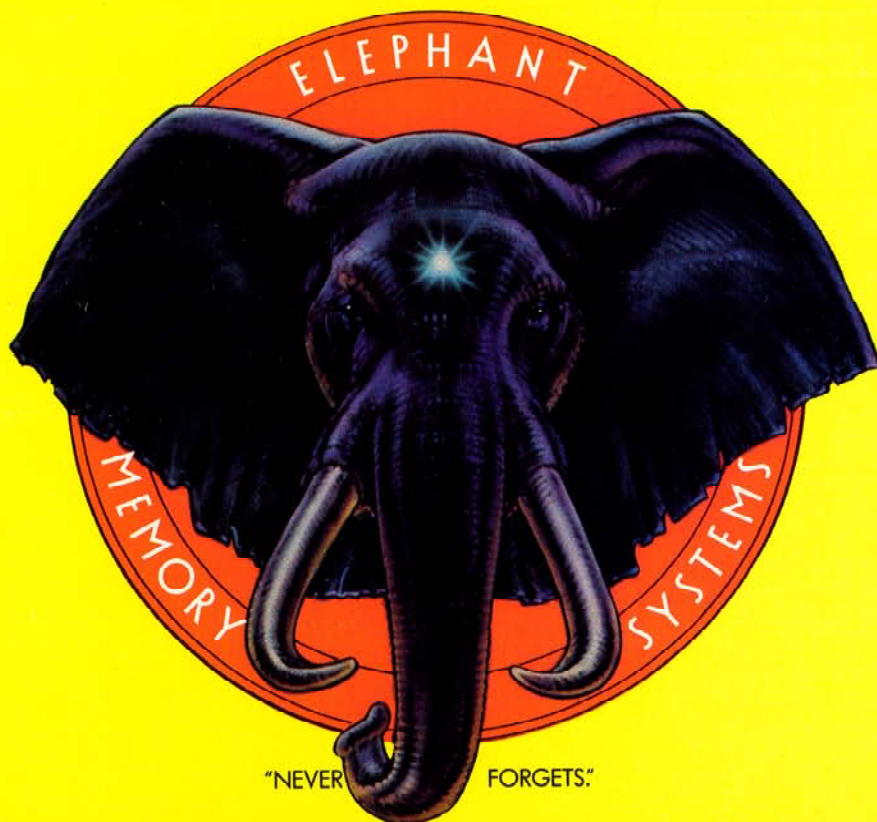
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