Business & Stocks Issue

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January 1984 USA $2.95

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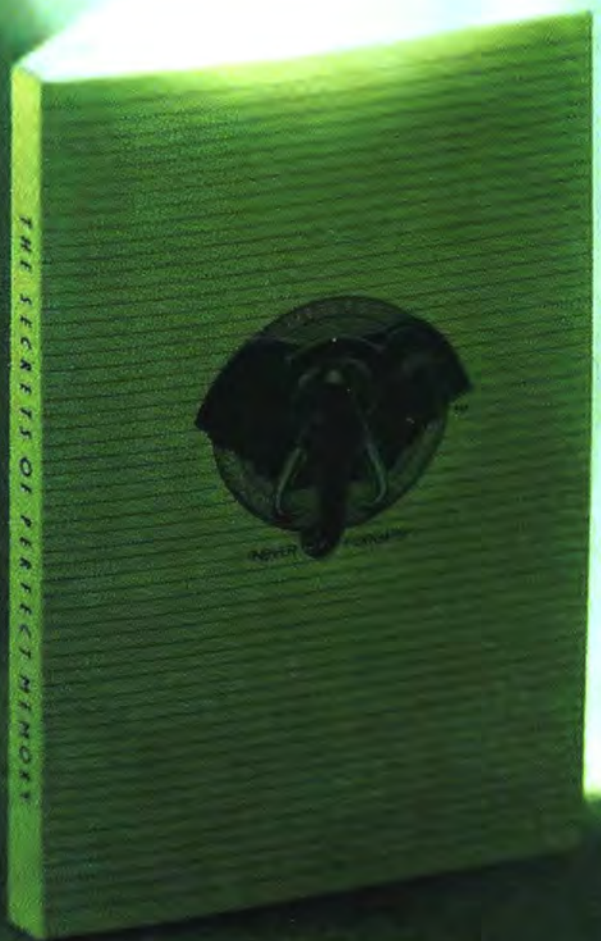

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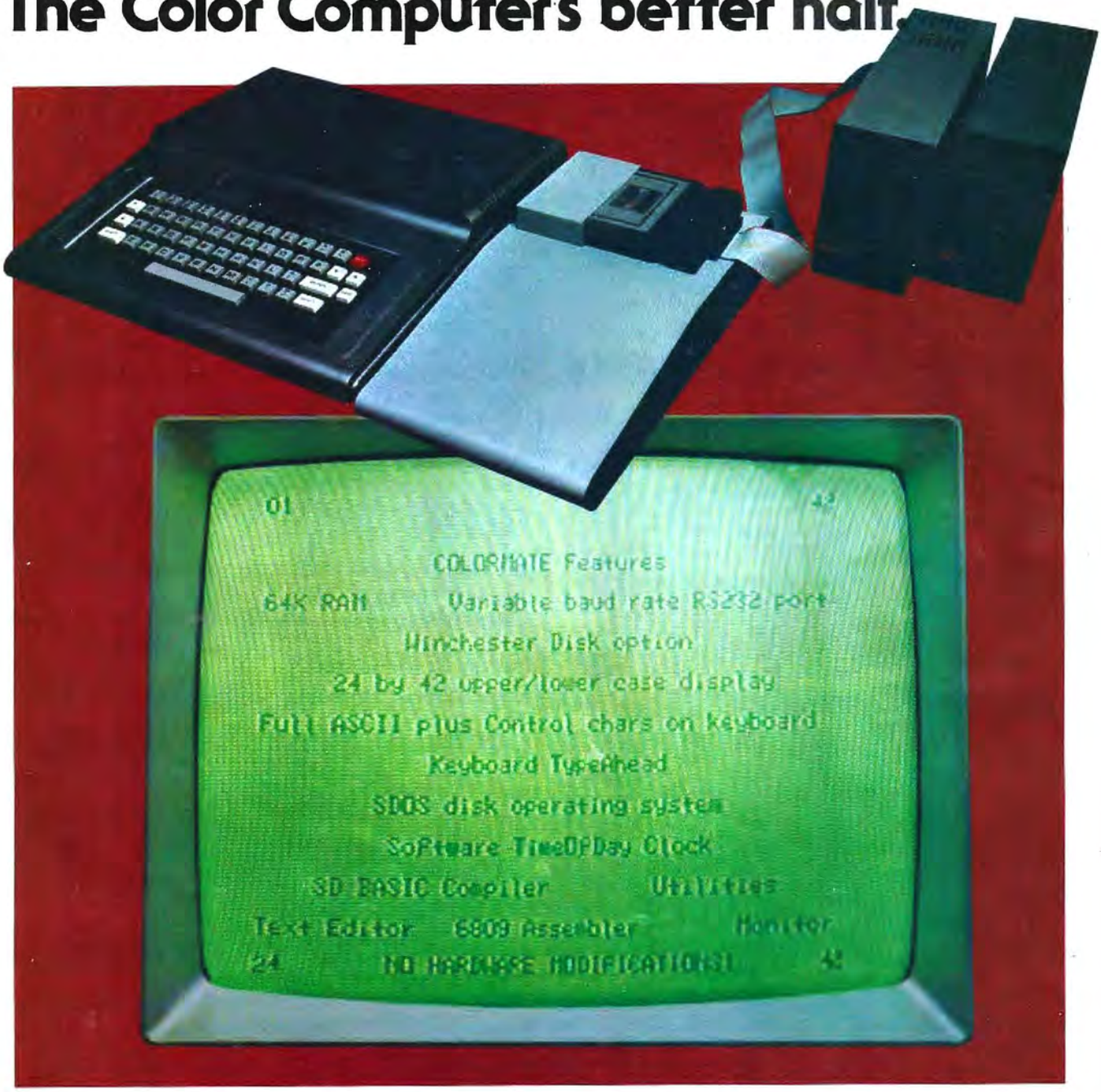

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HOT CoCo

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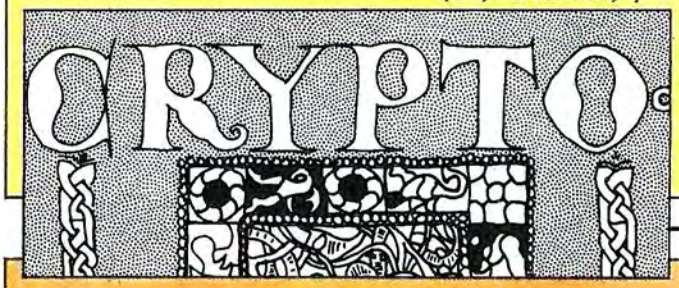

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DIGRESSIONS

WHAT DO YOU DO ABOUT SOFTWARE PIRACY?

One of the hottest (no pun intended) topics in the computer press of the past year is software piracy. This plague is just as prevalent in the Color Computer circle as in the rest of the industry. It costs you, the reader, money because it cuts into vendors' sales, and it discourages those vendors from investing in new, more exciting software for your CoCo.

Software piracy takes many forms. The most extreme case is when someone copies software while intending to resell at a lower price. Yet this is not the most damaging kind of piracy to the CoCo software industry. What hurts most is the guy who buys a piece of software and does a "favor" for a friend by giving him a copy.

Well intentioned or not, this "favor" is theft. True, most people cannot afford all the software they'd like to own and much software is overpriced, but using these facts as justification for "freebies" doesn't wash. And some people would like to make it harder for users to get these freebies by restricting promotion of the numerous copy utilities.

Vendors protect software to keep honest people honest; any dedicated pirate can break any protection scheme without the aid of a back-up utility. But while protection schemes might keep most novices from backing up software, they also create real problems for the legitimate user.

How does a user put his favorite utility on all his system disks if it's protected? How does a user transfer all his copy-protected tapes to disk when he upgrades his system? How does a user preserve his software investment by making back-ups if that software is protected? Copy utilities were written for the legitimate software owner with the above problems, not for the software pirate.

It's easy to sympathize with those who oppose copy software, because that software has the potential to be abused; it's just as easy to make an illegal copy of a program with this software as it is to make a legal copy.

So, should all copy utilities be censored? Will censoring all software with the potential to be abused in this way solve the problem of software piracy? No and no. The root of the problem lies with the user who thinks nothing of copying a program and giving it away. You don't see Radio Shack pulling its tape recorders off the shelves because too many Rolling Stones albums have been pirated. You don't outlaw technology to solve a problem in human attitude.

What must be done is to educate the Color Computer public about how software piracy damages their hobby. The trend in many computer clubs to write antipiracy rules into their bylaws is a commendable step in this direction.

HOT CoCo will publish ads that promote copy utilities as long as those ads emphasize only the legitimate uses of that software. We have published programs that copy protected software, and we might well do so in the future, but only in conjunction with a legitimate application.

We strongly urge that all computer clubs discourage members from unethical copying. If your club has a software library, encourage your members to use it rather than accept illegitimate copies. If your club has a statement of policy against piracy, let us know when you submit your listing for publication in *HOT CoCo*. If you have no such statement of policy, you owe it to your members and the CoCo software industry to adopt one.

Software companies should do all they can, within reason, to make illegal copying as unappealing as possible. If they protect their software, they should provide quick, inexpensive replacements for blown media. They

should offer documentation and software upgrade service for those programs that require it, so the buyer feels he is getting more than just a piece of software.

But you bear the ultimate responsibility. You are an honest lot, by and large, and very enthusiastic about your computer hobby. Software piracy is like the "Death of 1,000 Cuts"; one "cut" won't kill the individual, but enough of those little cuts drains the life-blood. Don't fool yourself if you accept illegitimate software by rationalizing that your one transgression can't hurt. There are perhaps hundreds of other users in the Color Computer public with the same thought.

The Color Computer Means Business

This month *HOT CoCo* shows you ways to make your Color Computer pay its keep. This issue focuses on ways to manage and make money with your CoCo.

Computers are good at doing "what if" projections, and the Color Computer is no exception. And what better topic with which to do "what if" projections than the stock market? Howard DePol and Jim Barbarello wrote "Stock Transactions Tracker," p. 58, to not only keep accurate records of stocks the user owns, but to predict the outcome of potential transactions.

Are you a salesman? If you are, you probably have to juggle a lot of information about accounts, orders, and prices. "Active Negotiations," by Charles Levinski, p. 66, has proven itself in the field. You can adapt it to a number of other applications, as well.

Need some help managing your personal money matters? We have two articles that will help you. Richard Tucker has a simple, yet effective program that figures interest, principal, and term of any personal loan (p. 110). Carl Christensen's "Computing Your Future," p. 52, tells you how to plan for retirement.

We've got some work savers this month, too. Gerald Sprouse has a good mailing-list program for disk users that's suitable for a club, church, or small business (p. 88). Mike Charlton's "CoCo Payroll" takes the drudgery out of figuring the payroll for a small business. Glen Tapanila's "Show as You Go," p. 80, demonstrates a clever technique for making more effective graphic presentations.

Thinking about buying a data-base manager? Read James Perotti's "Data-Base Managers and the Small Business," p. 46, first. It will give you insight as to how a data-base manager can help you and what to look for when shopping for one.

But Wait, There's More...

Re:FLEX, p. 138, returns this month with its new author, Scott Norman. Scott takes a look at two Basics available only with the FLEX operating system. Scott's column will be the one to read if you are going to invest in either FLEX or the new OS-9 operating systems.

Due to space limitations last month, we were unable to publish Part III of "Journey to the Center of the ROM," by Mark Goodwin. It appears this month on p. 114. Again due to space limitations, Reader's Forum was sacrificed this month for other material and will return next month.

Mark Silverblatt's "Colormania" series begins this month, and it will concentrate on Assembly and advanced Basic programming. Mark starts off the series slowly with an introduction to number systems. Here's your chance to get started programming in Assembly.

Let's Hear from You!

What's your favorite column in *HOT CoCo*? What's your least favorite? Why? What are the individual articles that you've liked or disliked? What should we be doing that we are not?

We have a lot of questions that only you can answer. We are serious about making *HOT CoCo* your magazine, so please tell us your impressions by dropping us a note at Pine St., Peterborough, NH 03458. We'll thank you for your input.—*M.N.* ■

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The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *HOT CoCo*, you should make this change.

HOT CoCo formats its program listings to run 64 characters wide. This accounts for the occasional wraparound you will notice in our program listings. Don't let it throw you, particularly when entering Assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: *HOT CoCo* Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of our writer's guidelines. Payment for accepted articles is made at a rate of approximately $50 per printed page; all rights are purchased. Authors of reviews should contact the *HOT CoCo* Review Editor, 80 Pine Street, Peterborough, NH 03458.

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Feedback

No Junk In Elmer's Arcade

As a computer science major who works at the college computer center, redoing code in several languages, I hate to come home and begin typing in a published program listing, only to find several lines of unneeded code that could be replaced by one GOSUB.

On the other hand, Richard Ramella should be commended for an outstanding display of structured programming in "Elmer's Arcade." That's efficient programming.

I noticed one odd thing about the game, "Sprinks." On my computer, the dot stops when I release the key pressed, but on my dad's computer the dot continues to move.

I found that the rollover table on his machine does not reset itself. If anyone else has this problem, they can make the following change:

```
505 FOR Z=1 TO 4 : POKE 340+Z, 255
  : NEXT
```

This change slows the program, but it's almost unnoticeable.

Douglas James III
Baconton, GA

Literacy Plus+ Call for Participation

The Arizona State University College of Education is hosting the fourth annual Microcomputers in Education Conference, "Literacy Plus+," March 15 and 16, 1984.

The two-day conference emphasizes practical, creative ideas for successfully using computers in all aspects of education. There will be introductory presentations for those with little computer knowledge.

On the 13th and 14th there will also be a preconference on Microcomputers and the Writing Process. The preconference will feature symposiums, research presentation, reports of ongoing studies, discussion of actual classroom experiences, and hands-on word processing workshops.

The 14th is also scheduled for sharing experiences and research findings on other topics concerning microcomputers in education.

We are soliciting papers for the conference and preconferences. Contact Ruth Camuse at the address below for speaker-proposal forms.

Vendors interested in securing a booth should contact Donna Craighead, conference codirector.

Ruth A. Camuse
Conference Codirector
College of Education
Payne B 47
Arizona State University
Tempe, AZ 85287
602-965-7363

Modified "Doculist/C"

James Barbarello's article, "Doculist/C" (*HOT CoCo*, June 1983, p. 58), was worth the whole year's subscription price, not only because it has been a great aid in developing and debugging programs, but also for what it taught me about the workings of my CoCo. The "Galaxy Trek" adventures of later issues have also been popular with my whole family.

Readers should note that Doculist/C will spot the kinds of problems (leaving out required spaces in Basic) that Howard Culbreth discussed in "Reader's Forum" in the September issue (*HOT CoCo*, p. 44). If Doculist/C doesn't add a space between a variable and a Basic expression, you might get a syntax error.

If you examine the numbers in memory, you'll find the ASCII codes instead of a token. For example, if you enter IF X=YTHEN..., you'll find 133 88 179 89 84 72 69 78... in memory.

```
63000 ' DOCULIST2  DOCULIST/C:V1
.2 MODIFIED
63005 PRINT#-2,CHR$(27)"N"CHR$(6
)
63010 CLEAR500:CLS:PRINT;PRINT"
   doculist - INIALIZING":GOSUB6
3290:PRINT:PRINTTAB(12);"PRINTIN
G.":PRINT:SA=PEEK(25)*256+PEEK(2
6):FA=PEEK(27)*256+PEEK(28):LA=S
A
63015 INPUT"STARTING LINE NUMBER
";D
63020 NA=PEEK(LA)*256+PEEK(LA+1)
:LN=PEEK(LA+2)*256+PEEK(LA+3)
63022 IFD=0THEN63030ELSE IF D=LN
 THEND=0:GOTO63030
63024 LA=NA:GOTO63020
63030 IF LN=63000 OR NA=0 THEN E
ND
63040 TXT$=STRING$(10-LEN(STR$(L
N)),32)+STR$(LN)+" ":CNT=11
63050 FORI=LA+4 TO NA-2
63060 C=PEEK(I):IF C=34THENQ=0
63070 IF C<128 AND C<>58 ORQ=-1T
HEN TXT$=TXT$+CHR$(C):CNT=CNT+1:
GOTO63170
63080 IF C=58 THEN 63200
63090 ' BYTE IS TOKEN,SO CHECK
63100 IF C=255 THEN I=I+1:C=PEEK
(I)-50 ELSE C=C-128
63110 IF C=2 OR C=3 THEN Q=-1
63120 ' DECODE TOKEN
63130 IFRIGHT$(TX$,1)<>" "AND RI
GHT$(TX$,1)<>","THENTX$=TX$" "
63140 FORX=A(C) TO A(C)+9:FI PEE
K(X)>128 THEN 63160
63150 TXT$=TXT$+CHR$(PEEK(X)):CN
T=CNT+1:NEXTX
63160 TXT$=TXT$+CHR$(PEEK(X)-128
)+" ":CNT=CNT+1
63170 IF LEN(TX$)>69 THEN GOSUB6
3240
63180 NEXT I:LA=NA:GOSUB63240:GO
TO63020
63190 ' CHECK COLON
63200 IF PEEK(I-1)<>58 AND PEEK(
I+1)=131 THEN 63170
63210 IF PEEK(I+1)=58 THEN I=I+1
:C=PEEK(I):GOTO63210
63220 GOSUB63230:GOTO63170
63230 ' PRINTROUTINE
63240 IFLEN(TXT$)>69 THEN PRINT#
-2,LEFT$(TXT$,70):TXT$=STRING$(1
2,32)+RIGHT$(TXT$,LEN(TXT$)-70):
CNT=13:GOTO63270
63250 IF LEN(TX$)>12THENPRINT#-2
,TXT$
63260 TX$=STRING$(11,32)+":":CN=
12:Q=0
63270 RETURN
63280 ' FILL TOKEN ARRAYS
63290 DIMA(111):A(0)=43622:J=1
63300 FORI=43622TO43822:IFPEEK(I
)>128THENA(J)=I+1:J=J+1
63310 IFJ<53THENNEXT
63320 A(53)=33155:J=54:FORI=3315
5TO33355:IFPEEK(I)>128THENA(J)=I
+1:J=J+1
63330 IF J<78THENNEXT
63340 A(78)=43802:J=79:FORI=4380
2TO44000:IFPEEK(I)>128THENA(J)=I
+1:J=J+1
63350 IFJ<98THENNEXT
63360 A(98)=33309:J=99:FORI=3330
9TO33500:IFPEEK(I)>128THENA(J)=I
+1:J=J+1
63370 IFJ<112THENNEXTELSERETURN
```

Program Listing. Doculist/C Enhancement

The HJL-57 Keyboard

Compare it with the rest. Then, buy the best.

If you've been thinking about spending good money on a new keyboard for your Color Computer, why not get a good keyboard for your money?

Designed from scratch, the HJL-57 Professional Keyboard is built to unlock ALL the potential performance of your Color Computer. Now, you can do real word processing and sail through lengthy listings...with maximum speed; minimum errors.

At $79.95, the HJL-57 is reasonably priced, but you can find other CoCo keyboards for a few dollars less. So, before you buy we suggest that you compare.

Compare Design.
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440

The Program Listing is a modified version of Doculist/C. I used it with my Epson MX-80 printer with tractor feed. I've made two changes. First, adding line 63005 and deleting all of 63270 except RETURN lets you print the complete program and doesn't require your continuous attention.

Line 63005 sets up the Epson printer to count lines, skip the last six, and go to the top of the next sheet automatically. Another printer might require a different code.

Also, adding lines 63015, 63022, and 63024 causes the listing to begin with the specified line number. Entering a zero starts the listing from the first line of the program. Used with the break key, this allows you to print out any segment of the program.

Alan Derkacs
Fountain Hill, PA

Changes in the CMI and BioBox

I've found a problem that will affect a number of readers who attempt to use my CMI ("Real-World Applications—Part I, the CMI," *HOT CoCo*, September 1983, p. 82) and BioBox ("Real-World Applications—Part II," *HOT CoCo*, October 1983, p. 38).

Both projects use the CoCo's cassette port for input and output interface. The problem occurs in sensing the output of the interface (input to the CoCo).

The CoCo uses a zero crossing detector circuit to sense when a change in input level has occurred. With no input to the CoCo, the input to the comparator portion of the detector is supposed to be at a positive level.

Thus, when a negative signal is applied, it combines with the reference and the resultant level crosses zero and goes negative. This triggers the comparator, whose output changes from low (0) to high (1). When the signal changes and goes positive, the comparator switches again, producing a low (0) output.

However, in my CoCo, the no-input condition has the comparator input negatively biased. I've concluded this is due to tolerance variations in the resistors that bias the comparator. When either the CMI or BioBox produces a positive trigger pulse, the CoCo senses it because it changes the state of the comparator.

If, however, the theoretical condition of initial-positive biasing exists, a positive pulse does nothing (since the comparator input must go negative to do something). The result is that the BioBox produces immediate faults, and the CMI indicates "out of range."

Now I've developed (and verified on both CoCo versions) easy fixes. They are not as elegant as the original designs, since they require the construction and use of a cable to connect to the joystick port. They are simple, however, and require only removal of some components and a very minor change to the programs.

The information here tells if you need the change and exactly what to do.

CMI Changes

Color Computer variations can affect proper operation of the CMI. Technically, the output of the CMI is provided to the CoCo's cassette input circuitry. This circuitry contains a comparator (U14) in which the input should be biased low when no input is present. The CMI output can then signal the CoCo by providing a high level to U14. Due to component variations within the CoCo, the no-input bias might already be high; then the CMI cannot signal the CoCo.

Check your CoCo by entering PRINT PEEK(65312). It will return either a 2 or 3. If your CoCo returns a 2, you must modify the CMI and Capmeter program as follows:

- Locate, remove, and discard capacitors C1 and C2 and resistors R5 and R6. Obtain two 2.2K (2200 ohm), 1/4-watt resistors.
- Locate and remove jumper J and reinstall in the two holes C1 vacates. Install a 2.2K resistor in the holes J vacates (the holes that C2, R5, and R6 vacate remain unoccupied). Note the two pads to which J2 (black) is connected. Tack solder one end of a 2.2K resistor to one of these pads. Tack solder the other end to the other pad (this places the 2.2K resistor in parallel with J2).
- Obtain a six-pin (stereo) DIN plug

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Feedback

(Philmore EA-9 or equivalent), a 1/8-inch phono plug, and 2 feet of two-conductor wire. Call one conductor A and the other B.

Attach one end of conductor A to pin 4 of the DIN plug (refer to the numbers on the DIN plug). Attach the other end of conductor A to the tip (shortest) lug of the phono plug. Attach one end of conductor B to pin 3 of the DIN plug. Attach the other end to the ring (remaining) lug of the phono plug. You have just constructed a CMI cable.

- Load the CMI program and list line 30. Note that the last three DATA values are 254,186,255. Change these values to 1,180,255. Similarly, the first three DATA values of line 40 are 32,129,254. Change these values to 0,129,1. Save the modified program.
- If you have a 32K CoCo and you experience an out-of-memory (OM?) error when you run the program, retype lines 10 and 50 as follows:

```
10 CLS 5:CLEAR 200,32127:DEFUSR=
32128:R(1)=10:R(2)=0.1:C(1)=9
50 FOR I=32128 TO 32170:READ M:POKE
I,M:NEXT I
```

To use your modified CMI, load and run the modified program. Insert your cassette cable's large grey plug into the BioBox jack marked "grey" as before. Insert the CMI cable's DIN plug into the CoCo's right joystick jack. Insert the CMI cable's phono plug into the BioBox's black jack. All other operations remain unchanged.

BioBox Changes

The BioBox operates the same as does the CMI. Perform the same check, and if your CoCo returns a 2, make the following BioBox and Bio program modifications:

- Locate and remove capacitor C2. Form a jumper from a short length of wire and install in the two holes C2 has vacated.
- Locate and remove transistor Q3. Form a jumper from a short length of wire and install in the two vacated holes closest to J3 (black). The third vacated hole remains unoccupied.
- Perform the same modifications as given in the third step for the CMI. You've just constructed a bio cable.
- Load the Bio program and list line 50. The last three DATA values are 254,186,255. Change these values to

1,180,255. Similarly, the first three DATA values of line 60 are 32,129,254. Change these values to 0,129,1. Save the modified program.

● If you have a 32K CoCo and you experience an OM? error when you run the Bio program, retype lines 10 and 70 as follows:

```
10 CLEAR 1000,32127:DIM T(50,3):
DEFUSR=32128:DEFUSR1=32173
70 FOR I=32128 TO 32197:READ M:
POKE I,M:NEXT I
```

Use this modified BioBox just as you do the modified CMI. All other operations remain unchanged.

James Barbarello
Englishtown, NJ

Looks Like We (Err...)

Goofed

Ed. note—There were two errors in our November 1983 issue that we'd like to correct.

The System Requirements box for "Smashout" should include an SDS80C Editor/Assembler (Micro Works).

The lines referred to in the last full paragraph on page 77 of "Colorful Cryptology—Part III" should be 100–130, and not 130–170.

Sorry.

"Give Your Computer Some Character" Change

Line 02550 on page 112 of "Give Your Computer Some Character" (*HOT CoCo*, September 1983, p. 104) contains an error. Change it to 00.

Also, when I upgrade my 16K CoCo to 64K, will all my old programs and those designed for 32K run on it?

Christopher Waters
Harvey, LA

They should.—eds.

Joysticks And the CMI

Anyone building the capacitance meter interface described in "Real-World Applications—Part I, the CMI" (*HOT CoCo*, September 1983, p. 82) should know that the CMI might not work if your joysticks are plugged in.

The CMI uses the cassette port, which shares some circuitry with the joystick inputs, and these can interfere with each other. As far as I can tell, the joysticks prevent the cassette input from falling to zero volts. If a call to USR(0) immediately returns a zero no matter what you do, this is probably why.

I'm looking forward to more "Real-World Applications."

Robert L. Hawkins
Columbus, OH

Where's the Bug?

I was very pleased to find Ken Knecht's article, "CoCo Word Processor" (*HOT CoCo*, June 1983, p. 36).

However, I've found a problem in Program Listing 2, and I haven't been able to solve it. The program prints at least one line of a block or indented form letter one character to the left of the margin.

I've spent several hours reviewing the program and can't find the reason for the problem. I'd appreciate any help anyone can give.

David B. Newell
Sedalia, MO

You're the third person to tell me about this problem. One reader even tried having the computer print the value of the variable LM before printing each line. This variable, as TAB(LM), positions the start of each line. Even when the line started one character to the left, the value of LM did not change. Thus, a change in LM was not the problem.

Next, he tried replacing the TAB(LM) with a string of X's the same length as the TAB(LM). This time the computer dropped one of the X's. This indicated to me that there must be a bug in Basic's print routine.

The problem does not appear to be in the program, at least according to the tests and the fact that only three readers have mentioned it. But a bug in Basic doesn't sound right either, because I've never heard of a similar problem in any other program. I'm stumped and would welcome any help.

Incidentally, the TAB(LM) appears in lines 163, 165, 220, 230, 710, 810, and 1010 of Listing 2 (p. 37). Only line 710 should be able to cause the problem. Also, the problem only occurs in the first line of a document, or in the first line after a blank line. Perhaps this is a clue.

Since the length of the justified line is correct, the computer does not appear to be tacking a CHR$(8) on the beginning of the affected line.

Ken Knecht
Yuma, AZ

Space Race

I must disagree with Beth Norman's evaluation of Space Race from Spectral Associates.

As a home version of the arcade game, Omega Race, Space Race is a good duplication, although the controls are a bit touchier and the action slightly faster than in the arcade version. But I've found Space Race one of the most challenging CoCo games I've played.

Rotate/thrust-type keyboard controls, as used in Space Race, are always difficult to learn at first. I had problems getting the ship to do what I wanted, and it did take a long time, but now I can zoom it around just fine. But once you learn to use the keyboard controls, they give much more control than do joysticks.

In my opinion, Space Race deserves a challenging rating, and not the poor one you gave it.

Alexander Beneson
New York, NY

It is perfectly possible for a game to be challenging, even maddening, and still be good. I am not reluctant to give high ratings to a game I find difficult.

The problem with Space Race, in my opinion, is that there is nothing about the game that draws me into it—nothing that makes me want to get better. Its internal reward structure, whatever it may be, is lacking.

Beth Norman

Classifying the Colors In Multicolor Graphics

In Kenneth Anderson's article, "Introduction to Multicolor Graphics—Part II" (*HOT CoCo*, September 1983, p. 62), he states that there is a

logical method to find colors in his program.

The numbering system he described is essentially counting in base five, and it is a simple matter to let the computer do the work. Enter the following lines to make the task of classifying colors much easier:

```
145 FOR CP=1 TO I-1: C(CP)=1: NEXT
180 ' LOGICAL ORDER OF SELECTION
190 CP=I
200 C(CP)=C(CP)+1: IF C(CP)=5 THEN
C(CP)=1: CP=CP-1: IF CP=0 THEN
END ELSE 200
```

Gary Teter
Paradise, CA

"Give Your Color Computer Some Character" With Disk Basic

In my article, "Give Your Color Computer Some Character" (*HOT CoCo*, September 1983, p. 104), I mentioned that you could modify the program to run on Disk Basic. Enough readers have written to ask how it's done, so I thought I might share the information with everyone.

Modify the original program as follows:

- Change line 440 to DSET EQU $BC.
- Change line 450 to SBEG EQU $BC.
- Delete the SEND reference.
- Change line 710 from $8CF1 to $C58F.
- Change line 1040 from RTS to JMP $CB4A.
- Change line 1340 from PSHS B to CMPB #24 and delete lines 1350–1370.
- Insert these lines:

```
1421  TFR   X,D
1422  ADDA  #24
1423  PSHS  D
1561  PULS  D
```

- Replace the two <SENDs in lines 1500 and 1550 with ,S.

This patch does, however, eliminate the possibility of the Apple mixed-mode emulation and all other non-four-line formats. To this end, I've revised my program entirely, so that all the original modes are supported under both Disk and Extended Color Basic.

I've also written a new version that allows 51 characters per line, although this is slightly less legible. In addition, the clear key now clears the screen.

I'm offering cassettes with these programs in object code for $5. One side has the 42-character version, while the other has the 51-character version. Specify Disk Basic or Extended Color Basic when ordering.

Thomas Rokicki
Box 258
College Station, TX 77841

Copy That Screen

"Print That Trace" (*HOT CoCo*, June 1983, p. 64) was very helpful in debugging my programs, and I thought there might be some interest in the following routine to copy the text screen to the printer:

```
15 FOR P=1024 TO 1535
20 C=C+1: IF C=33 THEN C=1: PRINT
#-2,""
25 X=PEEK(P)
30 IF X>127 THEN X=42
35 IF X<=31 THEN X=X+96: GOTO 45
40 IF X>=96 THEN X=X-64
45 PRINT #-2,CHR$(X);
50 NEXT P
55 PRINT #-2,""
```

It will not copy a graphic character, so I changed my graphics to an asterisk in line 30.

Jim Burridge
Thomaston, ME

Correct "Inverted Video Modification"

There was some incorrect information in my article, "Inverted Video Modification" (*HOT CoCo*, September 1983, p. 94).

For the quick modification, lift pin 32 of IC U7 (a 6847) from the socket. If leaving this pin up doesn't invert the video, just tie it to ground.

For the complete modification, lift pin 32 of IC U7, and pins 1 and 2 of IC U29 (a 74LS02). Then connect pin 32 of U7 to pin 1 of IC U2, and connect pin 2 of U29 to pin 2 of U7 (note—don't lift pin 2 of U7).

That's all you need for the modifications. Pin 16 of IC U29 doesn't exist, and you don't lift pin 3 of U29.

As far as the new F board is concerned, I've received conflicting information about the correct IC numbers. Just look for the 6847 and the 74LS02 on the PC board.

John G. Skora
Shoreham, NY

"Submarine Simulation" Fix

I noticed that the printer dropped a few bytes in line 1420 of my "Submarine Simulation" article (*HOT CoCo*, November 1983, p. 109). The line should read as follows:

```
1420 OC$="": IF R(2)>0 THEN SW=1
```

Also, if you want to use the program with a disk system, make these changes: Change line 10 to GOTO 9905, and remove POKE 65495,1: in line 9905.

This removes the break-key disable function and high-speed operation that is not compatible with some disk systems.

William S. Bonnell
Rochester, NY

"Galaxy Trek Adventure 2," Change 2

Please make the following line changes in "Galaxy Trek Adventure 2" (*HOT CoCo*, September 1983, p. 72):

```
1000 A$=A$+"     ":V$=LEFT$(A$,3):
N$="":FORI=3TOLEN(A$):IFMID$
(A$,I,1)=" "THENN$=MID$(A$,I+1,4):
NQ$=MID$(A$,I+1,LEN(A$)-4-I):
I=255:NEXTI:ELSENEXT I
1007 IFVN=7THEN2100
2100 IFN$="ENER"ANDCL=28THEN
2115
2110 B=300:GOSUB2050:PRINTNQ$:
GOSUB2050:GOTO850
```

I've included these changes in an errata sheet and sent it to all who have purchased the tape of Adventure 2. My apologies for any frustration!

Howard F. Batie
12002 Chevoit Drive
Herndon, VA 22070

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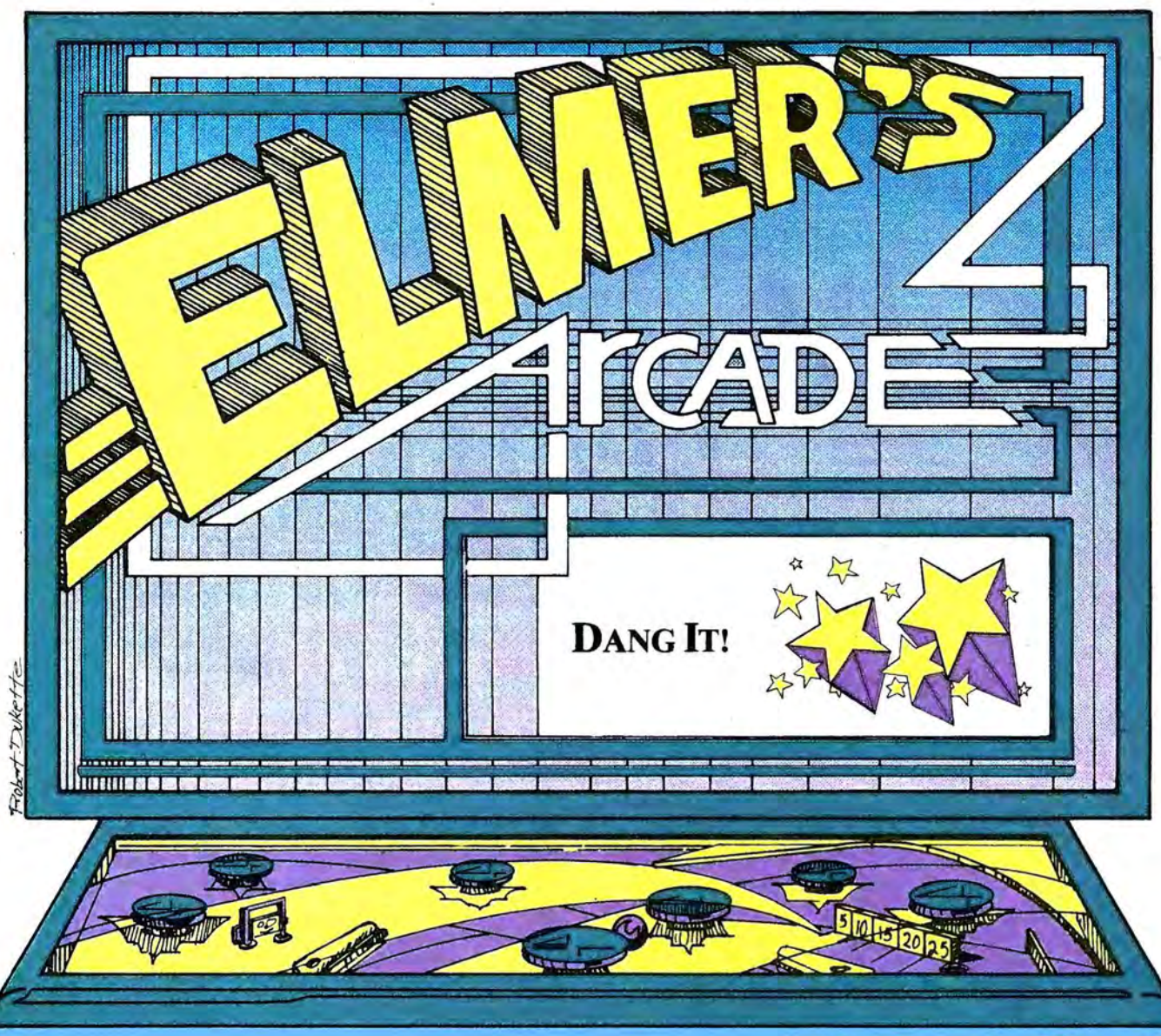

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instant CoCo

by Richard Ramella

Elisa the Puzzle Lady was at Elmer's joint last week. I was glad to see her. I like puzzles as much as I like arcade games.

"Talk some sense into this man," she said, pointing at Elmer. "Look at this puzzle and tell me that it's not a winner."

"I still have puzzles left over from your last visit that I haven't sold," Elmer complained.

"So, we'll put it on consignment," said Elisa, pressing the puzzle into my hand.

It was a little plastic gizmo with a window in the front.

"What do you do with it?" I asked.

"Try to put the little BBs in the slots at the top."

"Whoa! These things run uphill." With a distinct sense of vertigo I tilted the puzzle box slightly and every BB in the box climbed toward the top in contravention of the law of gravity.

"Let me see that!" Elmer grabbed for the puzzle.

"Wow!" I said, keeping it out of his reach.

"I'll take a dozen," he said to Elisa.

While Elisa wrote up the order, I figured out why the BBs ran uphill (or seemed to). "Look," I said, "there's a mirror at a 45-degree angle in this thing. You work the puzzle sideways and backwards to move the BBs to the top. The BBs roll around on a plane parallel to the ground, and the mirror makes it appear that they're frolicking around the far wall."

"It's a trick then," said a disappointed Elmer.

"All life is a puzzle, my friend, but

the trick is only in your mind," said Elisa, whisking Elmer's money out of sight. He had apparently forgotten the part about consignment.

Elmer tried the puzzle. "I like it," he said unsurely. "It's kind of like a miniature arcade game."

"Now you know why I come here," said Elisa as I gently took the gadget

System Requirements

4K RAM
Extended Color Basic
or Micro Color Basic (MC-10)

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from Elmer's hands.

"Hey, give me that," he told me.

I drew back the puzzle. "I want it. I'm going to write a computer game."

"Sure," said Elmer. And to Elisa: "How much do you get for these wholesale?"

"A half-dollar each."

"That'll be a buck," said Elmer.

"But it's shopworn," I protested. "And it will wipe me out as far as play time goes."

"We'll put it on the tab," said my good and trusting friend.

The little puzzle box inspired me to write Dang It!, a moving strategy game of colors that climb a wall. If I did my job right, you'll also be climbing the wall and saying "Dang It" as Elmer does when he fumbles around with the little puzzle.

Also, this game can teach you something useful about graphic PEEK and POKE commands on your CoCo or Micro CoCo—the MC-10.

Dang It! begins with a white playing square drawn on the screen. Randomly, blocks of color sweep from the left or right at the bottom of the field. To release a color to climb the wall, press any key except break or shift. The color will go and stick to whatever it hits.

If the released color sticks in a position where the color is the same above it or to either side, the game ends. It's simple at the start, but becomes more complex when the playing field becomes increasingly crowded, and the colors crossing the bottom of the screen begin to speed up.

The highest possible score seems to be 324 (27 across by 12 down). You get one point for every color that goes up and doesn't come in contact with the same color. You lose one point if you allow the color choice to run all the way across the bottom of the screen without sending it up. The top-left of the screen displays your current game's score while the top right displays the high score for the series.

When the game ends a game-over message appears at the bottom left of the screen, and a tone sounds. To start the next game, press any key except break or shift.

One final playing tip. If a white playing piece is the first to cross the bottom, there's no place to put it because the frame is white. So take the lost point and stay viable.

I think you have to become somewhat monomaniacal about this game to score higher than 50. That throws down the gauntlet rather forcefully, doesn't it?

More on PEEKs and POKEs

PEEK and POKE graphics are what make this program work.

First thing to do is write down the RAM location for the text display number. If you have an MC-10, this magic number is 16384. On my 16K Extended Color Basic machine, the number is 1024. In both program listings for this game, R is given the respective values for POKE and PEEK graphics in line 240. Both numbers are the zero position on the screen display.

This short program explains POKE and PEEK:

```
100 REM * POKE-PEEK LECTURE *
110 CLS
120 R = 1024
130 INPUT "NUMBER 1 TO 255";X
140 CLS 0
150 POKE R + 232,X
160 PRINT PEEK(R + 240);
170 FOR T = 1 TO 1000
180 NEXT T
190 CLS
200 GOTO 130
210 END
```

MC-10 users, change line 120 to:
120 R = 16384

Run the program and enter a number 1–255 when prompted. The program POKEs the graphic to the middle of the screen. The POKE is achieved by adding the value of R to the screen position 240 (just like the PRINT@ 240 screen position). The numbers 1–255 are the ASCII decimal codes for the characters POKEd to the screen.

CoCo owners, see pages 280, 281, and 276 of *Getting Started with Color Basic*. MC-10 owners, see pages 115, 116, and 118 of *TRS-80 MC-10 Micro Color Computer Operation and Language Reference Manual*. These manuals provide text and graphics characters.

Back to "Dang It!"

Now back to the little program. Line 160 prints the ASCII value of the character. The command to PRINT PEEK(R + 240) displays the ASCII number of the character you just POKEd. It doesn't parrot the number you entered. It examines the screen position R + 240 and finds the value of the character printed there. Then it tells you that value.

It also works for PRINT@ graphics, but you have to add in the magic number for the PEEK test. Example: PRINT@ 32,CHR$(255) can be tested in Extended Color Basic with the command PRINT PEEK(1024 + 32). It returns the ASCII decimal code for what's at screen position 32 (in this case, an orange block).

Now that you see what it does, let's look at Dang It! to see how you can use it. The line numbers I refer to are the same in both listings.

In lines 270–290, I POKE in the top and sides of the white playing square.

I've found PRINT@ graphics faster than POKE graphics on the

✓ See List of Advertisers on page 131

Program Listing. Dang It!

```
100 REM * BROKEN FIELD NIGHTMARE
 * TRS-80 COLOR COMPUTER *
110 REM * COLOR BASIC, EXTENDED
COLOR BASIC, MC-10 BASIC
120 REM * ELMER'S ARCADE # 8 / R
ICHARD RAMELLA
130 Q=1024
140 REM *** FOR MC-10 MAKE LINE
100 Q=16384
150 CLS0
160 PRINT @ 133,"BROKEN FIELD NI
GHTMARE ";
170 FOR T=1 TO 1000
180 NEXT T
190 CLS0
200 M=10
210 H=301
220 U$=CHR$(94)
230 D$=CHR$(10)
240 L$=CHR$(8)
250 R$=CHR$(9)
260 A$=CHR$(246)
270 Z$=CHR$(233)
280 FOR A=160 TO 190
290 IF A=160 THEN FOR B=A TO A+3
20 STEP 32: PRINT @ B,CHR$(207);
: PRINT @ B+30,CHR$(175);: NEXT
B
300 PRINT @ A,CHR$(207);
310 PRINT @ A+320,CHR$(207);
320 NEXT A
330 PRINT @ 15,"TIME:";H-N-1;
340 PRINT @ 47,"TACKLERS:"M;
350 FOR T=1 TO 1000
360 NEXT T
370 FOR C=1 TO M
380 PRINT @ 163+RND(9)*32+RND(26
),Z$;
```

Listing continued

Color Computers, so I use PRINT@ in line 440, which is part of a loop that takes the player graphics in either direction.

The next important thing that happens is in line 560, a PEEK test. This line reads, "If the position north of the current position of the upward flying color piece is not blank, then it must be some color, so go to line 590 to see what happens."

In line 590, first look at the previous lines. Back in lines 390–400 the color of the fly-up playing piece is made recognizable by the value of A, which added to 143—CHR$(143+A)—yields the block of color that crosses the screen. In line 590, L is made to equal whatever 143+A totals.

The important PEEK test is in line 610. It says, "If the position above the flying graphic is its same color (its ASCII number equal to L), or if the position to left or right is the same color, go to line 650 for a loser routine." If these tests for failure aren't met, SC, which stands for score, has a point added, and the game goes back to line 330 to continue.

Unless you know what you're doing, don't POKE around with values other than those indicated, i.e., Extended Color Basic—1024 to 1535, and Micro Color Basic—16384 to 16895.

There are other ways of using the commands and you will see examples in other programs, but these numbers are the extent of my POKE/PEEK responsibility to you. Strange things could happen if you fail to heed my advice. You could lock up the system and lose the resident program. ■

I'll help if you have trouble making Dang It! work. I cannot help if you've modified it in any way. If you can, send a line printer listing for comparison or state where you get error messages. Include a stamped, self-addressed envelope or, from other countries, a self-addressed envelope with coin equal to the stamps on your outgoing letter. Write Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926.

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ELMER'S ARCADE

Listing continued

```
390 NEXT
400 A=161+RND(9)*32
410 PRINT @ A,A$;
420 B$=INKEY$
430 N=N+1
440 PRINT @ 98,H-N;
450 IF H-N<1 THEN 720
460 S=A
470 IF B$<>U$ AND B$<>L$ AND B$<
>D$ AND B$<>R$ THEN 420
480 IF B$=U$ AND PEEK(Q+A-32)=12
8 THEN A=A-32: B$=""
490 IF B$=D$ AND PEEK(Q+A+32)=12
8 THEN A=A+32: B$=""
500 IF B$=L$ AND PEEK(Q+A-1)=128
 THEN A=A-1: B$=""
510 IF B$=R$ AND PEEK(Q+A+1)=128
THEN A=A+1: B$=""
520 PRINT @ S,CHR$(128);
530 PRINT @ A,A$;
540 IF PEEK(Q+A+1)=175 THEN 580
550 IF B$=U$ AND PEEK(Q+A-32)<>1
28 OR B$=D$ AND PEEK(Q+A+32)<>12
8 OR B$=L$ AND PEEK(Q+A-1)<>128
THEN 720
560 IF B$=R$ AND PEEK(Q+A+1)<>12
8 THEN 720
570 GOTO 420
580 SC=SC+(H-N)
590 PRINT @ 0,"SCORE:"SC;
600 H=H-10
610 N=0
620 M=M+5
630 FOR T=1 TO 5
640 SOUND 176,1
650 SOUND 193,1
660 SOUND 204,1
670 SOUND 219,1
680 NEXT T
690 CLS0
700 PRINT @ 0,"SCORE:"SC;
710 GOTO 280
720 FOR A=0 TO 14
730 PRINT @ A,CHR$(128);
740 NEXT
750 PRINT @ 98,"FINAL SCORE:"SC*
M;
760 FOR T=1 TO 2
770 SOUND 218,2
780 SOUND 216,2
790 SOUND 210,2
800 SOUND 204,4
810 SOUND 210,6
820 SOUND 216,6
830 SOUND 218,6
840 IF T=1 THEN SOUND 227,2: SOU
ND 227,4: FOR K=1 TO 10: NEXT K:
 SOUND 227,6
850 IF T=2 THEN SOUND 229,8
860 FOR K=1 TO 50
870 NEXT K
880 NEXT
890 GOTO 760
900 END
```

END

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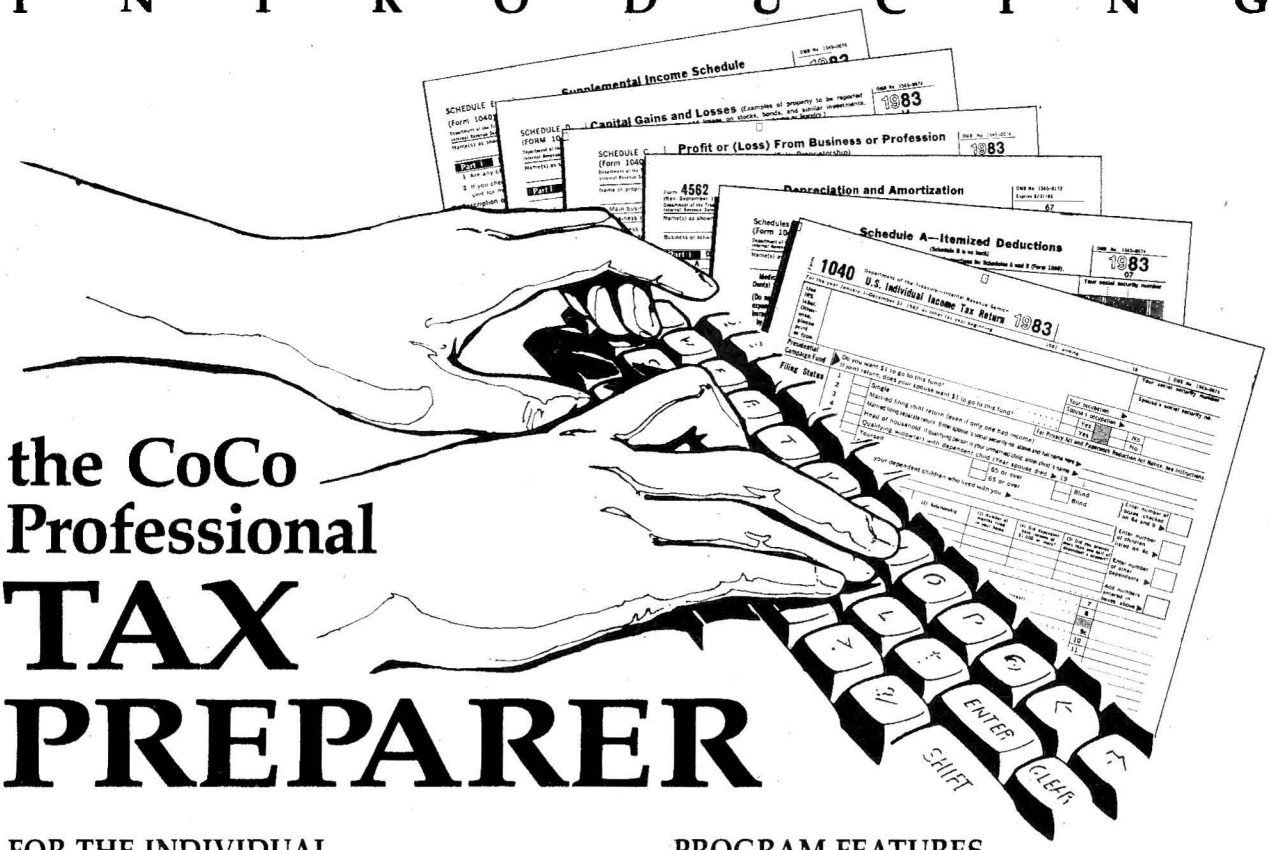

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The Basic Beat

THE FIRST STEPS TO BASIC PROGRAMMING
LESSON 8

by James W. Wood

You are only a few months from finals and the graduation ceremony, as this column nears its end.

You've already learned how to PEEK into high memory to check information POKEd into those locations. This month you'll learn to use PEEK so a program can tell what key you have pressed.

Isn't that the same as INKEY$? Yes, and no—when you run Program Listings 1 and 2 you'll see the difference.

You can save some work by first typing and running Listing 1. To change to Listing 2, simply delete lines 20–60 and add lines 20–50 of Listing 2.

Both programs let you draw on the screen by pressing the U, D, L, and R keys (up, down, left, and right). To move a line with Listing 1, you must press a key each time you want the line to move one space. To move 15 spaces, you must press the key 15 times.

Listing 2, using the PEEK command, allows the line to move as long as the key is pressed. You can move the line 15 spaces simply by holding the key down for the proper length of time. You don't have to release and press it 15 times.

PEEK has another advantage, too. When you use INKEY$, it is easier to use the four arrow keys. Program Listing 3 prints the word "FIRE" when you press the up arrow. The mark between the quotes in line 20 is an up arrow as printed by most printers. Try to change the program to use the down-arrow key.

The down arrow, left arrow, and right arrow are difficult, if not impossible, to use with INKEY$. Too bad—it would be easier to play a game with the arrow keys than with the U, D, L, and R keys.

Fortunately, you can program the arrow keys fairly easily using PEEK. Change Listing 2 to use the arrow keys. Figure 1 is the guide for determining keyboard PEEKs.

In line 20 of Listing 2, the program checks to see if you've pressed the U key. To change it to check for the up-arrow key, locate the up arrow in Fig. 1. Up arrow is across from memory address 341 and above the number 247, so change line 20 of Listing 2 to read IF PEEK(341) = 247 THEN Y = Y − 1. Change lines 30, 40, and 50 to use the proper arrow keys instead of the present D, L, and R. The drawing will be much easier to control.

You can also use PEEK to make the program require you to press more than one key at a time. Near the bottom of Fig. 1 is a row titled "Change of contents." What command would make memory location 338 contain the value 234? With no keys pressed, the locations are equal to 255; 234 is 21 less than 255.

The only combination of the "Change of contents" row that add up to 21 (−21, actually) is −16, −4, and −1. These numbers are under the @, P, and 0 keys. Run Program Listing 4 to see if this is the correct

```
10 CLS0:X=32:Y=15
20 A$=INKEY$
30 IFA$="U"THEN Y=Y-1
40 IFA$="D"THEN Y=Y+1
50 IFA$="L"THEN X=X-1
60 IFA$="R"THEN X=X+1
70 IF X<0 THEN X=0
80 IF X>63 THEN X=63
90 IF Y<0 THEN Y=0
100 IF Y>31 THEN Y=31
110 SET(X,Y,1)
120 GOTO20
```

Program Listing 1

```
10 CLS0:X=32:Y=15
20 IF PEEK(343)=251 THEN Y=Y-1
30 IF PEEK(342)=254 THEN Y=Y+1
40 IF PEEK(342)=253 THEN X=X-1
50 IF PEEK(340)=251 THEN X=X+1
70 IF X<0 THEN X=0
80 IF X>63 THEN X=63
90 IF Y<0 THEN Y=0
100 IF Y>31 THEN Y=31
110 SET(X,Y,1)
120 GOTO20
```

Program Listing 2

Address	Keys							
338	@	H	P	X	0	8	ENTER	
339	A	I	Q	Y	1	9	CLEAR	
340	B	J	R	Z	2	:		
341	C	K	S	↑	3	;		
342	D	L	T	↓	4	,		
343	E	M	U	←	5	-		
344	F	N	V	→	6	.		
345	G	O	W	SPACE	7	/		
	−1	−2	−4	−8	−16	−32	−64	Change of contents
	254	253	251	247	239	223	191	Contents if pressed

No key pressed, contents = 255

Fig. 1. Keyboard PEEKs

```
10 A$=INKEY$
20 IFA$="^"THEN PRINT"FIRE"
30 GOTO10
```

Program Listing 3

System Requirements

4K RAM
Color Basic
(Extended Color Basic for Listings 6 and 7)

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```
10 CLS:PRINT"PRESS THE THREE COR
RECT LETTERS TO SELF DESTRUCT!!!
"
20 IF PEEK(338)=234 THEN GOTO30
ELSE GOTO 20
30 FORW=1TO30:CLS(RND(8)):SOUNDR
ND(200),1:NEXT
```

Program Listing 4

```
10 CLS0
20 IFPEEK(345)=247THEN30ELSE20
30 FORA=496TO16STEP-32
40 PRINT@A,CHR$(255);:NEXTA
50 SOUND100,1
60 FORA=496TO16STEP-32
70 PRINT@A,CHR$(128);:NEXTA
80 GOTO20
```

Program Listing 5

```
10 A$="12345"
20 A=VARPTR(A$)
30 B=PEEK(A+3)+256*PEEK(A+2)
40 FOR C=B TO B+4
50 READ D
60 POKE C,D
70 NEXT C
80 DATA 180,155,159,151,184
```

Program Listing 6

```
10 A$="<LLISTMOTORCLOADTROFF"
20 A=VARPTR(A$)
30 B=PEEK(A+3)+256*PEEK(A+2)
40 FOR C=B TO B+4
50 READ D
60 POKE C,D
70 NEXT C
80 DATA 180,155,159,151,184
```

Program Listing 7

combination of keys. Remember, you must hold all three down.

I'll give you one more keyboard PEEK example, this time to create laser fire. Program Listing 5 requires that you press the space bar as a fire button. The laser keeps firing as long as you hold the bar down.

Thus far, you have used SET, CHR$, and POKE graphics. SET was the slowest. POKE increased the speed of displays, and CHR$ is fast enough for simple animation. Now I'll take you a small step beyond CHR$ graphics to the realm of "string packing," a very fast way to print a large area of graphics on the screen. String packing isn't the quickest way to program, but it should be worth the effort.

First, I'll show you a small graphic design. In the upper left corner of Fig. 2, I'll produce a yellow space ship with red lights on each end.

Program Listings 6, 7, and 8 help explain how to pack strings. Listing 6 requires Extended Color Basic. The numbers in line 80 are the graphics codes for the space ship. Use Fig. 3 to design other graphic patterns.

Line 10 of Listing 6 must have as many characters between the quotes as there are items in the data line. Line 10 could be A$="ABCDE". A$ is called a dummy string. In line 40, the number added to B must be one less than the number of items in the data line.

```
10 A$="<LLISTMOTORCLOADTROFF"
20 CLS0
30 PRINT@64,A$;
40 GOTO40
```

Program Listing 8

When you run Listing 6 on an Extended Color Basic computer, Listing 7 results. The computer rewrites line 10. You cannot type Listing 7 and expect it to work unless you remove lines 20–80 and add lines 30–40 from Listing 8. Then you can save the resulting program on tape and CLOAD it into a Color Basic computer.

If you don't have an Extended Color Basic machine, then take your issue of *HOT CoCo* to your local Radio Shack. Use their Extended Color Basic computer to produce Listing 8 and save it to tape. After saving the program, rush home and run it on your computer.

Listing 8 prints a small area, and it's difficult to tell that string packing prints graphics faster than CHR$ graphics do. I'll show you how to make a large title. I'll simply use the word "TITLE," but it should teach you how to design your own favorite.

Figure 2 contains the large block work, "TITLE." Notice how line 10 grew from Listing 6 to Listing 7.

Be careful to not let the dummy string start too long. It can only grow to 255 characters. For this reason, I

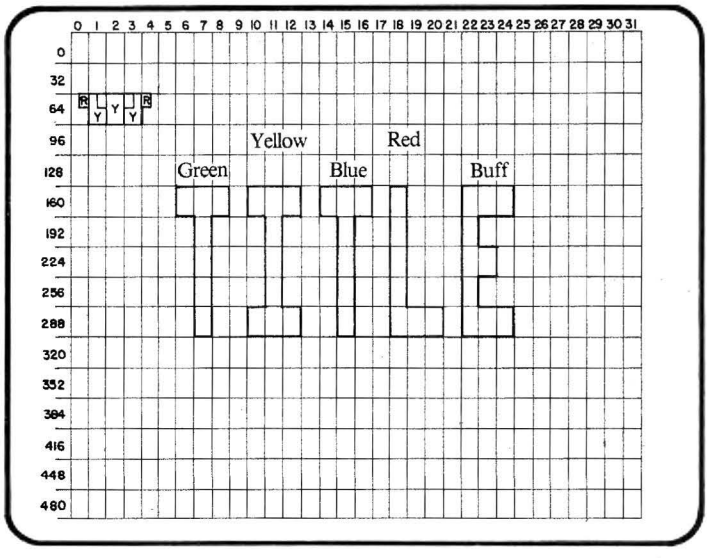

Fig. 2. PRINT@ Screen Locations

PRINT@ position

8	4
2	1

	blank	all sections colored
green	128	– 143
yellow	144	– 159
blue	160	– 175
red	176	– 191
buff	192	– 207
cyan	208	– 223
magenta	224	– 239
orange	240	– 255

Example

R	R
R	

red

176+8+4+2=190

PRINT CHR$(190)

Fig. 3. CHR$ Graphic Patterns

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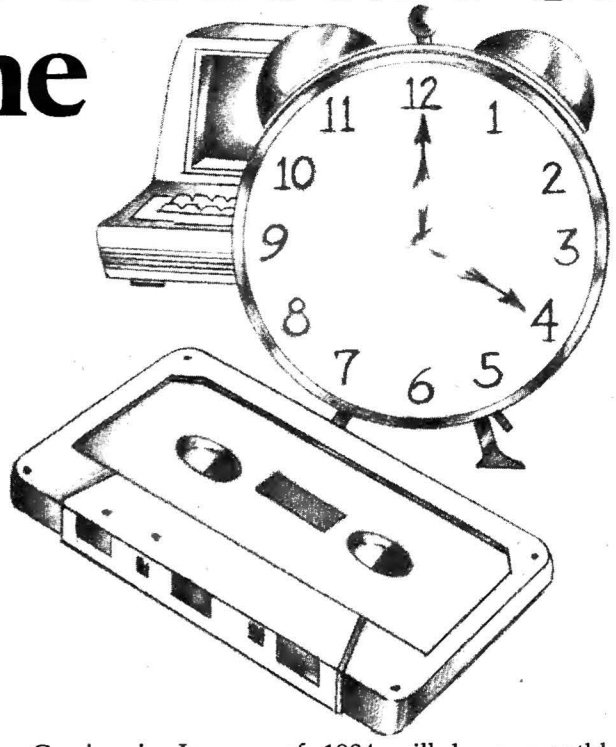

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```
10 A$="12345678901234567890123456
7890123456789012345678901234567
8901234567890123456789012345678
90123456"
20 V=VARPTR(A$)
30 P=PEEK(V+3)+256*PEEK(V+2)
40 FOR C=P TO P+95
50 READ D
60 POKE C,D
70 NEXT C
80 B$="12345678901234567890123456
7890123456789012345678901234567
8901234"
90 VV=VARPTR(B$)
100 PP=PEEK(VV+3)+256*PEEK(VV+2)
110 FOR C= PP TO PP+63
120 READ D
130 POKE C,D
140 NEXT C
150 DATA 128,128,128,128,128,128
,143,143,143,128,159,159,159,128
,175,175,175,128,191,128,128,128
,207,207,207,128,128,128,128,128
,128,128
160 DATA 128,128,128,128,128,128
,128,143,128,128,128,159,128,128
,128,175,128,128,191,128,128,128
,207,128,128,128,128,128,128,128
,128,128
170 DATA 128,128,128,128,128,128
,128,143,128,128,128,159,128,128
,128,175,128,128,191,128,128,128
,207,207,128,128,128,128,128,128
,128,128
180 DATA 128,128,128,128,128,128
,128,143,128,128,128,159,128,128
,128,175,128,128,191,128,128,128
,207,128,128,128,128,128,128,128
,128,128
190 DATA 128,128,128,128,128,128
,128,143,128,128,159,159,159,128
,128,175,128,128,191,191,191,128
,207,207,207,128,128,128,128,128
,128,128
```

Program Listing 9

```
10 A$="FORFORFORFORFORFORRESTORE
RESTORERESTOREFORMOTORMOTORMOTOR
FOR^^^FORSCREENFORFORFOR!!!FORFO
RFORFORFORFORFORFORFORFORFORFORF
ORFORRESTOREFORFORFORMOTORFORFOR
FOR^FORFORSCREENFORFORFOR!FORFOR
FORFORFORFORFORFORFORFORFORFORFO
RFORFORFORRESTOREFORFORFORMO
80 B$="FORFORFORFORFORFORRREST
OREFORFORFORMOTORFORFORFOR^FORFO
RSCREENFORFORFOR!FORFORFORFORFOR
FORFORFORFORFORFORFORFORFORFORFO
RRESTOREFORFORMOTORMOTORMOTORFOR
FOR^FORFORSCREENSCREENSCREENFOR!
!!FORFORFORFORFORFORFOR"
90 CLS0:PRINT@160,A$;:PRINT@256,
B$;
100 GOTO100
```

Program Listing 10

used two strings in Program Listing 9. A$ will represent the top three rows of TITLE. B$ will represent the bottom two rows. Lines 10–70 and 150–170 create A$. Lines 80–140 and 180–190 create B$. Each data line represents a 32-character row on the screen.

After running Listing 9 on an Extended Color Basic machine, remove lines 20–70 and 90–190. Add lines 90 and 100 of Listing 10 and you will have a working version of Listing 10.

Try to create a graphic that uses less memory than that required by string packing. Listing 10 uses only 231 bytes of memory. I determined this by typing PRINT MEM before the program was loaded into the computer, writing down the results, loading Listing 10, typing PRINT MEM again, and subtracting this reading from the first reading.

Now you're ready to add the rest of your program to your title. ■

Write James Wood c/o HOT CoCo, *Pine St., Peterborough, NH 03458.*

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The programs do not depend on BASIC, and so allow total compatibility and workspace with any size Color Computer, even 64K. Unlike other programs for the Color Computer which are said to be 64K compatible, **VIP Library™** programs are not limited to between 24 and 30K of workspace in 64K. **Library** programs have Memory Sense with BANK SWITCHING to fully use all 64K, thus giving an astounding 61K of workspace with the rompak cartridge, and up to 51K with a disk version!

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The Disk versions each have a Mini Disk Operating System which will masterfully handle from 1 to 4 drives. It offers smooth operation for such features as the ability to read a directory, display free space on the disk, kill files, save and automatically verify files, and load, rename and append files. **Library** programs simply do not have the limitations of BASIC.

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By Tim Nelson

RATED TOPS IN RAINBOW, HOT COCO, COLOR COMPUTER MAGAZINE AND BASIC COMPUTING

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The most powerful and easy-to-use word processor is available in the showpiece and workhorse of the **Library: The VIP Writer™**. Because of its undisputed superiority over all Color Computer word processors, it was selected by Dragon Data Ltd. of England to be the Official Word Processor for its line of Dragon microcomputers.

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The **Writer** will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance.

Although all versions feature tape save and load, the disk version provides the Mini Disk Operating System common to the whole **Library**, plus disk file linking for continous printing.

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By Dan Nelson

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Disk version requires 32K for lowercase displays.

Softlaw 128

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(Formerly Super "Color" Database)

INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

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

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As with all other **Library** programs, the **Database** features the powerful Mini Disk Operating System.

32K DISK $59.95

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(Formerly Super "Color" Disk-ZAP)

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

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Lowercase displays not available with this program.

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REVIEWS

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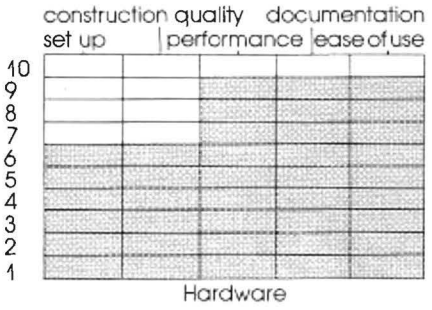
edited by Mark E. Reynolds



BT-1000 Expansion Interface Unit
$220 ($245 with 8K of RAM)
BT-1010 Parallel Printer Interface
$79.95
BT-1020 Real Time Clock/Calendar
$109
Basic Technology
Dept H
Box 511
Ortonville, MI 48462

by Doug Swank

Basic Technology's five-slot expansion interface not only expands the CoCo system bus, but your horizons as well.

After working with my evaluation unit for the past few weeks, I have a long list of gadgets I'd like to build, several of which are probably under development by BT or other hardware makers. The BT clock/calendar and parallel printer port are only a start; I am sure more goodies will appear soon.

Who needs an expansion interface? To paraphrase Commodore Vanderbilt's comment about owning a yacht, if you have to ask what it does, you probably don't need one. Users who just want to select one of several game packs would be better off with Basic Technology's BT-2000, a much simpler slot-selector unit.

The BT-1000 permits splitting the upper memory area into several independent blocks, and with a bit of planning you can talk to or control many peripherals. This flexibility enhances its power and opens the door to a host of real-world applications.

Having worked with microprocessor-based control systems for the past five years or so, I can imagine a low-cost development system for 6809 applications. A 32K CoCo with disk drives plus a BT-1000 would cost one-tenth as much as the development systems I've been using, and could blow most of them out of the water in terms of performance.

I feel the small-system commercial users—and the experienced hardware experimenters—will appreciate the BT-1000 features most, so I'll aim this review at them. All references to the CoCo memory map are in hexadecimal, with the usual ($) prefix.

The BT-1000 Interface Unit

The BT-1000 demands 7-by-14 inches of table space, about one-third of which is devoted to a sturdy-looking power supply. The ratings on the transformer and regulator ICs make it plain it can handle a full deck of plug-ins without much effort.

Heat dissipation was obviously considered in its design since internal temperature after 48 hours of exercising the two modules supplied was barely above ambient. I would have full confidence about putting the BT-1000 into 24-hour service.

The open pack slots would collect dirt in an industrial area, but a snap-on cover is an easy remedy. Gray duct tape is an even easier remedy if appearance isn't important. I made my temperature test with all open slots covered with tape.

The one-piece case is molded of dark gray fiberglass with an aluminum bottom plate. The shape, plus the two-foot ribbon cable on the pack that plugs into the CoCo, permit it to sit on top of or behind the computer.

My evaluation unit was from an early production run with no markings on the slots or switches. Nevertheless, it had gold-plated edge connectors and epoxy-glass boards, with none of the hand-wired patches common to first-run units.

The operating manual is adequate for experienced users, but puzzling for newcomers. I believe later production runs will include case markings and an expanded manual.

Memory mapping is where all the fun begins with the BT-1000. In the ordinary 32K CoCo, addresses from $0000–$7FFF are system stacks, displays, and user RAM. Memory $8000–$BFFF are Extended Color and regular Basic. $C000–$DFFF is the realm of ordinary games, and $E000–$FEFF is left undefined. (Users running disks and FLEX have $E000–$FEFF as a deliberately defined user area.)

The five slots in the BT-1000 are split into two groups: the CTSLO area, $C000–$DFFF; and the CTSHI area, $E000–$FEFF. Slots 1, 2, and 3 are in CTSLO, while slots 4 and 5 are in CTSHI.

Slot 1 has special privileges since it has the CART line connected. The

CPU checks this one at powerup, and if the CART line is jumpered the system does an EXEC &HC000. This is the place for a disk controller or block of ROM that you wish to take control at startup.

Four 24-pin sockets inside the BT-1000 case permit installation of RAM or EPROM to populate some or all of the CTSHI area without a plug-in pack—a neat touch for dedicated systems. Plug-ins make addresses not used by internal memory available, so you could have a block of ROM as well as an external interface in this memory area.

The Radio Shack disk controller almost completely occupies the CTSLO area, and incomplete decoding by the controller wastes most of the remaining addresses. Therefore, with the disk operating, I was frustrated in my attempt to use slots 2 and 3 for anything else. Non-disk systems could use it, with blocks of $1000 (4096 decimal) per slot being most convenient.

Jumpers and DIP switches inside the unit can do all of the above partitioning. If you want to decode into blocks smaller than $1000, you'll have to do the job externally.

So much for the technical details. The unit does its job exactly as advertised, but a box with five empty slots isn't very exciting, even though the pilot lamp in the power switch is quite pretty. But plug a few things into the slots and see what happens....

The BT-1020 Real Time Clock/Calendar

The clock/calendar occupies addresses $FEC0–$FEFF. You can move it to other blocks down to $FE00 with internal jumpers. It has all the usual features you might find on a modern digital watch, plus several others in keeping with its status as a computer peripheral. One time-keeping feature not usually found on watches is compensation for Daylight Savings Time.

A tape program supplied with the unit permits initial setup and on-screen display. You can easily splice it to your own program, or rewrite it if necessary since a source listing is included.

Features of interest for computer systems are a periodic alarm and maskable interrupts at times of day, end of clock update cycle, or specific rates such as once per second. The clock normally takes power from the 5-volt interface supply, but a nickel/cadmium battery keeps the timer portion operating for up to two weeks after an eight-hour charge. (Charging is automatic when you turn on the interface.)

A 64-byte internal RAM has 14 bytes devoted to time, control, and data. The other 50 bytes are available to you. The battery will keep them alive if system power fails.

Fifty bytes of data don't sound like much, but remember that they stay alive. In a data-logging application, you can store the time every minute, the last data logged, and perhaps even a jump address to an emergency routine. When the power comes back on, the program can figure out how long the power has been off and how much data has been lost.

By the way—the TIMER function is sometimes said to count 60 times per second, but since the color TV frame rate controls it, it actually counts 59.98 times per second. Any clock run by the CPU's timer would need elaborate correction to be accurate for long term use, but who wants to convert their computer into a clock?

The BT-1010 Parallel Printer Interface

This one is my favorite. Like the clock module, it comes with a tape and source listing for a relocatable printer driver. The data going to the printer is simply written to the designated RAM address, and the module does all the handshaking with the printer. Since the operation only takes a few machine cycles, it is now possible to feed a printer while on-line with a modem.

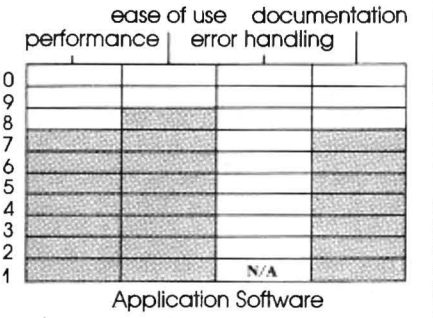
All printers are at their best when fed in parallel, and the serial interface add-on for some brands costs more than this module, so the BT-1010 is a good value even if you just plug it into the computer itself.

Calling it a printer interface hides many of its functions, since the heart of the unit is a chip that contains two 8-bit, two-way ports configurable from software, two 16-bit timers, and a startling array of programmable options. You can install another header for the times when you get bored with just feeding a printer.

Basic Technology includes complete data on the interface chip for those who want to do custom applications. A pair of 8-bit, D-to-A converters would permit elaborate music, for instance.

Again, the BT-1010 parallel module would be useful even without the expander, and with the BT-1000 expander, you could operate a pair of them without memory conflict. The BT-1020 clock would be less useful alone than in the expander.

The BT-1000 transforms the CoCo into a serious micro system. I haven't looked at the simpler BT-2000, but it would be a better choice for the user who doesn't need the partitioning but merely wishes to select one of five slots. Recent price reductions on both units make them even more attractive. ■



Colorspeak
Bumblebee Software
P.O. Box 25427
Chicago, IL 60625
16K, Color Basic
$169, ROM pack
$4, manual alone
10-percent discount to the vision-impaired

by Scott L. Norman

Recently, a number of companies have introduced products that add speech-synthesis capability to the Color Computer. These products fall into two categories: software that simulates speech by feeding the computer's digital-to-analog (D/A) converter synthesized renditions of a speech waveform, or hardware/firmware products that use specialized integrated circuits to generate phonemes, the elementary units of spoken language.

Despite the vendor's name, Bumblebee Software's Colorspeak falls in the latter category. It is a rather flexible, easy-to-use product, and can generate fairly acceptable speech.

Like several other voice-output

products, Colorspeak is based on the Votrax SC-01 speech-synthesis circuit. This is a complex, low-power-drain IC, capable of generating 64 different phonemes in response to a 6-bit input code.

Stringing phonemes together produces continuous speech, much as putting one letter after another produces written language. You can use an additional 2 bits of input data to specify one of four levels of inflection, making the speech a little less mechanical.

It takes more than the SC-01 to build a speech synthesizer, though, and that's where products differ. At the very least, a manufacturer must supply a control program and interface circuitry before the product is complete.

Colorspeak fulfills the requirements for a stand-alone product quite nicely. The ROM pack includes 4K of ROM containing the machine-language program that lets your Basic code drive the speech-synthesis chip. There is also 2K of RAM intended for use as a text buffer, although late-model Color Computers do not permit writing data to RAM addresses in the cartridge-address space. Putting a CLEAR statement in your program rectifies this, as I'll describe below.

Colorspeak fully uses the CoCo bus lines available at the cartridge port; audio output comes through the TV receiver, for example, rather than through an auxiliary amplifier.

There are actually four methods of specifying spoken output, although all are similar in that they require the construction of a text string in a particular format. The four modes are as follows:

- The spelling mode: Here the names of the letters, numerals, and some punctuation marks are pronounced as the program encounters them in the text string. The allowed punctuation marks are $, %, −, +, <, >, ?, !. A blank space is pronounced as "space."
- The phoneme mode: Here you must break the desired speech into phonemes and specify hexadecimal codes for each, according to a table in the manual. This is the most flexible mode in that it permits you to specify the inflection of each phoneme, but the conversion process can be tedious and the text strings might bear no relation to written English.
- The text-to-speech mode: Now the text string looks like English (assuming that's what you want to hear), although you must follow Colorspeak's own rules of phonetic spelling.
- The inflection mode: This is another version of text-to-speech, the difference being that now it uses a few built-in rules of inflection to make the speech a little more natural. In general, the result is a little more pleasing than the text-to-speech mode's output, but not nearly as good as the phoneme mode can produce.

Colorspeak can be extremely simple to employ. The ROM pack has no apparent effect on normal nondisk computer operation—there is no new power-up message, and PRINT MEM returns the usual value.

There are only three requirements for adding speech to a Basic program: You must set aside string space for a text buffer at the top of RAM (because of the write-inhibit restriction I mentioned earlier), you must specify the start address of Colorspeak, and you must set up the text string in the appropriate format. Then passing control to Colorspeak with A = USR0(0) in Extended Color Basic, or A = USR(0) in the Color Basic dialect, produces speech.

The documentation gives details of the CLEAR statements that reserve buffer space in 16K–64K machines, as well as the DEFUSR0 (Extended) and POKE (Color Basic) commands that define the transfer address. I have included the accompanying Program Listing to show how simple a demonstration program can be, as well.

English is far from a phonetic language, of course, and so phonetic spellings often differ from the correct ones. Colorspeak, like other synthesizers, has its own conventions for the pronunciation of single letters and letter combinations in the Text and Inflection modes.

For example, in most vowel/consonant/vowel combinations, the first vowel will be given its long form. An additional consonant is then required to shorten such a leading vowel. A silent H is a good choice; thus my wife's name, Sharon, becomes SHAHRON. The O is short because no vowel follows the N.

"Right" provides another example of Colorspeak syntax. It turns out that the IGH combination is the only way to generate a long "i" sound. Consonants are also affected. The "g" sound in "message" requires a "DJ" combination: MESSUDJ.

Working these things out is part of the fun of using a speech synthesizer, I expect. In any event, the text-to-speech and inflection modes are very useful. The final text is still likely to be pretty readable, too.

Here are the first few lines of the Gettysburg Address, in fairly accurate Colorspeak dialect:

FOUR SCORE AND SEVEN YIHRS AGO
OUR FOHTHERS BRAUT FORTH UHPON
THIS COHNTIHNENT A NEW
NATION CUHNSEEVD IN LIHBERTY
AND DIHDIHKATED TO THE
PROHPOSIHTION THAT ALL MEN ARE
CREEATED EEQUUHL

The first "E" in SEVEN isn't pronounced as a long vowel; the ROM program includes the names of the numerals. The extra spaces between NATION and CUHNSEEVD are the only way of inserting pauses in either of the text modes; the phoneme mode has a separate code to do this job.

Even though the Votrax chip is programmed with English phonemes, it is possible to make Colorspeak do a fair job with some foreign languages. BAUHNZHOOHR is a decent French greeting, while an approximation to the German version of "I think, therefore I am" comes out ISH DAINGKT ALZO ISH BIN.

Working with the phoneme mode is a little more complex. The documentation gives a listing of the 64 possible phonemes in two forms: a letter/number shorthand (the "a" in "father" is AH1, for instance) and the hexadecimal codes that are actually used in the string TA$.

```
10 CLEAR 1000,32000: ' Clears st
ring space in a 32K computer
20 DEFUSR0=49152
30 CLS: PRINT@6, "TEXT-TO-SPEECH
  DEMO"
40 PRINT: INPUT "     What would
 you like me to say";T1$
50 TALK$="/T "+T1$+" ."
60 A=USR0(0)
70 PRINT: PRINT TAB(2) "(1) Repe
at this string"
80 PRINT TAB(2) "(2) Keep old st
ring on screen"
90 PRINT TAB(2) "(3) Enter new s
tring"
100 INPUT S
110 ON S GOTO 60, 40, 30
120 END
```

Program Listing. Colorspeak Demonstration Program

See List of Advertisers on page 131

Four codes can represent each phoneme, depending on the inflection desired. Thus the word "equals" pronounced in a monotone is encoded as follows:

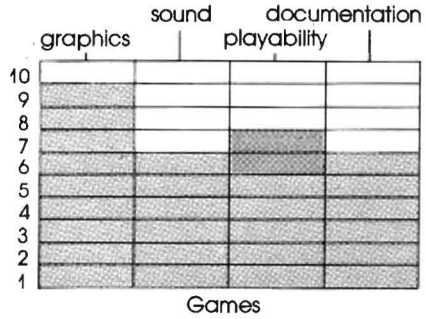
3C596D76585F

To add a little emphasis, the pitch of the "e" could be raised by changing the 3C to 7C. That's the general pattern. Adding 64 (hexadecimal 40) to a particular phoneme's code gives a step up in pitch.

Once again, this mode is powerful but tedious to use. It might be preferred for incorporating speech into an educational program or into software designed for people unaccustomed to synthesized speech. For more routine applications, the two modes that permit the use of English-like text strings are far simpler to use.

Colorspeak deserves a good rating. The speech output is quite mechanical under the best of circumstances, but it's still much easier to understand than that produced by the software synthesizers I've seen.

The documentation could stand some expansion, both figuratively and literally. I would welcome more examples of phonetic spelling, and the condensed type font used in the manual can get awfully tiresome to read. The people at Bumblebee Software, who are obviously sympathetic to vision problems, should do better. ■



Junior's Revenge
Computerware
P.O. Box 668
Encinitas, CA 92024
32K, Extended Color Basic, joystick
$28.95, cassette
$31.95, disk

by Peter Paplaskas
***HOT CoCo* staff**

For all you Donkey Kong Junior fans, here's a spinoff called Junior's Revenge, a machine-language program with superb arcade graphics.

This game reverses the roles of Donkey Kong to have you, as a young gorilla, working to overcome many obstacles to rescue your father from Luigi, the protagonist of Donkey Kong.

Luigi has your gorilla father locked in a cage. You must successfully jump, swing, climb, and dodge across seven screens, grab the key from Luigi, and open the cage.

When you begin play, you use the right joystick and have 50 seconds to make your way through each screen. The display shows the time in the upper right corner, and the screen number you are in.

In screens one, three, and six you climb and jump from vine to vine to the top of the screen. You must avoid the Vinegators, or you can earn extra points by picking fruit and dropping it on them, knocking them off the vines.

If you successfully complete a screen, you receive a bonus timer that is added to your score. You get another Junior for every 10,000 points.

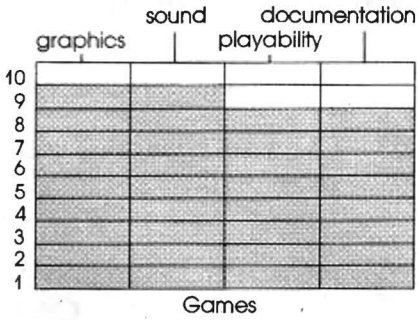
In screens two, five, and eight you must climb chains, avoid Vinegators and ZuZu birds, and push several keys into place. Finishing this task temporarily frees your father.

In the fourth screen, you must jump on a trampoline and grab one of the moving chains or land on a moving platform. Jump on the trampoline and hold the fire button down to get a super jump.

If you make it to the seventh screen, you're in Luigi's hideout and must climb onto each conveyor belt and walk across it, avoiding the sparks that are all around. Finally, you grab the key from Luigi and open the cage to set your father free.

The only flaw I could find in the entire game is a very minor one: Although the documentation states that you can only get killed in the practice mode by falling, you also lose Junior if the 50-second timer runs out.

Junior's Revenge can be pretty frustrating until you get the knack of controlling Junior's movements. Winning requires some dexterity. It's one of the best Color Computer games, though, and offers an entertaining challenge. ■



Buzzard Bait
Tom Mix Software
3424 College N.E.
Grand Rapids, MI 49505
32K, Extended Color Basic, joystick
$27.95, cassette
$30.95, disk

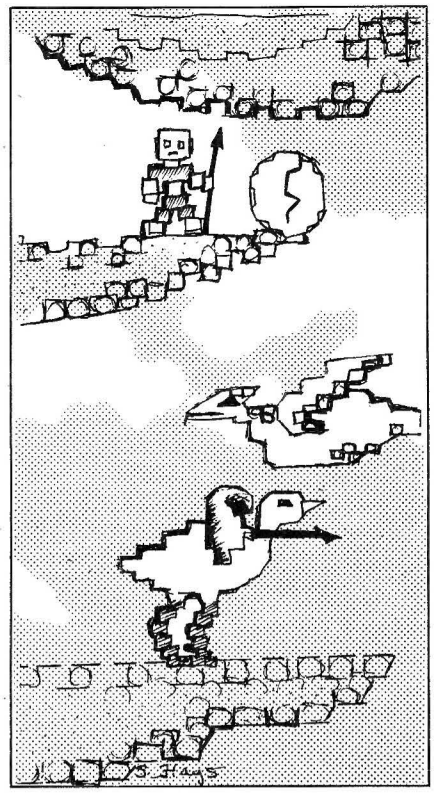
by Peter Paplaskas
***HOT CoCo* staff**

If you're familiar with the arcade game Joust, then you're in for a surprise with Buzzard Bait, a one- or two-player, 32K machine-language program that plays exactly like its arcade counterpart. It offers excellent color and detailed graphics.

You control a rider astride a large bird, and your objective is to unseat several enemy riders from their birds. In the first wave, you face only four enemies, but their number, and other hazards, increase as you enter each new wave.

In the single-player game, you use the left joystick to control your rider. Pushing the stick left or right commands his direction, and pushing the fire button flaps the bird's wings, causing it to fly. One push equals one flap.

You first appear at the bottom of the wrap-around screen and have a few seconds to position yourself before the enemy riders materialize on



certain of the spots on each of four floating islands.

You defeat your opponents by lancing them from a higher position. If both contestants are at equal heights, they bounce off. If the enemy is higher than you, your riderless bird flys away from the contest.

If you defeat an opponent, his "life force" falls to the ground as an egg. If you don't lance the egg, it will hatch into a more aggressive rider who will soon receive a new mount.

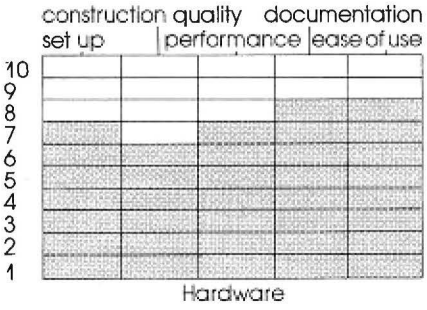
As you successfully complete each wave, things get more difficult. You have to face greater numbers of riders. A pterodactyl flies across the screen, and you can only defeat him by lancing him directly in the mouth—an extremely difficult task.

Part of the base at the bottom of the screen becomes a lava pit that destroys whatever enters it—and sometimes a fiery hand reaches out to pull low-flying birds to their doom. Beginning with the highest, the floating islands, which you can use in your battle strategy, begin to disappear in the more difficult waves.

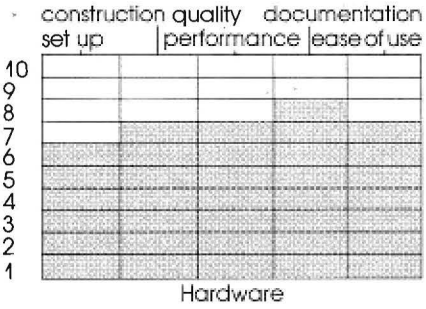
The two-player game provides some of the best coordinated arcade action you can find.

You both have the same task, and you can work together or as adversaries. You can collect points for killing the other player, but the program awards bonus points for player cooperation. This mode also offers a gladiator wave in which you can face each other for bonus points, but I prefer a team effort.

This is one game that continues to challenge me to beat my best score. It's also one that's going to blow many a fire button on the Radio Shack joysticks. ■



1248-EP EPROM Programmer
Computer Accessories of Arizona
Larry Foltzer
5801 E. Voltaire Drive
Scottsdale, AZ 85254
$99 ($30 for improved software)



Intronics EPROM Programmer
Intronics
George Indorf
P.O. Box 13723
Edwardsville, KS 66113
$90

by Martin Goodman

Two of the more powerful, flexible, and economical EPROM programmers for the Color Computer are the 1248-EP and the Intronics EPROM Programmer.

EPROMs are chips on which data can be impressed with electrical pulses. Once programmed, these chips retain the information until that information is erased. The most commonly used varieties of EPROMs are UV erasable EPROMs. These chips are erased by exposure to short-wave ultra violet light. They differ from ROMs and PROMs in that EPROMs can be programmed and reprogrammed up to several hundred times.

There are two 8K-by-8-bit ROMs in the Color Computer and a third one in the disk controller pack. These contain the Basic, Extended Basic, and Disk Basic operating systems. Unfortunately, this system is flawed by several outright bugs and other permanently fixed features (like the default RS-232 baud rate) that a CoCo owner might wish to alter. But with an EPROM programmer and some 2764 or MC68766 EPROMs, you can make some of these desirable alterations.

You can dump ROMs into RAM, alter them, and then dump them onto an EPROM. By substituting EPROMs for ROMs, you get a customized version of Basic. This is particularly useful because Tandy's new set of ROMs for the CoCo (Basic 1.2, Extended Basic 1.1, and Disk Basic 1.1) won't correct several annoying bugs found in the old ROMs.

Creating custom EPROMs lets you burn a set of utilities into the disk ROM. Certain CoCo functions, such as the location of the interrupt and reset vectors and the reset service routine, can only be altered by changing the ROM. The right modification of ROMs lets you break out of any program.

Since all three CoCo ROMs are 8K by 8, any 8K-by-8 EPROM should work. However, the Motorola MC68766 and the MC68764 EPROMs are especially good because their pinouts are identical to that of the 24-pin ROMs in the CoCo. As a result, they can be substituted directly into the CoCo's ROM sockets with no other modifications.

The other 8K-by-8 EPROMs (2764, 2564, and MK2764) are generally less expensive, and they come in faster versions, but all of these are 28-pin EPROMs that require you to construct an adapter socket/header for use in the CoCo. This is particularly inconvenient in the case of the disk controller card, in which there is simply not enough room inside the plastic shell for such an adapter socket.

The 2564 is a 28 pin 8K-by-8 EPROM that, after it is programmed, can be wired to fit in the 24 pin CoCo

ROM socket. You must connect pins 1 and 28 to pin 26, pins 2 and 27 to pin 14, then insert it in the CoCo ROM socket with pins 3 and 26 of the EPROM in the number 1 and 24 holes of the ROM socket.

I should also note here that "dynamic ROMs" are used in the CoCo. These cannot be read by the EPROM programmer if you merely insert the ROM in the EPROM-programmer socket. They can, however, be replaced by EPROMs.

The cost of a CoCo plus one of the two EPROM programmers reviewed below is considerably less than the cost of most dedicated EPROM programmers of equal or lesser flexibility.

The EPROM Programmers

Both the 1248-EP and the Intronics EPROM Programmer are extremely flexible. They can program a wide variety of EPROMs (1K-by-8 to 8K-by-8 for the Computer Accessories device and from 1K-by-8 to 16K-by-8 (27128 chip) for the Intronics device).

Both units are easy to use, and the documentation for each is well written. Both devices read or program the 2508, 2516, 2532, 2716, 2732, 68764, and 68766 EPROMs. These represent the majority of 24-pin, 25-volt-requiring EPROMs on the market.

The software of both units checks an EPROM for erasure, for dumping the contents of an EPROM to memory, for programming an entire EPROM, and for verifying the contents of an entire EPROM against memory.

Neither unit requires Extended Basic. As supplied, both work only with a cassette-based system, although you can modify either to work in parallel with a disk system. The 1248-EP, however, is better suited for modification.

Such a modification requires a bit of decoding the Disk Basic ROM, the input/output (I/O) ports, and, in the case of the Intronics device, a minor modification of the software. Neither unit comes with explicit instructions to make all the needed modifications, although some helpful instructions do come with the 1248-EP.

Both units plug into the CoCo's system port, and both use tinned (rather than gold-plated) lands on their edge card connector. Both units derive their programming voltages of 25 and 21 volts from a DC-to-DC inverter circuit. This eliminates the need for an external power supply although it can introduce some "hash" onto the DC voltage to the board. Each uses two 6821 chips for its input/output function.

The 1248-EP now comes with a Textool brand zero-insertion-force (ZIF) socket, which is much more expensive but far more durable than the Aires socket that comes with Intronics' EPROM programmer. However, Intronics will, on request, sell their programmer without a ZIF socket so you can install your own.

Although the 1248-EP has its software present in an on-board ROM, the software for both EPROM programmers is written in position-independent code. Thus, you can load in the operating software of both from tape to any position in memory. However, it's convenient to use the 1248-EP software where it resides on the on-board ROM.

The 1248-EP

Because its software is in an on-board EPROM, the 1248-EP is somewhat easier to use, but it's more difficult to alter the software.

The 1248-EP also does all of its selection of different EPROMs from the keyboard. This is also a very nice convenience, and reflects good engineering and attention to detail. Along the same lines, the device comes with legs that support it by the side of the computer. I added similar legs to the Intronics device, as I liked this idea so much.

When it arrives, the software on the ROM is located at address $C000. However, you can add an address decoder chip (74LS138) to the board and readdress the program anywhere from $C000–$F000 at $800 intervals. Additionally, as the code is position independent, you can choose to read it in from tape to any location in low RAM and dispense with the on-board EPROM.

During all EPROM operations, the 1248-EP displays the EPROM type you have selected—a useful convenience. The software uses a new EPROM programming approach that is about seven times faster than the Intronics device. When programming a number of 8K-by-8 EPROMs, this can mean the difference between a seven-minute program time versus one minute.

The 1248-EP also has the more flexible software of the two units, allowing you to directly program from and dump to any place in memory. You can also dump or program any fraction of the EPROM to memory. Similarly, any fraction of an EPROM can be verified against memory.

Hardware hackers interested in running this EPROM programmer in conjunction with their disk systems will appreciate the 1248-EP's capability of addressing the on-board EPROM to an area above the Disk Basic ROM. Additionally, the I/O addresses reside in the FF50–FF5F area, so they won't conflict with the I/O ports of the disk controller.

Having the 1248-EP coresident with the disk-controller card does involve decoding the addressing of the disk ROM and the disk I/O ports to prevent ghosting. You must decode the Disk Basic ROM by ORing the CART line with A13 before it connects to the enable on the ROM. You create the enable line for the Western Digital disk-controller chip by ORing the SCS line with the A4 line in order to eliminate ghosting of the disk I/O ports up into the area used by the 1248-EP. These problems arise due to sloppy, inadequate address decoding within the Color Computer and its associated disk-controller card.

Computer Accessories provides hints on how to use one of the unused ports on one of their PIAs to make a parallel I/O port for the CoCo.

The most serious shortcoming of the 1248-EP is its inability to handle either the 28-pin EPROMs (2564s, 2764s, and 27128s) or any EPROM that requires a programming voltage of 21 volts (2732As and 2764s). As the 28-pin EPROMs become more popular, this criticism will become important. The 1248-EP has a 24-pin EPROM socket and has no convenient means of producing a 21-volt programming voltage.

Although the 1248-EP worked according to specifications when I received it, careful oscilloscope analysis of the power supply showed that the +5V line had a lot of hash generated by the DC-to-DC inverter on board. I cured this by adding three pass capacitors between the +5V line and ground. I recommend that you add a

few .1μf pass capacitors between the +5V and ground around the power supply pins of the chips on the board and a 10μf electrolytic as well from +5 volts to ground at some convenient point on the board.

Using the +12V line as the input to the DC-to-DC inverter was a poor choice. It required the manufacturer to place a +12V trace on board, which increases the risk of damage to the computer if you jiggle the 1248-EP while it is in use.

The Intronics EPROM Programmer

The Intronics device was designed for maximum economy and a range of EPROM types. It has a 28-pin ZIF socket and a power supply designed to provide both 25- and 21-volt programming voltages. A combination of software and plug-in personality modules selects the EPROM type.

Five modules come with the programmer, allowing you to program 2508, 2708, 2516, 2716, 2532, 2732, 2564, 2764, and MK2764 EPROMs. Additional modules let you program 2732A, 68764, 68766, and 27128 EPROMs and are available for $5 each (the 27128 requires a minor change in the software as well). With its extended set of modules, the Intronics device can program essentially every variety of UV EPROM on the market.

The use of personality modules, the inclusion of the schematic, and the availability of source code all make it easy to modify this device to accommodate future EPROMs.

The software that drives the Intronics EPROM Programmer is less flexible than that of the 1248-EP and must be loaded from cassette. Unlike the 1248-EP, the Intronics device can only program an entire EPROM, or dump it to memory. Both of these functions are also targeted to a fixed spot (beginning at address $2000) in RAM. However, it can slide blocks of data of any size around in memory.

The 6821s are socketed, and schematics come with the documentation. The source code is available, on request, for an additional $5.

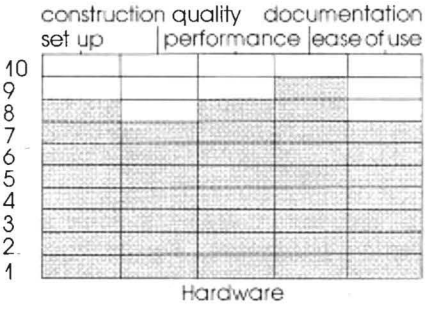
The device derives its programming voltages from the +5-volt line, making it less likely that careless jarring will damage your computer. This also makes it compatible with Tandy's CoCo II, unlike the 1248-EP. Unfortunately, it has no support legs like the 1248-EP.

To program 28-pin EPROMs or those requiring 21-volt programming voltages (2732As, 2764s, and 2564s), the Intronics device is the best choice. It is sufficient for virtually all varieties of EPROMs and is the most economical unit for those who wish to program an entire EPROM.

If you restrict your work to the Color Computer and the smaller-size EPROMs, the 1248-EP is more desirable. It's quicker and more flexible for small production runs. The 1248-EP can handle the 68764- and 68766-type EPROMs, which are the most suitable for modification of the CoCo's ROMs.

If you buy an EPROM programmer, you must also purchase an EPROM eraser. This consists of a box that contains a short-wave UV light bulb. It costs from $49 on up depending on capacity and speed.

As a final note, both Intronics and Computer Accessories of Arizona are promising significantly improved versions of these products. Intronics will be introducing a version with an improved ZIF and software only (no need for personality modules) selection of EPROM type. They might be ready by the time this review hits the stands. Contact either company for more recent information on their EPROM programmers. ■



Multi-Pak Interface
Radio Shack
1400 One Tandy Center
Fort Worth, TX 76102
$179.95

by Rusty Le Blang

Radio Shack has just introduced its Multi-Pak Interface. It plugs into the cartridge port on the right side of the Color Computer and offers four expansion slots for plugging in program packs, disk controllers, and other hardware devices. The interface will eliminate all that unnecessary wear and tear on the cartridge slot, and the hassle of plugging and unplugging ROM packs and peripherals.

The unit comes with its own power supply, an on/off switch in back, and a slot-selector switch in front. You use the selector switch to choose the slot you want at startup, and you can change to another slot at any time during operation simply by moving the switch. However, the manual tells you to press the reset switch when doing this, because the computer sometimes hangs up when you switch slots in the middle of program execution.

The interface can select a slot via software as well as hardware, and takes no RAM away from Basic. If you are in Basic (by starting up the computer with the selector set to an empty slot or to the disk controller) and wish to start up a ROM pack, simply POKE a value corresponding to the desired slot into memory address 65439. The following table shows the required values:

Slot Number	Value
1	POKE 65439,0
2	POKE 65439,17
3	POKE 65439,34
4	POKE 65439,51

The values are in increments of 17, so you don't need the manual by the computer everytime you want to change slots.

One of the nice things about the interface is that it lets you use the disk controller and the Graphics Input Tablet at the same time. You can edit your own pictures with the graphics tablet and save them right to disk. An addendum sheet included with the operations manual instructs you to plug the Graphics Input Tablet interface into any slot other than that for the disk controller (slot four).

Read the three values from the tablet (either by PEEK in Basic, or LDA in machine language), and load the display. When you are finished, simply use the SAVEM command to save your picture to disk. When you do this, the start address of the first graphics screen will be moved from $600 to $E00 with the disk installed. Remember this offset when you are saving any of the eight graphics pages.

Another interesting feature of the Multi-Pak Interface lets you examine the contents of a ROM pack without the danger of shorting out the computer. Place your ROM pack into a slot in the interface, and enter Basic by selecting an empty slot before you turn on the computer. Then disable the cartridge interrupt by typing POKE 65315,54.

Next, POKE the value corresponding to the slot with the ROM pack into 65439. Then, if you examine the contents of memory from 49152–57343, you'll find the ROM pack program there.

You can now move the program down into low memory, and save a copy to cassette. If you have disk, you can bypass the cassette and save it right to disk. To do this, once you have moved the ROM pack to RAM, POKE the value for the slot with the disk interface into 65439 and then execute 49152. You'll turn on the computer in Disk Basic, and the program will still be intact.

Make sure you move the slot-selector switch to the same slot; since you used a POKE for slot selection, the selector switch will no longer work, but if you press reset, the switch will be active again and boot the computer up back in the slot it selected.

The interface lets the computer select the slot being used at a particular time. However, there is always power in all four slots; when you select a slot, the interface activates the cartridge-select signal and the spare-chip-select signal on that slot so that if the device has ROM in it, it will use memory from $C000–$FEFF. If it contains a spare controller chip, it will use memory from $FF40–$FFBF.

Data lines are open to all four slots, so the interface is capable of handling several pieces of memory-decoded hardware at the same time—such as a real-time clock, a parallel printer port, a voice synthesizer, or even an 80-by-24 video display. These devices usually use memory from $FF40–$FFBF (the disk controller uses address $FF40–$FF5F), so there is no memory-conflict problem. This alone makes the interface worth having.

You can also use software to program which slot will have the cartridge-select signal, and which will have the spare-chip signal. For example, the spare chip in the disk interface is the disk-controller chip, and it's programmed by four addresses in memory from $FF40–$FF5F:

Address	Function
$FF40	Drive Select
$FF48	Disk Status and Command
$FF49	Track Number
$FF4A	Sector Number
$FF4B	Data Transfer Byte

The rest of the addresses in that area repeat these four. When the cartridge select and spare-chip select are on the disk slot, the disk ROM will be placed in memory from $C000–$FEFF, and the controller chip will be from $FF40–$FF5F.

If you look at the binary equivalent of the values you POKE into the slot select, you will see that the high-order nibble (bits 4–7) echoes the low-order nibble (bits 0–3): 0=0000–0000, 17=0001–0001, 34=0010–0010, and 51=0011–0011, because the high-order nibble programs the cartridge signal, and the low-order programs the spare-chip signal.

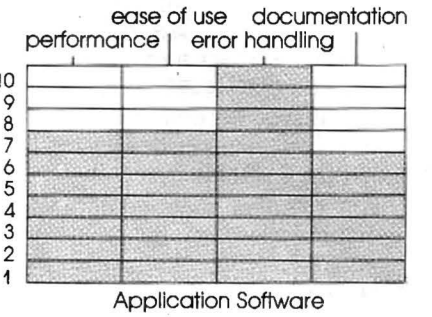
What can you do then if you have a voice synthesizer that uses the same memory as the disk-controller chip, but you wish to use the synthesizer with a program on disk? You can change the spare-chip select signal to the slot with the synthesizer, and when that's finished, switch it back to the disk controller.

To do this in your Basic or machine-language program, take the slot number you want for the cartridge-select signal, AND it with the value 240 to clear the low-order nibble, and OR it with the slot number (values 0, 1, 2, or 3) that you want to have use the spare-chip-select signal. Then just POKE it (or STA it) into 65439.

This feature brings up some interesting possibilities. For example, it could be possible to run up to 16 disk drives off the interface, using four disks in each of the four slots. When you want to use a drive in another slot, just POKE the spare-chip select to that slot, and Disk Basic will program the controller for that slot. You'll remain in Basic, and be able to save and load programs normally. The possibilities are endless!

I do object to the size of the Multi-Pak Interface, but that's about my only criticism. The unit is almost as big as the original interface for the Model I, and it takes up a lot of valuable desk space. At least the Model I interface acted as a base for the video display.

The Multi-Pak Interface is a welcome addition to the Color Computer family. With four hardware- and software-selectable slots, the ability to use the disk drive with other hardware devices, and the relief of no longer having to destroy the cartridge slot by plugging and unplugging ROM packs, it is the best expansion interface on the market for the Color Computer. If you are serious about your computer and want to expand it to its full potential, the Multi-Pak Interface is the only way to go. ■



Superscreen
Mark Data Products
24001 Alicia Parkway No. 207
Mission Viejo, CA 92691
16K, Extended Color Basic
or Disk Basic
$29.95, cassette
$32.95, disk

by Steve Brown

Superscreen is a machine-language utility program that replaces the familiar 32-character-by-16-line screen display with a 51-character-by-24-line display using a full upper- and lowercase character set.

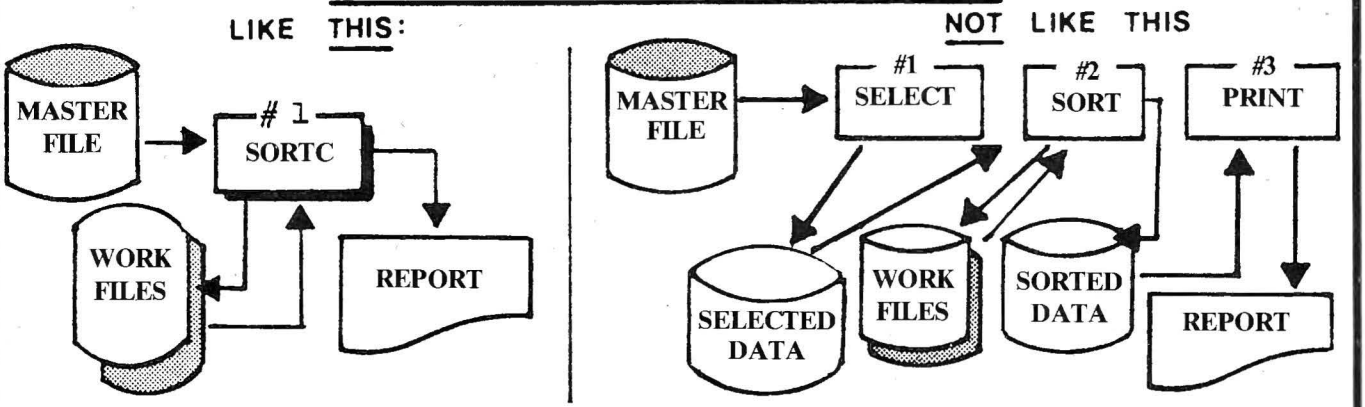
In addition, Superscreen incorporates an easily mastered command set that allows you to mix graphics and text on the new wide screen. Further, screen customizing features include reverse-video display and selection of cursor type.

For the programmer in all of us, Superscreen offers a real boon: auto-key repeat to allow repetitive entry of a character, or fast-forward cursor movement while editing.

These display and programming benefits make the program worth owning, but Superscreen also fixes one

SORTC** for OS9*

THE ONE AND ONLY



BOLDLY GOING WHERE NO SORT HAS GONE BEFORE

SORTC is a high speed, full-record compounding disk sort, which gives microcomputer users mainframe capabilities. It has been specifically designed to sort data efficiently while offering the user great flexibility in designing sort programs. It is written in BASICO9* for use under OS9.

COMPOUNDING FUNCTION

SORTC has the capability of summing user-specified numeric fields on equality of keys. This allows significant savings in memory, disk space, and program development time. A reduction in the number of disk accesses required when compared to other sorts is inherent in the design of **SORTC**.

DISK BASED

Specifically designed to sort large volumes of data, **SORTC** imposes no size restrictions on the amount of data to be sorted. It also places no limits on the number of sort keys which can be used or the order in which the keys are sorted. Furthermore, the sort procedure can be performed as many times as necessary within the same program. This feature allows the programmer to take advantage of any existing data bias, and possibly even reduce the size of the sort key.

ADVANCED DESIGN

While most disk sorts are partially based upon the Fibonacci series, **SORTC** is not. **SORTC** is a generation ahead of the normal sorts based upon the "Fib series". Its unique algorithm is automatically optimized at run time for a reduction in workspace, reduced # of disk accesses and shorter run times. Designed to be as "crash proof" as possible, the sort procedure will not abort if it is accidentally asked to sort zero items.

EASY TO USE

It is not difficult to design a program which will use **JBM's SORTC**. Since **SORTC** is a subroutine, the user may write any procedure he or she wants to format the data for sorting and then to process the sorted data. The sorted data need not be written back to disk, but instead is immediately available. The sort code is automatically inserted into the source procedure by a simple Sort Generator.

ORDERING INFORMATION

SORTC, from **JBM's MIDWARE** line of quality software, is available on either five and one-quarter or eight inch diskettes for a price of $150.00. All of **JBM's** software packages come complete with comprehensive user's manuals.

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of the most frustrating glitches in the CoCo ROM by supporting full implementation of an "ON ERROR GOTO" statement, which lets you build error-trapping routines into programs to avoid crashes and loss of data.

Superscreen requires only 16K Extended Color Basic, but accommodates itself to 16K, 32K, or 64K machines and supports Disk Basic. You don't need any POKEs to fit the program to your machine, as the program automatically adjusts itself to available memory, relocating itself from the top of the first 16K of memory to the top of the next 16K, modifying the appropriate registers along the way.

The actual screen displays are done on the graphics pages. Mark Data warns you not to reserve fewer than four pages (PCLEAR4) before running Superscreen.

Control Codes

Superscreen controls the screen environment through nine control codes, invoked by the Basic statement PRINT CHR$(N), where N is the code.

To use these control codes, you can call the PRINT CHR$(N) statement from the command mode or implant it in a Basic program. For example, to clear the screen, use the command PRINT CHR$(28); CHR$(31). Code CHR$(28) homes the cursor and code CHR$(31) erases from the cursor position to the end of the screen.

Superscreen gives you a new vista—a whopping 1,223 PRINT@ locations. Superscreen fully supports the Basic PRINT@ command. Plus, the CoCo is no longer limited to 511 print positions.

I use my CoCo for quite a few data-entry and file-processing applications. Formatting menu screens and data-entry prompt screens is frustrating when limited to only 32 characters and 16 lines. Superscreen's 51-by-24 format allows me to put most of the data-entry prompts for a single record on one screen.

The PRINT@ function also allows other uses of the control codes. The command PRINT@ 0, CHR$(31) clears the screen, just as the PRINT CHR$(28); CHR$(31) command above does. The effect is that of the CLS command.

The PRINT@ statement also allows some nifty effects in overwriting screen messages. The command, PRINT@ 0, "THIS IS FIRST" will place that message at the upper left of the screen. The command, PRINT@ 0, "AND SECOND"; CHR$(30) will print the new message at position 0 and will wipe out the remaining characters left over from the first PRINT statement.

Auto-Key Repeat

Pressing any alphanumeric key and holding it down for a moment engages the auto-key-repeat feature. After about a half-second, Superscreen recognizes that you want to repeat the depressed key and begins printing that character until you've had enough, or the keyboard input buffer is full.

This feature is particularly useful when you're editing long Basic program lines: just hold down the space bar until the cursor is under the offending character. Auto repeat is slick and efficient.

Error Trapping

Anyone who has spent precious time entering lots of separate data inputs into their latest program, only to have all that typing wiped out of memory when the whole thing crashes due to a syntax error, will find Superscreen worth the price for this feature alone.

The CoCo's Extended Color Basic is designed to come to a screeching halt when it encounters an error in a set of instructions. Despite all pleas, Basic resolutely closes all files and resets several memory registers, usually resulting in a program crash, lost time and data, and some new scatological phrases on your part.

The ON ERROR GOTO statement, a part of the Basic on other computers, doesn't allow the program to crash. Rather, when the machine encounters an error, the ON ERROR GOTO statement branches the program to a designated routine that brings the program to a gentle halt while retaining all registers. The error-trapping routine also uses two new commands, ERR and ERL.

ERR is represented by a numeric code that you must look up on a table provided in Superscreen's documentation. For example, an SN error is code number 2. The program then stops until you tell it where to resume.

You can also use the ERR/ERL commands in an IF...THEN statement to send program control back to a specified line. Unfortunately, Basic doesn't allow you to edit the offending line and continue as though there were no error, but careful structuring of an error-trapping routine will save many lost hours.

Since laziness and fear contribute equally to my computing efforts, I make ample use of write-protect tape on disks. More than once a program has crashed because the disk I was writing to had a write-protect tab in place. With ON ERROR GOTO I can keep some of the laziness and alleviate the fear of losing a full buffer because the program returns the WP ERROR code and waits while I remove the write-protect tab.

Documentation

The preproduction sample of Superscreen that I received had six pages of very complete documentation,

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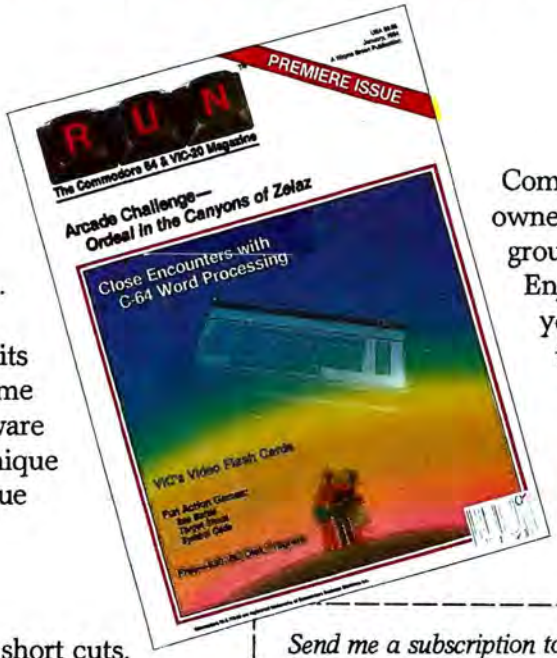

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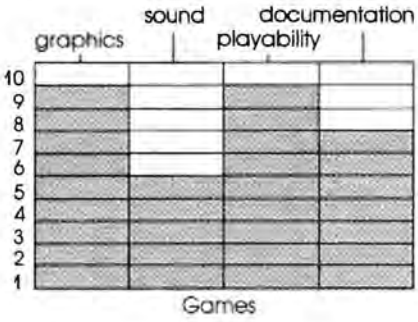
with plenty of examples to illustrate Superscreen's versatility. I hope the production version will be as complete and will contain a demo program or two, which is the best way to learn exactly how to use the program.

Summary

Superscreen does what it sets out to do so well that it is hard to find any major faults. The only bothersome aspect is not in the program, but in the CoCo. Superscreen uses the PMODE 4 graphics screen; the expanded "text" screen is green with black letters. However, the CoCo phenomenon of "artifact" colors creates colored halos around the smaller letters required to squeeze 51 characters on a line. Turning the TV color controls to black and white eliminates the problem, however.

Mark Data Products is known for quality games and hardware. Superscreen represents a quality utility program that fills a definite need for the serious CoCo user. The program offers flexibility in screen formatting and text handling that the CoCo doesn't offer. Plus, no other programs on the market so far have offered the error-trapping utility of Superscreen. ■



Lancer
Spectral Associates
3418 South 90th St.
Tacoma, WA 98409
32K, Extended Color Basic, joysticks
$21.95, cassette
$24.95, disk

by Steve E. Williams

Lancer is the best version of Joust that I have seen for any home computer. Using the Color Computer's graphics to the maximum, it is a near duplicate of the original coin-operated game.

In Lancer, you control a rider astride a giant stork. Your objective is to unseat opposing riders from their storks.

Lancer Graphics

You can play solo, but it's especially enjoyable to work cooperatively with a friend in the two-player mode. The resulting team spirit enhances the action and is quite different from the boredom of other games in which each player must await his turn.

The arena consists of an open area with five islands suspended in midair over treacherous lava pits. A bird can land safely upon the islands, two of which wrap around the screen borders. Islands disappear at the higher skill levels to augment the challenge.

In order to score a kill, a knight must glide downward into an opposing rider, or otherwise come in contact at a higher position.

When you kill an enemy rider, his life force plummets to a nearby island in the form of an egg. You must lance these eggs, or they will hatch into new, more dangerous riders in a few seconds.

You will lose one of your five riders if he's lanced from above or falls into the lava pits. If you have another rider left, he will appear on one of the island materialization pads.

A dragon appears randomly at the higher skill levels. Its touch is deadly, and you can kill it only by spearing it directly in its mouth.

You direct your mount with the joystick and flap its wings with the fire button. Control is exceptionally smooth and realistic. For example, in normal movement, a bird might take a running start, leap into the air, glide upward with its momentum, hover a while, flap, and turn before finally landing upon an island or attempting to lance an opponent.

Lancer features detailed, colorful graphics. The arena, knights, birds, and dragons are displayed in beautiful, high-resolution graphics. You can actually see the enemy birds' long brown necks and the spotted designs upon their beating blue wings. Your mount is a two-tone red and green stork with yellow markings.

This game offers a challenge that similar microcomputer programs do not. Enemy knights fight intelligently, often surprising their victim by flying off one edge of the screen and returning through the other. In addition, they fly artfully in defense and are tough to attack.

Lancer ranks with the finest arcade games for all home computers. ■

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By RUGBY CIRCLE
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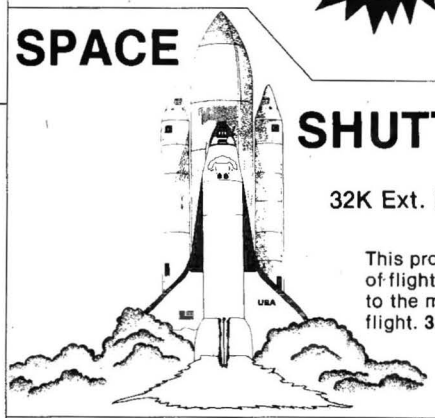

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32K Ext. Basic

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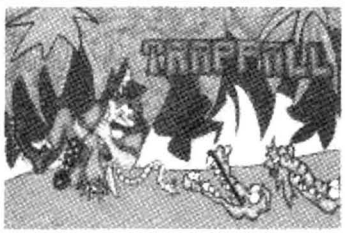

"TRAPFALL"

By KEN KALISH
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."

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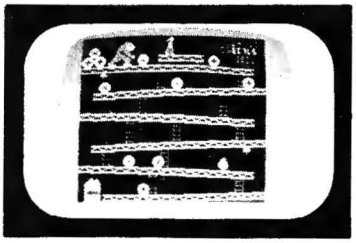

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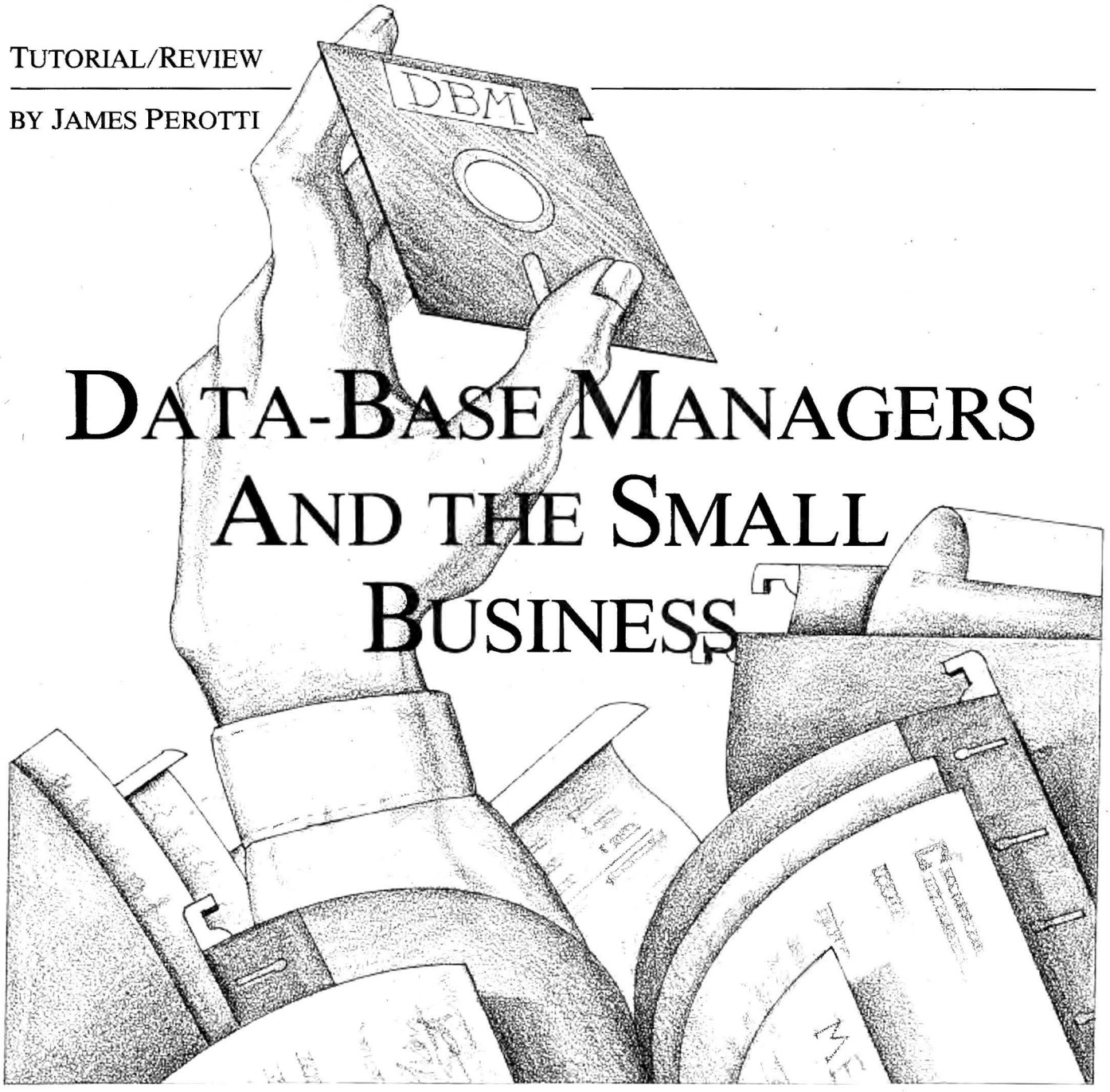
BY JAMES PEROTTI



DATA-BASE MANAGERS AND THE SMALL BUSINESS

Many people have naive ideas about information; they believe that having more information available improves decision making. But you've seen the ads with a hallway full of paper advancing towards the poor manager.

Too much information often has a paralyzing effect on people trying to make a decision. As Naisbett says in *Megatrends*, "We are drowning in information but starved for knowledge."

Using the XDMS Data Management System (Westchester Applied Business Systems, Box 187, Briarcliff Manor, NY 10510; disk, $179.95; with DBMS utilities, $249.95), I'll explain how such a program can help you store and retrieve information efficiently.

Bill Adams wrote XDMS for the FLEX operating system; it runs with no difficulty on the 64K Color Computer. I chose this program because it is a state-of-the-art, data-base management system (DBMS) that supplements typical data-base processing techniques with the ability to calculate the data. That feature expands the usefulness of this system considerably.

Has all that information you need to sort through got you down? Get a data-base manager and relax.

What Is a DBMS?

"Look at this, we got three separate mailings from the Credit Union: One is for the checking account, another for the savings, and the third is for the car loan." The Credit Union has a problem with data duplication because it stores the customer's name, address, and other data in a file for each account.

Why is this a problem? If a customer moves or changes names, *all* the files containing this personal information must be changed. Normally this isn't a big deal, since the Credit Union realizes that the customer has three separate accounts. On occasion, however, someone slips up and the customer's accounts are sent to the wrong address.

A DBMS is a means to organize and manipulate data files in an *integrated* manner. It organizes all the files into one data base, represents the relationships among their records, and uses these relationships to process the data.

Suppose a company wants to use information about employees' job classification, department, and sex; a DBMS would integrate these records into a single data base. Thus it is possible to retrieve all the employees (by name) who work in the budget department, or all employees with job class 4, or all females in job class 2 who work in the production department.

A file is a collection of records. A payroll file, for example, has a record for each person on the payroll. A record consists of several fields of stored information such as name, address, zip code, sex, age, marital status, credit rating, and current balance.

Each part of the information in a record is called a field. Thus a record is made up of fields, and a file is made up of records. A DBMS can process (i.e., access or update) files, records, or fields.

Selection

Our organization has a room full of filing cabinets containing the personnel files of everyone in the company. The files are organized in alphabetical order, and any authorized person could easily examine someone's file.

But the filing system makes it extremely difficult to answer questions such as "How many people earn more than $50,000?" "How many women make more than $25,000?" "How many people were hired in 1980?"

The managers who have to make decisions based on answers to those questions are stymied by their inability to *select* the information they need from the sheer bulk of irrelevant information.

Finding needed information easily is the major strength of a DBMS.

DBMSes use English-like phrases to simplify the selection process. Here is an example that will list the names and salaries of females:

```
LIST NAMES, SALARY IF SEX = F.
```

And this one will print the names and salaries of people earning over $50,000:

```
PRINT NAMES, SALARY IF SALARY > $50,000.
```

DBMS Transaction Processing

Small businesses are finding that a microcomputer running a good DBMS can effectively handle most of their information; small business people, in fact, buy most of the DBMSes.

DBMSes are general-purpose programs; they can do what you want them to do; they substitute for a programming language. Many management theorists predict that DBMS commands will become the replacement in business for most computer languages (even Cobol).

Because DBMSes can process numerical and textual information and write reports, a good DBMS can substitute for all kinds of expensive business packages in a small business. The Color Computer with 64K of RAM can handle large data bases because XDMS employs a *virtual memory* process, which uses the disks as memory, switching files in and out of RAM as needed. The disk I/O slows processing down, but processing speed is expensive. Price a hard disk with tape back-up or a minicomputer.

Computers proved themselves to businesses by doing *transaction processing* accurately and efficiently. Data was stored sequentially on a master file, which was updated by a transaction file.

But what happens if you want to expand the records to include another field? Without a DBMS, inserting and deleting another field is time-consuming and complex. Since the files are sequential, they must be rewritten.

Good DBMSes are written to facilitate transaction processing. Updating and altering records is designed to be done by data-entry clerks who input data in response to prompts. For example:

```
Name: _____ _____
      (last)      (first)
Purchases: $_____.__
Payments:  $_____.__
```

The credit processing for a retail store is an example of transaction processing. Each month a master file that maintains each customer's balance is updated with a transaction file that contains the payments and purchases from last month. The computer calculates a new balance and creates a file from which bills are sent to customers.

Updating a customer's record is a transaction; updating all the records is an example of transaction processing. See Fig. 1 for an abbreviated version of a master file.

Altering the record structures by adding fields is also no problem for a good DBMS. XDMS requires only that you define the new field and then insert data into it. You can pull the data from another file. This is nice because you can also pull additional data from a mainframe file and add it to the data base on the Color Computer.

To be effective at transaction processing, a DBMS must be able to work with multiple files simultaneously (e.g., a file with this month's transactions, the master file, and a file from which bills will be printed).

Computation

File-management systems and most data-base programs for micros have limited or nonexistent capabilities to calculate numerical data. Even though the calculations below are simple, most DBMSes would have trouble with them.

- Interest: Old Balance × 18 percent
- New Balance: Interest + Purchases − Payments

Without this ability to compute numerical data, the small-business person using a data base must write a program to access the data in the file, do the calculations, and put the results back into the file—not impossible, but certainly a pain.

Processing such as billing, inventory, and payroll requires computation. XDMS handles the calculations straightforwardly with its CALC function:

```
CALC OLD BALANCE * .18 = INTEREST
CALC INTEREST + PURCHASES - PAYMENTS = NEW BALANCE
```

Mid-Managers and DBMS

The micro revolution is sweeping through big business. Dun and Bradstreet recently reported that 70 percent of the companies with more than 5,000 employees had purchased microcomputers for their managers and professionals.

What's the appeal? Why do managers need a micro when these organizations have multimillion-dollar computer facilities?

Software sells hardware. These managers are buying machines to run SuperCalc and VisiCalc; the sales figures on these packages are the clue to what is going on.

Lotus 1-2-3 is now the hottest selling software in the country; it is a combination data base and spreadsheet program. XDMS is a data base expanded to perform calculations on the columns (fields) of the data base. It will probably become a big success on the 64K Color Computer as managers discover the power of the software and the value of the hardware.

Spreadsheets have limited abilities to deal with textual material. DynaCalc and SuperCalc can sort text fields, but none of the spreadsheets can really *process* information (select, find, extract, exclude, format, combine, and so on).

Managers find that the spreadsheets extend their abilities to do numerical

Output Name	Dept.	Sex	Salary
Doozer	Admin.	M	30,000
Gray	Admin.	F	19,000
Hines	Admin.	M	47,000
Ramey	Admin.	F	20,000
Gopher	Admin.	M	20,000
Ziegler	Admin.	F	24,000
Rum	Admin.	M	49,000
Beauty	Admin.	F	17,000
Hoover	Maintain.	M	23,000
Dawson	Maintain.	M	26,000
Iseman	Maintain.	F	19,500
Snoozy	Maintain.	M	39,000
Koda	Maintain.	F	21,000
Powers	Maintain.	M	22,000
Gerig	Prod.	M	29,000
Wolfe	Prod.	M	31,000
Lagraff	Prod.	M	30,000
Orth	Prod.	M	42,000
Inert	Prod.	M	32,000
Junior	Prod.	M	34,000

Table 1. Original Data

Output Name	Dept.	Sex	Salary
Beauty	Admin.	F	17,000
Gray	Admin.	F	19,000
Gopher	Admin.	M	20,000
Ramey	Admin.	F	20,000
Ziegler	Admin.	F	24,000
Doozer	Admin.	M	30,000
Hines	Admin.	M	47,000
Rum	Admin.	M	49,000
Output Name	**Dept.**	**Sex**	**Salary**
Iseman	Maintain.	F	19,500
Koda	Maintain.	F	21,000
Powers	Maintain.	M	22,000
Hoover	Maintain.	M	23,000
Dawson	Maintain.	M	26,000
Snoozy	Maintain.	M	39,000
Output Name	**Dept.**	**Sex**	**Salary**
Gerig	Prod.	M	29,000
Lagraff	Prod.	M	30,000
Wolfe	Prod.	M	31,000
Inert	Prod.	M	32,000
Junior	Prod.	M	34,000
Orth	Prod.	M	42,000

Table 2. Sorted by Department and Salary

Output Name	Sex	Job	HDate	Salary
Gray	F	1	01-01-81	19,000
Ramey	F	1	03-01-82	20,000
Iseman	F	1	08-01-83	19,500
Gopher	M	2	04-01-69	20,000
Hoover	M	2	07-01-77	23,000
Powers	M	2	02-01-79	22,000
Koda	F	2	03-01-83	21,000
Beauty	F	2	09-01-83	17,000
Junior	M	3	01-01-76	34,000
Inert	M	3	02-01-77	32,000
Wolfe	M	3	03-01-78	31,000
Dawson	M	3	06-01-78	26,000
Doozer	M	3	08-01-78	30,000
Lagraff	M	3	09-01-78	30,000
Gerig	M	3	04-01-79	29,000
Ziegler	F	3	07-01-80	24,000
Hines	M	4	09-01-75	47,000
Orth	M	4	01-01-82	42,000
Rum	M	4	01-01-82	49,000
Snoozy	M	4	01-01-82	39,000

Table 3. Sorted by Job and Hire Date

analyses on budgets and financial records. They are now discovering that DBMSes extend their abilities to analyze records that include both textual and numerical data.

A typical managerial process goes something like this:

- A problem forces the manager to analyze information to better understand the problem.
- The information is ambiguous; the data suggests no clear decision.
- The manager then formulates a hypothesis based on shaping and interpreting the data that explains the information.
- This knowledge based on the information becomes the basis for a decision.

Let's try an example to illustrate the decision-making process and the usefulness of XDMS. Pretend that you are a manager with responsibility for three departments and 1,000 employees (I'll only use 20 records in this illustration).

Ms. Ziegler, who is a member of your administrative staff, informs you that she has filed a formal grievance with the company alleging that the company practices salary discrimination based on sex. She claims that all the women's salaries in your departments are substandard and that this pattern of discrimination will be the basis for an EEOC grievance if you do not rectify the salary inequities.

You are shocked and perplexed. You have tried hard to hire and advance women. Ziegler is an example; you have seen to it that she is relatively high priced. Salaries are based on company policy; job classification, and seniority

eeny meeny miney mo

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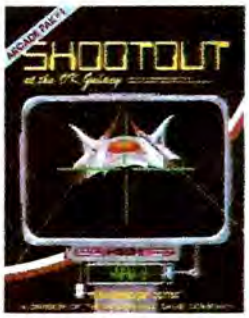

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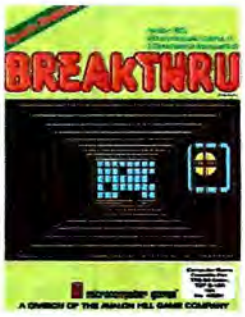

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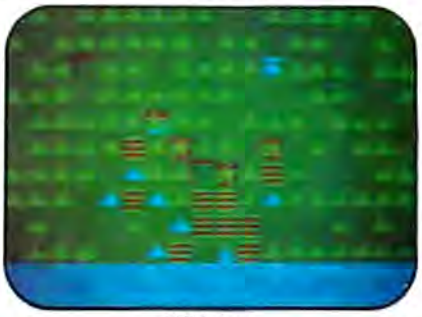

VC Screen

SHOOTOUT (at the OK Galaxy)

30 ALIEN WARSHIPS HAVE ENTERED YOUR PATROL ZONE. OK, shields up?, energy level . . . check, azimuth set? Yup. This may sound like the latest summer space movie thriller but in fact it's the preparations YOU will make when playing Avalon Hill's new **arcade** strategy game SHOOTOUT AT THE OK GALAXY. Over 2 years in the making, SHOOTOUT is purely graphical combining arcade excitement with just the right touch of strategy.

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Fig. 1. An Abbreviated Version of a Master File

Output Name	Sex	Salary M	Salary F
Beauty	F		17,000
Gray	F		19,000
Iseman	F		19,500
Ramey	F		20,000
Gopher	M	20,000	
Koda	F		21,000
Powers	M	22,000	
Hoover	M	23,000	
Ziegler	F		24,000
Dawson	M	26,000	
Gerig	M	29,000	
Lagraff	M	30,000	
Doozer	M	30,000	
Wolfe	M	31,000	
Inert	M	32,000	
Junior	M	34,000	
Snoozy	M	39,000	
Orth	M	42,000	
Hines	M	47,000	
Rum	M	49,000	

Table 4. Salaries Arrayed by Sex

determine people's pay. Better analyze the situation. Here is a job for XDMS.

Look at Table 1. The data is all jumbled. You need to sort the records in order to focus patterns in the data. At this point you don't know what you are looking for.

What if you looked at the salaries in each department? In DBMS terms, what if you sorted the data by department and by salary? The command to do this with XDMS is: "Sort by dept, by salary."

Good DBMSes also have report-writing capabilities. They permit you to specify titles, headings, margins, tabs, and so on. For Table 2 I used "Title Table 2, Sorted by Dept and by Salary", and "Margins 10, Tabset 7".

Table 2 clearly shows that there are no women in the production department. It also shows that women are lowest paid in the maintenance department, but you just hired Iseman and Koda. They have the least seniority.

That's probably true of the administration department, too. Salaries are based on job classification and seniority; a sort by job class and hire date (HDATE) will verify this.

XDMS and other good DBMs can work with strange data structures like a 01-01-81 date or a social-security number. XDMS permits you to calculate with dates, to compute years employed (i.e., by subtracting HDATE from today's date: CALC 01-01-84 – HDATE = YEARS).

HDATE also illustrates the need to add a new field to the records. XDMS easily handles the addition by asking that you define a new field (DEFINE HDATE,S,8), and update the data file by inserting the dates in the HDATE field.

You could also pull the dates from another file. You could fill in the HDATE field by output from another file, but the names in both files must match. XDMS provides a way to merge two files.

If your hypothesis is correct, the salaries in each job class should go from highest to lowest based on seniority. But look at Table 3. Note Ziegler's salary.

JOB CLASS #1

Output Name	Sex	Salary
Gray	F	19,000
Iseman	F	19,500
Ramey	F	20,000

JOB CLASS #2

Output Name	Sex	Salary
Beauty	F	17,000
Gopher	M	20,000
Koda	F	21,000
Powers	M	22,000
Hoover	M	23,000

JOB CLASS #3

Output Name	Sex	Salary
Ziegler	F	24,000
Dawson	M	26,000
Gerig	M	29,000
Lagraff	M	30,000
Doozer	M	30,000
Wolfe	M	31,000
Inert	M	32,000
Junior	M	34,000

JOB CLASS #4

Output Name	Sex	Salary
Snoozy	M	39,000
Orth	M	42,000
Hines	M	47,000
Rum	M	49,000

Table 5. Sorted by Job Classification and Salary

But there is a problem with the fact that people in production (job class 3) are paid more than people in other departments. The people in job class 4 are your top managers; their salaries are set on the basis of merit. You realize that many factors affect the salaries. It's time to focus on a comparison of salaries for men and women.

You construct a simple sort by salary, but find it hard to read. XDMS permits you to sort the salaries and present them in two columns, male and female. You can array data with XDMS using any field; in this case you could array by department, job, or sex. The command to array the salaries under the M or F columns is: Array Salary for Sex = M,F.

The results as shown in Table 4 appear pretty damning. Maybe Ziegler is right.

The array shown in Table 4 shakes you; you immediately rip it to shreds. An administrative assistant cannot be compared to the head of a department! You must consider the fact that the women are mostly in job class 1.

quickly sort by job class and by salary. (Table 5.) Again, the results do not please you.

The conclusion is inescapable; your legal office calls it *Prima facie* evidence of salary discrimination based on sex. You decide to go to the company president and ask for funds to increase the women's salaries. You seek advice from your department heads about appropriate salaries and use XDMS to compare the women's salaries to the men's.

Summary

DBMSes offer small businesses an efficient way to handle their information resources. Midmanagers in large organizations find that a DBMS helps them select the information relevant to their immediate problem, sort and analyze the information, and reach decisions based on their interpretation of the information.

These applications were illustrated with commands and output from XDMS. XDMS is a tremendously powerful programming language and report writer—one that works with files, records, and fields. This short article only touched on a few of its capabilities; *HOT CoCo* and other magazines will probably begin to publish how-to articles for using DynaCalc and XDMS in the future.

Like any language, XDMS is hard to learn. Knowing which commands do what takes time. Pulling an HDATE field from one file and inserting it into another requires some thought.

The operations are complex; hence, the commands to perform the processes are difficult to master. Even after spending hours experimenting with certain of XDMS's commands, I could not get the output correct.

This is a fault of the manual; it needs to be clearer and filled with less jargon and more examples.

Bill Adams wrote a terrific program, but the manual is barely adequate. It's a major flaw in what is an otherwise remarkably powerful data-management system for the Color Computer, one designed for managers of small and large businesses. ■

Ed. Note:

As HOT CoCo *went to press, a new version (1.1) of XDMS and an upgraded XDMS+ were announced. Both manuals have been revised, which should alleviate the difficulty of learning the data-base commands.*

You can write to James Perotti, c/o HOT CoCo, *Pine St., Peterborough, NH 03458.*

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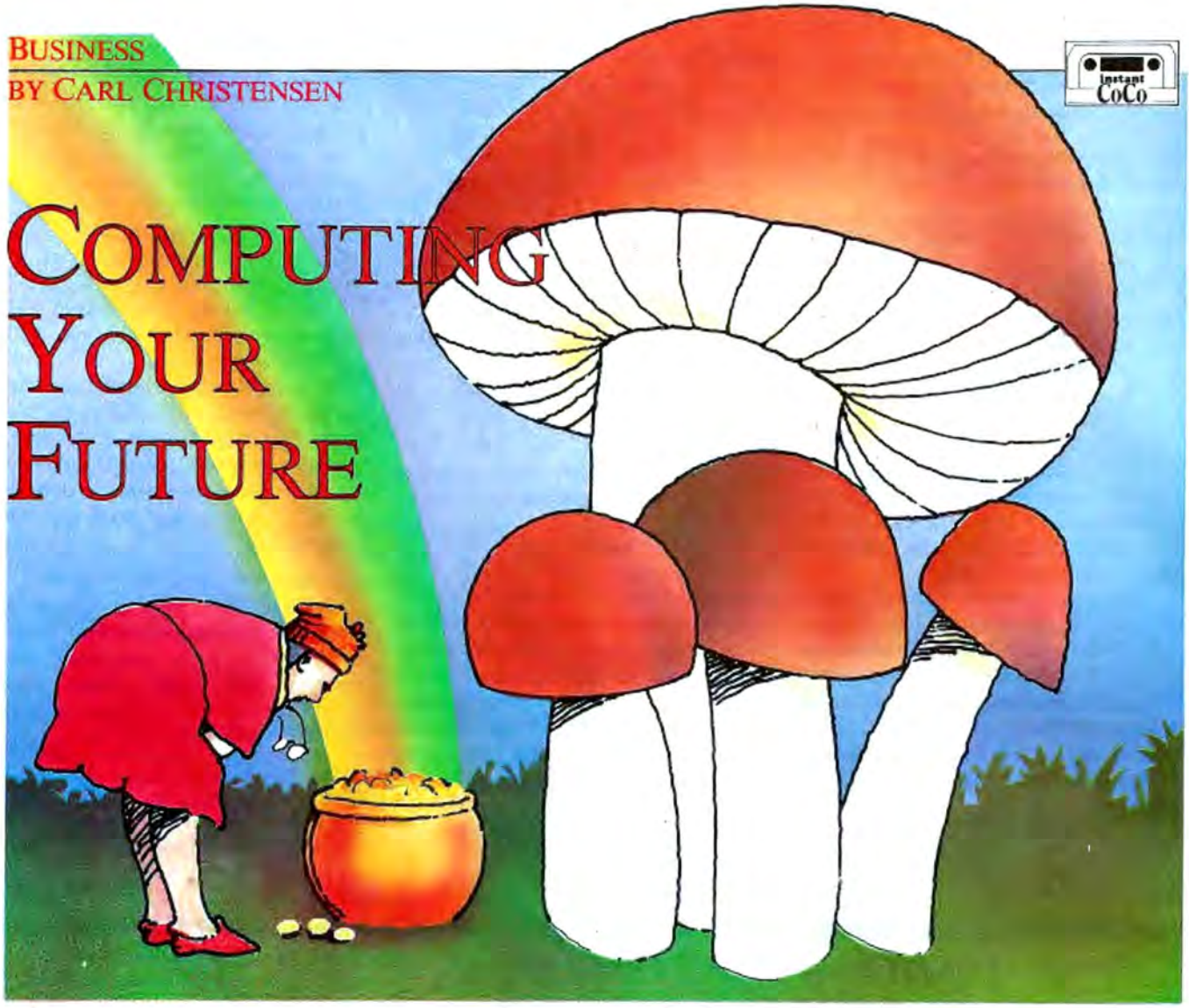
BUSINESS

BY CARL CHRISTENSEN

COMPUTING YOUR FUTURE



Many books on personal money matters state that only a small percentage of people who reach retirement age are financially able to enjoy a comfortable, secure retirement. These books illustrate how a little planning, regular saving, and prudent investing can help almost anyone achieve the goal of a secure retirement.

If you haven't thought about providing for your retirement, maybe your CoCo can get you started.

The planning process involves deciding how much income you would need to retire today. You must then adjust this amount for inflation up to your proposed retirement date and calculate the size of the nest egg needed to produce the adjusted retirement income. Finally, you calculate how much you will have to invest every year to achieve that goal.

My program (see Listing) lets you try an infinite number of possibilities and see what difference a few extra dollars saved or a few extra percentage points

500	Title
1000	Input the numbers
1500	Choose retirement option
2000	Calculations
2100	Retirement benefits (adjusted for inflation)
2200	Calculate size of nest egg needed according to retirement option
2300	Calculate size of current savings at retirement
2400	Calculate amount of additional savings needed
2500	Calculate annual savings necessary
3000	Display solution on the screen
4000	Options
	Print? (5600)
	Choose different retirement option? (1500)
	Start again? (1000)
	Quit? (6000)
5000	Subroutines
5100–5500	Formulas
5600	Dump screen to printer
5700	INKEY$
5800	Printer on?
5900	Input instructions
6000	End

Table 1. Line Descriptions

System Requirements

16K RAM
Extended Color Basic
Printer Optional

in net investment yield could make.

Nuts and Bolts

Table 1 describes the program line by line, while Table 2 defines the variables. The only POKEs in the program are to increase or decrease the processing speed of the CoCo. You can modify or eliminate these on other machines.

The program uses no graphics, and you can convert it to Color Basic by eliminating the PRINT USING commands and using subroutines to raise numbers to a power.

The subroutine at 5600 is a simple screen dump to a Radio Shack Line Printer VII. You would have to modify it to allow it to function with a different printer.

One of the fancier features of the program is its three retirement options.

- Interest Only—You live on the interest produced by your nest egg and leave the principal undisturbed.
- Fixed Annuity—You live on principal and interest and exhaust the whole thing at the end of a fixed period.
- Inflation Adjusted Annuity—You live as in option 2, but increase the benefits each year.

Obviously each of these plans requires a different sized nest egg. That's what the program calculates.

Notice that you invest your savings at the end of each year while you are working and that you receive the benefits at the beginning of each year during your retirement. Note also that the program applies the same inflation rate for your whole life and that the return on investment is average net yield after taxes.

Inflation Adjusted Annuity

Standard annuity formulas calculate the cost of a fixed flow of income for a fixed period when you invest the principal at a given interest rate. This is the formula used in retirement option two. Given the rate of inflation over the last few decades, however, it doesn't seem wise to plan a 20- or 30-year retirement on a fixed income.

The code in lines 2260–2282 calculates the savings needed to provide an annuity with increased benefits each year. First it calculates the cost of an annuity to pay a fixed benefit at the level of the first year of retirement (2266). Then it calculates the increase in benefits (IB) for the next year (2276) and a second small annuity (2266).

Since this small annuity will not start paying until the second year, it can earn interest the first year, so it needs to be discounted to its value at the moment of retirement (2270). Finally, the program adds the cost of this smaller annuity to the cost of the primary annuity (2272). It repeats this process for each year in the life of the annuity to give you the size of the nest egg (SN) you will need at retirement to provide this flow of increasing benefits. ■

Address correspondence to Carl Christensen, 523 Inca, Salinas, CA 93906.

String Variables

LN$	Large number (for PRINT USING)
SN$	Small number (for PRINT USING)
O$	Retirement option (name)
AA$	INKEY$ input

Input Variables

AA	Value of INKEYS$ inputs
IR	Inflation rate
WY	Working years
RY	Retired years
CS	Currently desired salary
SP	Savings at present time
WI	Investment yield while working
RI	Investment yield during retirement
O	Retirement option

Subroutine Calculations

PV	Present value
FV	Future value
I	Interest rate/period
P	Number of periods
PMT	Payment

Calculations of Variable Annuity

OB	Old benefit level
NB	New benefit level
IB	Increase in benefit
SI	Savings increase needed
Y	Year of retirement

Output Variables

SN	Total savings needed at retirement
SR	From current savings
SA	From annual savings
RB	Yearly retirement benefits
FB	Benefit in final year of variable annuity
SY	Yearly savings required until retirement

Screen Dump to Printer

L	Screen location
C	ASCII code of character at L
CN	Character counter

Table 2. Variables

Data

- Inflation: 10%
- Retiring in three years for three years
- Salary desired: $1,000 per year
- Savings at the present time: $100
- Yields on investments: 10%
- Option #3—Inflation Adjusted Annuity

The program calculates that $1,166 must be invested each year. Here is the verification:

	Working			Retired		
	1st Year	2nd Year	3rd Year	1st Year	2nd Year	3rd Year
Present Savings	$100 + 10% = 110	+ 10% = 121	+ 10% = 133			
Annual Savings	$1166	+ 10% = 1283 + 1166 2449	+ 10% = 2693 + 1166 3859 + 133			
Benefits Begin			3992	3992 − 1331 2661 + 10% =	2928 − 1464 1463 + 10% =	1610 − 1611 (1)
Salary	1000 + 10% =	1100 + 10% =	1210 + 10% =	1331 + 10% =	1464 + 10% =	1611

Table 3. Example of Program Calculation

Program Listing. Retirement Planner

```
500 ' TITLE
510 CLS:PRINT@64,"* R  E  T  I
R  E  M  E  N  T *"
520 PRINT@174,"FOR":PRINT@226,"T
RS-80 EXTENDED COLOR BASIC"
530 PRINT@396,"(C) 1983":PRINT@4
22,"CARL J. CHRISTENSEN"
540 LN$="$$#,###,###":SN$="$$###
,###"
550 POKE65495,0:' POKE HIGH SPEE
D
560 GOSUB5700
1000 ' INPUT DATA
1010 GOSUB5900:PRINT"AVERAGE RAT
E OF INFLATION.":INPUT IR
1020 GOSUB5900:PRINT"YEARS UNTIL
 RETIREMENT.":INPUT WY
1030 GOSUB5900:PRINT"YEARS OF RE
TIREMENT.":INPUT RY
1040 GOSUB5900:PRINT"ANNUAL RETI
REMENT INCOME":PRINT"DESIRED IN
CURRENT DOLLARS.":INPUT CS
1050 GOSUB5900:PRINT"CURRENT RET
IREMENT SAVINGS.":INPUT SP
1060 GOSUB5900:PRINT"AVERAGE YIE
LD ON INVESTMENTS    UNTIL RETIR
EMENT.":INPUT WI
1070 GOSUB5900:PRINT"YIELD  ON I
NVESTMENTS DURING    RETIREMENT.
":INPUT RI
1500 ' INPUT RETIREMENT INCOME O
PTIONS
1510 CLS:PRINT"RETIREMENT INCOME
 OPTIONS:"
1520 PRINT:PRINT"1. INCOME OF"RI
"% ON PRINCIPAL."
1530 PRINT:PRINT"2."RY"YEAR ANNU
ITY AT"RI"%."
1540 PRINT:PRINT"3."RY"YEAR ANNU
ITY AT"RI"%.":PRINTTAB(2)"BENEFI
TS INCREASE"IR"% PER YR."
1550 PRINT@480,"TYPE 1, 2 OR 3."
;:GOSUB5720:IF AA<1 OR AA>3 THEN
 1550 ELSE O=AA
1560 IFO=1THENO$="INTEREST"
1570 IFO=2THENO$="ANNUITY"
1580 IFO=3THENO$="INFL ANNTY"
1600 CLS:PRINT"NOTE:":PRINT:PRIN
T"SAVINGS ARE INVESTED AT THE EN
D OF EACH WORKING YEAR."
1610 PRINT:PRINT"BENEFITS ARE PA
ID AT THE BEGIN- NING OF EACH YE
AR OF RETIREMENT.":GOSUB5700
1700 CLS:PRINT@233,"CALCULATING"
2000 ' CALCULATIONS
2100 ' CAL. RETIREMENT BENEFIT
2110 I=IR*.01:P=WY:PV=CS:GOSUB51
00:RB=FV
2200 ' CAL. SAVINGS NEEDED
2210 ON O GOTO 2220,2240,2260
2220 ' RETIRE ON THE INTEREST
2230 SN=RB/(RI*.01):GOTO2300
2240 ' RETIRE ON AN ANNUITY
2250 I=RI*.01:P=RY:FV=RB:GOSUB54
00:SN=PV:GOTO2300
2260 '  RETIRE ON AN INCREASING
ANNUITY
2262 OB=RB:IB=RB:' FOR 1ST YR
2264 FORY=1 TO RY
2266 I=RI*.01:P=RY-Y+1:FV=IB:GOS
UB5400:SI=PV:' PV FOR EACH ANNUI
TY
2268 IF Y=1 THEN2272:' FOR 1ST Y
R
2270 I=RI*.01:P=Y-1:FV=SI:GOSUB5
200:SI=PV:' DISCOUNT TO PV AT RE
TIREMENT
2272 SN=SN+SI:'ADD TO TOTAL SAV
2274 IF Y=RY THEN2282:' FOR FINA
L YR
2276 NB=OB*(1+(IR*.01)):' INFL I
NCREASE IN BENEFITS
2278 IB=NB-OB:OB=NB:NB=0
2280 NEXT Y
2282 FB=OB
2300 ' CAL. SIZE OF CURRENT SAVI
NGS AT RETIREMENT
2310 I=WI*.01:P=WY:PV=SP:GOSUB51
00:SR=FV
2400 ' CAL. ADDITIONAL SAVINGS N
EEDED
2410 SA=SN-SR
2500 ' CAL. YEARLY SAVINGS NEEDE
D
2510 IF WY=0 THEN SY=SA:GOTO3000
2520 I=WI*.01:P=WY:FV=SA:GOSUB55
00:SY=PMT
3000 ' OUTPUT TO SCREEN
3010 CLS:PRINT"INFLATION RATE"IR
"%"
3020 PRINT:PRINT"RETIRING IN"WY"
YEARS:"
3030 PRINTTAB(2)"SAVINGS ";:PRIN
TUSING LN$;SN
3040 PRINTTAB(4)"FROM CUR SAV ";
:PRINTUSING LN$;SR
3050 PRINTTAB(4)"FROM ANN SAV ";
:PRINTUSING LN$;SA
3060 PRINTTAB(2)"YIELD"RI"%"
3070 PRINTTAB(2)"METHOD: ";
3080 IF O=1 THEN PRINT RI"% "O$
3090 IF O=2 OR O=3 THEN PRINT O$
 RY "YRS"
3100 PRINTTAB(2)"SAL/YR";:PRINTU
SING SN$;RB;:IF O=3 THEN PRINT "
-";:PRINTUSING LN$;FB:GOTO3120
3110 PRINT
3120 PRINTTAB(4)"(CURRENTLY ";:P
RINTUSING SN$;CS;:PRINT")"
3130 PRINT"INVESTMENT REQUIRED:"
3140 PRINTTAB(2)"CURRENT SAVINGS
 ";:PRINTUSING LN$;SP
3150 PRINTTAB(2)"ANNUAL SAVINGS
 ";:PRINTUSING LN$;SY
3160 PRINTTAB(2)"YIELD"WI"%"
3170 PRINT:PRINT"<P>=PRINT
<ENTER>=CONTINUE";
4000 ' OPTIONS
4010 GOSUB5720:IF AA$="P" THEN G
OSUB5600
4020 CLS:PRINT"1. CHANGE OPTION"
:PRINT"2. BEGIN AGAIN":PRINT"3.
QUIT PROGRAM"
4030 PRINT@480,"TYPE 1, 2 OR 3."
;:GOSUB5720
4040 IF AA<1 OR AA>3 THEN 4030
4050 OB=0:NB=0:IB=0:SN=0
4060 ON AA GOTO 1500,1000,6000
5000 ' SUBROUTINES
5100 ' COMPOUND INTEREST - FV
5110 FV=PV*((1+I)^P):RETURN
5200 ' COMPOUND INTEREST - PV
5210 PV=FV/((1+I)^P):RETURN
5300 ' ORDINARY ANNUNITY - PV
5310 PV=FV*((1-(1/((1+I)^P)))/I)
:RETURN
5400 ' ANNUITY DUE - PV
5410 PV=FV*(1+I)*((1-(1/((1+I)^P
)))/I):RETURN
5500 ' SINKING FUND - PMT
5510 PMT=FV*(I/(((1+I)^P)-1)):RE
TURN
5600 ' SCREEN DUMP TO PRINTER
5610 GOSUB5800:POKE65494,0:PRINT
#-2:PRINT#-2:PRINT#-2,CHR$(16);"
24";
5620 FOR L = 1024 TO 1471
5630 C=PEEK(L):IF C>95 THEN C=C-
64
5640 PRINT#-2,CHR$(C);:CN=CN+1
5650 IF CN=32 THEN CN=0:PRINT#-2
:PRINT#-2,CHR$(16);"24";
5660 NEXT L:PRINT#-2:POKE65494,0
:RETURN
5700 ' INKEY$
5710 PRINT@483,"PRESS ANY KEY TO
 CONTINUE.";
5720 FORXX=1TO10:AA$=INKEY$:NEXT
5730 AA$=INKEY$:IFAA$=""THEN5730
5740 AA=VAL(AA$):RETURN
5800 ' PRINTER CHECK
5810 PP=PEEK(65314)
5820 IF INT(PP/2) <> PP/2 THEN C
LS:PRINT "PRINTER OFF":GOSUB5700
:GOTO4020
5830 RETURN
5900 ' INPUT INSTRUCTIONS
5910 CLS:PRINT@288,"TYPE AMOUNTS
 WITHOUT COMMAS    AND PRESS <E
NTER>.":PRINT
5920 PRINT"ENTER PERCENTAGES AS
WHOLE      NUMBERS.":PRINT
5930 PRINT"USE _ TO MAKE CORRECT
IONS.";:PRINT@0,;:RETURN
6000 ' POKE NORMAL SPEED
6010 POKE 65494,0:CLS:END
```

END

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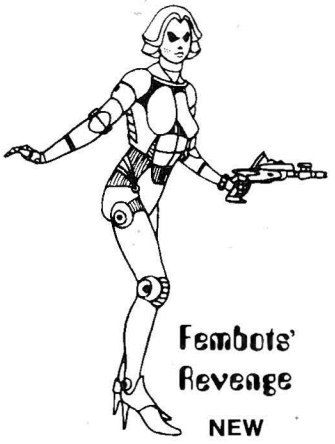

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Your ship is being enshrouded by the Xygoid Web. Certain death is minutes away! You must blast through the enveloping Web and destroy the Xygoid vessel before you are crushed. This is a multi-colored machine-code game in the highest resolution mode on a black background. Xygoid, from the galactic beginning! It will ensnare your mind!

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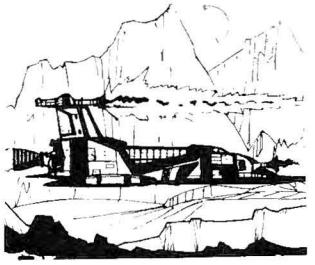

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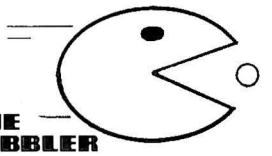

THE NIBBLER

The King of Pac games is here. This fast-paced maze-chase game will challenge the most skilled. You guide The Nibbler through the maze, the portals, onward to the Energy Pills. Then the Ghouls, constantly at your heels, will end up in your belly! The better you get the better you have to become to master the blazing speed. You haven't pushed your skill until you've tried this one!

16K Tape $19.95 16K Disk $24.95

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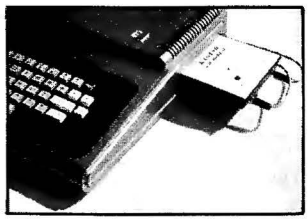

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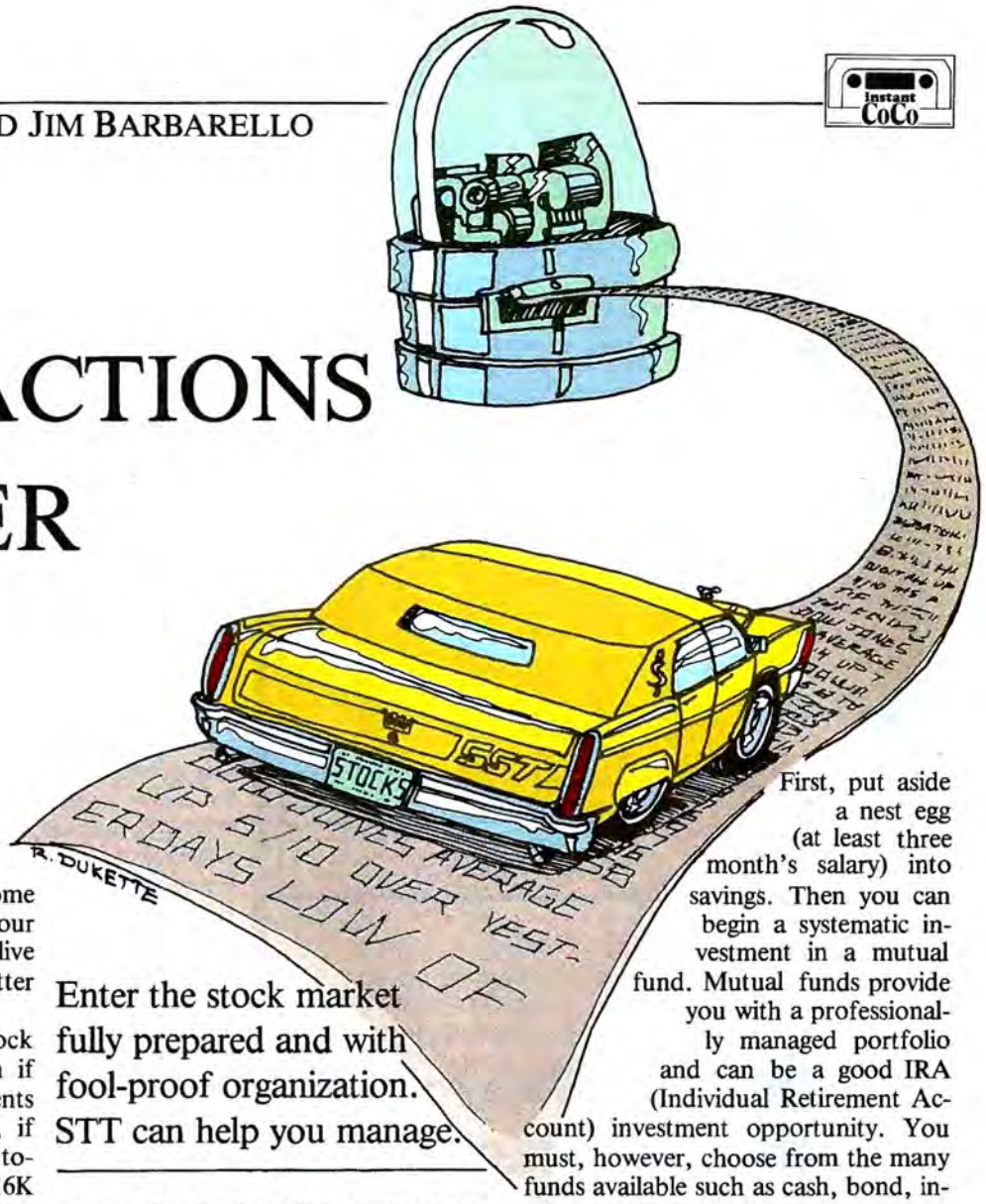
BY HOWARD DEPOL AND JIM BARBARELLO

STOCK TRANSACTIONS TRACKER



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Record keeping and financial management were probably among the suggestions you gave when asked "What can you do with a home computer?" But did you follow your own advice? Here's your chance to live up to your best intentions and better manage your personal finances.

This is a program called Stock Transactions Tracker (STT). Even if you don't have any stock investments now, don't stop reading because, if you follow a plan, you can begin today. STT allows you to use your 16K cassette-based CoCo to create individual portfolio files of up to 75 stocks each. It lets you quickly load, review, update, and save the file on tape, and provides a printed record on any 80-column printer.

Investing in the stock market is as simple as walking into the nearest brokerage house and turning over your money. Any broker will be glad to help you to spend it and provide abundant advice on what he thinks is best for you. This is *not* the best way to begin. You worked hard for your money and deserve to know exactly what is happening to it when you invest. Getting started in the market requires a well-thought-out plan.

First, put aside a nest egg (at least three month's salary) into savings. Then you can begin a systematic investment in a mutual fund. Mutual funds provide you with a professionally managed portfolio and can be a good IRA (Individual Retirement Account) investment opportunity. You must, however, choose from the many funds available such as cash, bond, income, and growth. A good stock broker can help you choose based on your investment goals, and give you an education in the process. Mutual funds have many advantages for the beginning investor, but you eventually want to invest in stocks of your own choosing. This is when you need a good management tool.

STT is a way to keep track of your portfolio and update certain critical information. With STT, you can enter the latest stock quotations and your CoCo calculates profit or loss, gives you a running portfolio value, and sums your dividend income. But that's only the beginning: STT makes much more information readily available. It is helpful to know why STT was devel-

HOWARD DEPOL AS OF: 06/22/83
(M)ODIFY, (F)ILE, OR (E)ND... ?

FILE	1	2	3
#SHRS	100	25	1000
NAME	TEST0001	XYZ CO	DISK CMR
DIV. R	.225	1	0
DATE	2/8/75	1/1/83	6/1/83
COST	1050.50	50	1050
PRICE	12.125	1.75	1.20
GAIN	162.00	-6.25	150.00
DIV. T	22.50	25.00	0.00
	GAIN	PORTFOLIO	DIVIDEND
TTLS	608.75	3264.25	105.10

Fig. 1. Sample Screen Display

System Requirements

16K RAM
Extended Color Basic
80-Column Printer

oped to understand what it does.

Transaction Tracking Requirements

First, it was necessary to decide what was important to me, the investor, and to the IRS. The rise and fall of the stock market is neatly shown in every financial publication throughout the country in the form of the Dow Jones Industrial Average (DJIA), but it didn't help manage my personal stock portfolio.

If you're like me, you skim through the New York Stock Exchange listings daily, making mental notes on how your particular stocks are doing. A typical day might sound like this. "Okay, this stock is up a half, but that one is down three quarters. Let's see, I have 400 shares of the first, but only 250 of the second, which I only bought 10 months ago. If I sell now, will it be a short- or long-term profit? That makes a big difference at tax time! Wait a minute, what did I pay for those stocks in the first place? How big a gain is it anyhow? Should I sacrifice a good dividend income and look for a more speculative issue with a greater price increase potential? That 400 shares was before the three-for-two stock split. Or was it?" This endless questioning and uncertainty goes on and on. The only sure way to get your personal investments in order is to organize them.

Even if you have a good system for managing your portfolio, you might want to perform projections (what ifs) on certain stocks and see how that affects your profits. You might also have separate portfolios for children, or your spouse, that you wish to manage separately. You need a tool that allows you to organize individual investment portfolios and make updates easily and quickly, and provides the option of making "what if" projections.

Using the STT Program

The program begins with two options: Create New File or Use Existing File. When you wish to use a file previously saved on tape, you select the second option. You are then told to prepare a cassette and press enter when ready. When you press enter, the message "Searching" appears. When the computer finds a valid STT file the message "Loading File" appears. With either option, STT must initialize an array that holds the data. You see a message "Initializing" that remains for some time based on the maximum number of records the program allows.

After initialization, you are advised of the portfolio's owner and the file's last update. If you are creating a new file, the owner will be "Noname" and the last update will be 99/99/99. You have the option of changing both. When you press N (No) in response to the "Change" question, you are asked to enter the date. If you make any changes to the file, the date is recorded as the date of last update.

At this point a screen presentation appears. On the first line you see the owner's name and last-update date. Under this is the command line, where all prompts appear. Next is the identification of the file (record) columns. The leftmost column identifies the data in each row: number of shares (#SHRS), stock name (NAME), dividend rate (DIV.R), date of initial purchase (DATE), total cost of purchase (COST), current selling price (PRICE), total gain (GAIN), and dividend total (DIV.T). Finally, the bottom two lines of the screen present the totals (TTLS) for gain, portfolio, and dividends.

Data Definitions

It is always important to know the number of shares you own of any given company. Also, share quantity can change, as with stock splits. When you receive such good news, you'll want to record it immediately, so the first row allows you to enter the number of shares. Less volatile is the company's name. The second row holds this information, or the company's ticker symbol (i.e., T for American Telephone and Telegraph). Company names occasionally change, but the ticker symbol does not. Even so, STT allows you to change any of the data entries at any time. Next is dividend data, which is entered in terms of rate-per-share. If there is no dividend, you can either leave it blank or enter a zero.

The stock purchase date is always useful since it determines whether you are in a short or long term position (useful when filling out your Federal income taxes). The date is entered in free form; there is no valid date checking.

Next on our list is the original cost data which should be entered as the sum of the cost-per-share times number of shares purchased plus any commissions, tax, or so on. This data rarely changes, but requires modification with circumstances such as taking advantage of a rights offering, selling off part of your holdings, or buying additional stock in the same company.

Many utilities offer rights to purchase shares on a limited basis and at a reduced price. For example, you originally bought 100 shares of XYZ company at a total cost of $2,000 and you now take advantage of a rights offering of one share at $15 per share, for every 10 shares you already own. You spend $150 to purchase 10 additional shares.

After this transaction, you update the file as follows: number of shares

STOCK TRANSACTIONS STATUS AS OF 06/22/83 FOR HOWARD DEPOL

FILE	# SHARES	NAME	DIV RATE	DATE	COST	PRICE	GAIN	DIV TTL
1	100	TEST0001	.225	2/8/75	1050.50	12.125	162.00	22.50
2	25	XYZ CO	1	1/1/83	50	1.75	-6.25	25.00
3	1000	DISK CMR	0	6/1/83	1050	1.20	150.00	0.00
4	32	K COCO	1.80	NOTKNOWN	405.00	22.125	303.00	57.60
5	1	JJB SFWR		6/10/83	100	100	0.00	0.00

TOTALS:	---GAIN---	-PORTFOLIO-	-DIVIDENDS-
	$608.75	$3264.25	$105.10

Fig. 2. Sample Data Printout

from 100 to 110, and cost from $2,000 to $2,150. The advantage of entering cost data this way is in the more frequent occurrences of stock splits and stock dividends, where you only have to modify the share information since cost basis remains unchanged.

The last piece of data you can enter is the current price-per-share. The CoCo calculates the gain, dividend total, and adjusts the gain, portfolio, and dividend totals automatically. Now that you know what the data is, you must know how to enter it. Note the command line; you have three options. You select the first, Modify, by pressing the M key. Modify allows you to either add new data or change existing data in the leftmost numbered column.

When you press M, the command line states "Move cursor, Press C, Enter Data," the totals on the bottom of the screen are replaced with the message "Press Clear to End Modify" and a left bracket (the cursor) appears immediately to the right of #SHRS. Pressing the up or down arrow moves the cursor to the allowable data entry positions. When the cursor is at the position you wish to modify, press C and the normal CoCo cursor appears in the column. Type in the new data and press the enter key. The CoCo cursor disappears, the new entry is right-justified and the Modify cursor reappears.

When you are finished with all modifications, press the clear key. The message "Calculating" appears in the command line. After a short time, the totals return at the bottom of the screen and the "(M)odify, (F)ile, (E)nd," message reappears. Before proceeding, note that the last update date in the upper right corner of the screen has been changed to "today's" date, and is preceded by an asterisk. The first time you complete a Modify, the date changes. The asterisk reminds you of that fact.

Now, how do you modify file 2 or 22? Consider each file in numerical order next to each other, and your CoCo screen as a 3-file-wide window. (Fig. 1.) To modify a particular file, you must move the window so the file is in the leftmost column. The simplest way to move the window is to use the right- or left-arrow keys.

Press the right-arrow key and you see files 2, 3, and 4. Press again and see files 3, 4, and 5. Press the left-arrow key and see files 2, 3, and 4 again. If you want to move the window a long distance (from files 1, 2, and 3 to files 23, 24, and 25), you can use the Files option. Simply press F and the command line asks "Leftmost File (1-25) ?"

Type in a valid number and press the enter key. The window immediately moves to show that file and the two following it (e.g., files 22, 23, and 24 if you enter the number 22). If you enter an invalid number (less than 1 or greater than 25), it is ignored and the Three Option Command line reappears.

The last option is End. Press E and you are provided with a new menu of options. You can select option 1, Continue Session, which returns you to the point where you selected End. You can obtain a printout of your file by selecting option 2, Print Report (To Printer). As a matter of fact, at any time during the session you can end, print a report, and return by selecting Continue Session. You can also save your modified (or new) file to tape by selecting option 3, Save Updated File. After this is done, you can select option 4, End, that truly ends the program. If you wish to perform projections on your file, you can modify it, print out the results, and then end without saving the what-if changes to tape.

When you select option 2, you are prompted to "Prepare Printer. Press Enter When Ready." When your 80-column printer is ready, press enter. A printout similar to Fig. 2 is printed. If there is no data on file the printer prints "No Records on File" below the headings. When printing is completed, you are returned to the option menu. When you select option 3, you are prompted to "Prepare Cassette. Press Enter to Continue."

Place your cassette in the recorder and move it to where you wish the new file to be located (in most cases you'll want the new file to overwrite the old). Then press the record button on the cassette deck and press the enter key. The message "Saving File" appears. When the file has been saved, you are returned to the option menu.

When you select option 4, you see the message "Program Ended." If you ever select this by mistake or, for any reason, wish to return to the program without losing data, simply enter GOTO 500 at the OK prompt. This safely returns you to the option menu.

How STT Works

To understand how the program works, refer to the Program Listing. The PCLEAR and PMODE statements in line 10 make maximum memory available for the program. Line 10 also reserves 5,000 bytes for string storage, reserves space above memory address 16205 for machine-language use, defines the machine-language USR entry point as 16206, and sets the variable FILES to 25. FILES defines the maximum number of files that the program allows. Line 10 defines it as 25, but it can be changed to 50 or even 75. Doing this, however, creates a larger cassette file that takes longer to save and load, and extends the time the computer needs to recalculate after a Modify ac-

Program Listing. Stock Transactions Tracker.

```
10 PCLEAR 1:PMODE 0:CLS:CLEAR 50
00,16205:DEFUSR=16206:FILES=25:X
R=FILES+2
20 DATA 134,0,198,1,142,4,0,166,
132,129,127,34,4,134,63,164,132,
167,128,140,6,0,38,239,57
30 FORI=16206TO16230:READM:POKEI
,M:NEXT
40 DIM A$(XR,8):MX=1:B$=STRING$(
224,32)
50 GOSUB 860
60 PRINT@265,"INITIALIZING..."
70 FORI=1TOXR:FORJ=1TO8:A$(I,J)=
STRING$(8,32):NEXTJ,I
80 GOSUB 930:PRINT@66,"OWNER: ";
PN$:PRINT" LAST UPDATE: ";UD$:P
RINT@196,"CHANGE (Y/N)...";:P=21
2
90 GOSUB 620:IFA$="N"THEN120
100 PRINT@212,A$:PRINT@257,"NEW
OWNER: ";:LINE INPUT PN$:PN$=LEF
T$(PN$,15)
110 PRINT" NEW LAST UPDATE DATE:
 ";:LINE INPUT UD$:UD$=LEFT$(UD$
,8):GOTO 80
120 GOSUB 930
130 PRINT@130,"ENTER TODAY'S DAT
E: ";:LINE INPUT ND$:ND$=LEFT$(N
D$,8)
140 PRINT@260,ND$;".";:PRINT@270
,"O.K. (Y/N)...";:P=283
150 GOSUB 620:IFA$="N"THEN120 EL
SE DF=0
160 CLS:PRINTPN$;TAB(17);"AS OF:
 ";UD$;:PRINT@96,"FILE":PRINT
170 PRINT"#SHRS":PRINT" NAME":PR
INT"DIV.R":PRINT" DATE":PRINT" C
OST":PRINT"PRICE":PRINT" GAIN":P
RINT"DIV.T":PRINT" GAIN
PORTFOLIO DIVIDEND";:PRINT"TTLS"
180 X=USR(0)
190 GOSUB 640
200 PRINT@32,"(M)ODIFY, (F)ILE,
OR (E)ND..."
210 P=62:GOSUB 600:IFASC(A$)=8OR
ASC(A$)=9THENN=(ASC(A$)=8)*2+1+M
X:GOTO 460
220 PRINT@32," "
230 IF A$="M" THEN 270
240 IF A$="F" THEN 450
250 IF A$="E" THEN 500 ELSE 200
260 REM* MODIFY
270 L=1189:POKE L,62:PRINT@454,"
      ";
280 PRINT@32,"MOVE CURSOR,PRESS
";CHR$(34);"C";CHR$(34);",ENTER
DATA";:PRINT@452,"PRESS (CLEAR)
TO END MODIFY.";
290 POKE L,62
300 A$=INKEY$:IF A$=""THEN300
310 P=ASC(A$):IF P=94 AND L>1189
 THEN POKEL,32:L=L-32:GOTO 290
320 IF P=12 THEN DF=1:POKE L,32:
GOTO 380
330 IF P=10 AND L<1349 THEN POKE
 L,32:L=L+32:GOTO 290
340 IF P=10 OR P=94 THEN 290 ELS
E MY=(L-1157)/32
350 PRINT@L-1023,;:LINE INPUT A$
:IF LEN(A$)=0 THEN 370
360 A$=LEFT$(A$,8):GOSUB 420
```

Listing continued

⌐ See List of Advertisers on page 131

Listing continued

```
370 PRINT@L-1023,A$(MX,MY);" ";A
$(MX+1,MY);" ";A$(MX+2,MY);:POKE
 L+9,32:POKE L+18,32:GOTO 290
380 A=VAL(A$(MX,6))*VAL(A$(MX,1)
)-VAL(A$(MX,5)):A=INT(A*100)/100
:B=VAL(A$(MX,1))*VAL(A$(MX,3)):B
=INT(B*100)/100
390 PRINT@358,;:PRINTUSING"#####
.##";A;:PRINT@390,;:PRINTUSING"#
####.##";B;:FORI=1382TO1389:MID$
(A$(MX,7),I-1381,1)=CHR$(PEEK(I)
-64):MID$(A$(MX,8),I-1381,1)=CHR
$(PEEK(I+32)-64):NEXT
400 GOTO 190
410 REM** RIGHT JUSTIFY SUB
420 FORI=LEN(A$)TO1STEP-1:IFMID$
(A$,I,1)=" "THENNEXT:I=LEN(A$)
430 A$(MX,MY)=STRING$(8-LEN(A$),
32)+LEFT$(A$,I):RETURN
440 REM** FILE MOVE
450 PRINT@32,"LEFTMOST FILE # (1
-";:PRINTUSING"##)...";XR-2;:INP
UT N:PRINT@32,;
460 IF N<1 OR N>XR-2 THEN 200
470 MX=N:GOSUB 670:GOTO 200
490 REM** END
500 GOSUB930:PRINT@66,"OPTIONS:"
:PRINT@130,"1. CONTINUE SESSION"
:PRINT"  2. PRINT REPORT (TO PRI
NTER)":PRINT"  3. SAVE UPDATED F
ILE":PRINT"  4. END":PRINT:PRINT
"  PRESS 1,2,3 OR 4...";:P=309
510 GOSUB 600:A=VAL(A$):IFA<1 OR
 A>4 THEN 510 ELSE GOSUB930:IF A
=1 THEN DF=(DF>1)*-1:GOTO160 ELS
E IF A=4 THEN 580
520 IF A=2 THEN 950 ELSE GOSUB 7
20:PRINT@192,B$:PRINT@201,"SAVIN
G FILE...";
530 OPEN"O",#-1,"STTDAT"
540 PRINT#-1,PN$,UD$
550 FORI=1TOXR
560 PRINT#-1,A$(I,1),A$(I,2),A$(
I,3),A$(I,4),A$(I,5),A$(I,6),A$(
I,7),A$(I,8):NEXT
570 CLOSE#-1:GOTO500
580 PRINT@233,"PROGRAM ENDED.":P
RINT:END
590 REM** INKEY
600 A$=INKEY$:IFA$=""THENPRINT@P
,CHR$(63);:PRINT@P,CHR$(128);:GO
TO 600 ELSE RETURN
610 REM** Y/N RESPONSE
620 GOSUB 600:IF A$<>"Y"ANDA$<>"
N"THEN620ELSERETURN
630 REM** TOTAL
640 PRINT@32,"     C A L C U L A
 T I N G":TG=0:PF=0:DT=0:FORI=1T
OXR:TG=TG+VAL(A$(I,7)):PF=PF+VAL
(A$(I,1))*VAL(A$(I,6)):DT=DT+VAL
(A$(I,8)):NEXT
650 REM** PRINT FILES
660 IF DF=1THENPRINT@23,"*";ND$:
UD$=ND$:X=USR(0):DF=2
670 LL=166:FORI=0 TO 2:PRINT@106
+I*9,;:IF MX+I<10 THEN PRINTSTR$
(MX+I);ELSE PRINTMID$(STR$(MX+I)
,2,2);
680 NEXT
690 FOR I=1TO8:FOR J=MX TO MX+2:
PRINT@LL+(J-MX)*9,A$(J,I);:NEXT:
LL=LL+32:NEXT
700 LL=LL+32:PRINT@LL-2,;:PRINTU
SING"######.## ######.## #####.#
#";TG;PF;DT;
710 POKE1485,32:POKE1495,32:RETU
RN
720 REM** TAPE MESSAGE
730 PRINT@200,"PREPARE CASSETTE.
"
740 PRINT@228,"PRESS enter WHEN
READY...":P=253
750 GOSUB 600:IF ASC(A$)<>13 THE
N 750 ELSE RETURN
760 REM* READ DATA FROM TAPE
770 GOSUB 720:PRINT@128,B$
780 PRINT@233,"SEARCHING..."
790 OPEN"I",#-1,"STTDAT":PRINT@2
33,"LOADING FILE..."
800 INPUT#-1,PN$,UD$
810 FORI=1TOXR
820 INPUT#-1,A$(I,1),A$(I,2),A$(
```

Listing continued

tion. The variable XR is set to FILES plus 2 to allow the largest file number to appear in the leftmost window for modifying. There is no data stored in these two additional files; their presence prevents errors.

Line 20 contains the code for a short machine-language program that reverses the color of every nongraphics character on the screen (light green to dark green). This aids in highlighting the file windows and total areas, and makes for a more pleasing presentation.

Line 30 loads the code into the protected memory area and line 40 defines a two-dimensional string array (A$(MX,MY)) that holds all data. MX is a variable used throughout the program to define which file is in the leftmost window, and is initialized at one. B$ is a string used to clear the screen without disturbing the top and bottom lines. This program uses a number of subroutines for common tasks, and sometimes calls other subroutines from them. The first subroutine is called from line 50, and begins at line 860.

Line 860 clears the screen, prints the title, reverses the screen and calls another subroutine at line 930. The Clear Screen subroutine (line 930) clears all data between the first and last screen lines. In this application, this leaves those two lines in reverse color, while restoring the normal light green to the remainder of the screen.

Next, line 870 prints the options available and sets P to 309. P (position) is used in the INKEY subroutine (line 600) to denote where a cursor appears. This routine uses the INKEY$ function to scan the keyboard and create a rapidly blinking question-mark cursor at position P. In this manner you can have a one-keypress input with a cursor.

Line 880 allows execution to continue only after a valid input (1 or 2) has been keyed in. Line 890 again clears the screen and, in concert with line 900, informs the operator of the option chosen. If the option is 1 (Create New File), PN$ (Person's Name) is set to NONAME, UD$ (update date) is set to 99/99/99 and execution returns to line 60. Otherwise, execution jumps from line 910 to the Read Data From Tape subroutine at line 760.

The subroutine at line 760 first calls the subroutine at line 720 to print a tape message. Line 750, in turn, calls the INKEY subroutine to wait for you to press the enter key. Then, execution returns to line 780, which displays the message "Searching." The program opens the buffer for input in line 780 and the message "Loading File" appears when the file is found.

Line 800 reads the file's header information, consisting of the person's name (PN$) and last update date (UD$). Then, line 820 loops to read the eight pieces of data for each record, storing them in the A$ array. When the file read is complete, the buffer is closed, and the message "Initializing" is printed.

Line 840 right-justifies each entry, padding spaces as necessary to make each entry eight characters long. With this completed, execution returns to the calling subroutine's line 910. Execution is then passed to line 80, skipping over line 70, which pads (initializes) all array elements when the Create New File option is chosen. Line 80 clears the screen (subroutine 930) and prints the owner information obtained either from an existing file or the definition in line 900 (for a new file).

Again the program calls the INKEY routine (line 90, with P redefined as 212) to request a Y or N response to the "Change" question. An N response branches execution to line 120. A Y response allows the data to be changed. Line 100 limits the name to 15 characters and the date to eight. These are both free-form inputs. Then execution loops back to line 80. In this manner, you can keep changing this data until you are satisfied with it.

Line 120 clears the screen and asks for today's date. This need not be today's date, but will become the new update date if a Modify is performed before the data is saved out to tape. Line 130 also limits the date input to eight characters. Lines 140 and 150 show you the date as it will be used and allow you to correct it.

When you press N to indicate no more changes are necessary, DF (date flag) is set to zero. DF is used later on in the program to determine when the update is to be changed. Lines 160–190 print the display screen. Lines 200–470 form a main loop that allows you to Modify, move the window (Files), or end.

Line 200 prints available options on the command line. Line 210 waits for a single-key input and first checks for a left- (ASCII 8) or right- (ASCII 9) arrow key press. If it senses one, it adjusts a file pointer (N) accordingly. If you pressed the left key, (ASC(A$) = 8) returns a −1 (true). The −1 times 2+1+MX sets N to MX-1. If you pressed the right key, (ASC(A$) = 8)

returns a 0 (false) and N is set to MX+1 (0*2+1+MX). In either event, execution jumps into the File routine at line 460. Here, it checks the current value of N for an invalid state. If found, no further action is taken, and execution returns to the beginning of the loop (line 200). Otherwise, the current file pointer MX is equated to N, and the files shift accordingly via the subroutine at line 670. When done, execution returns to line 200.

Back at line 210, if you did not press an arrow key, lines 230–250 compare the key press to the available options and branch to the appropriate lines (or return to line 200 if no match is found). The first option, Modify, begins at line 270. Here certain areas on the screen are readjusted (since other options might have disturbed them).

Line 280 prints instructions on the command line and over the totals area. Line 290 displays a right bracket (modify cursor) to the right of the #SHRS legend, while line 300 retrieves a key press. If you press an up arrow (ASCII 94) and the cursor is not on the topmost line (L>1189), L (location) adjusts to allow the cursor to move up one line, the present cursor is erased, and execution returns to line 290 (where the new cursor is drawn).

If you press the down arrow and the cursor is at least one line above the lowest allowable position (i.e., Cost), L adjusts to allow the cursor to move one line down, the present cursor is erased, and execution returns to line 290. If you press either arrow key and L does not allow movement, line 340 returns execution immediately to line 290. If you press another key (i.e., the C for change), line 340 defines the array pointer MY and allows input. If you press the enter key immediately (LEN(A$)=0), no modifications are made.

Otherwise, the input is truncated to eight characters in line 360 and right-justified in subroutine 420. Subroutine 420 also transfers the new input to the proper array element. Then, the complete row pointed to by MY (all three windows) is reprinted. This readjusts the presentation if you inadvertantly typed past the end of the leftmost window. Finally, execution returns to line 290.

When modifications are complete and you press the clear key (ASCII 12), line 320 sets the date flag to 1, and then jumps to line 380. Here the gain (A) and dividend total (B) are calculated, and rounded off to two significant decimals. Line 390 prints these values on the screen, then PEEKs them into the appropriate string-array elements. This allows the numeric values to be saved as strings in the proper format (right-justified). Then execution returns to line 190.

As stated above, you can move the window one position left or right using the arrow keys. But what if you want to move directly from file 1 to file 18? The F option allows this direct movement. Pressing F passes execution to line 450, which requests a number between 1 and the highest file allowable. It then waits for an input, equating this to the variable N, and clears the command line. As with the arrow keys, line 460 checks for an invalid input and, if it finds it, immediately returns execution to line 200. Otherwise, the current file pointer MX is equated to N, and the files are shifted accordingly via the subroutine at line 670. When done, ex-

Listing continued

```
I,3),A$(I,4),A$(I,5),A$(I,6),A$(
I,7),A$(I,8):NEXT:CLOSE#-1
830 PRINT@265,"INITIALIZING..."
840 FORI=1TOXR:FORJ=1TO8:A$(I,J)
=STRING$(8-LEN(A$(I,J)),32)+A$(I
,J):NEXTJ,I:RETURN
850 REM** BEGINNING
860 CLS:PRINT"   STOCK TRANSACTI
ONS TRACKER":X=USR(0):GOSUB930
870 PRINT@162,"1. CREATE NEW FIL
E":PRINT"  2. USE EXISTING FILE"
:PRINT@293,"PRESS 1 OR 2...";:P=
309
880 GOSUB 600:A=VAL(A$):IFA<>1AN
DA<>2THEN880
890 GOSUB930:PRINT@66,"OPTION CH
OSEN: ";
900 IF A=1THENPRINT"NEW FILE":PN
$="NONAME":UD$="99/99/99":RETURN
910 PRINT"EXISTING FILE":GOSUB76
0:GOTO 80
920 REM** CLEAR SCREEN
930 PRINT@32,B$;B$;:RETURN
940 REM** PRINTER UTILITY
950 PRINT@200,"PREPARE PRINTER."
:GOSUB 740
960 FORZ=XR TO1 STEP-1:IF A$(Z,1
)=STRING$(8,32)THENNEXT:PRINT#-2
,"NO RECORDS ON FILE":GOTO 500
970 PRINT#-2,TAB(12);"STOCK TRAN
SACTIONS STATUS AS OF ";UD$;" FO
R ";PN$
980 PRINT#-2," ":PRINT#-2,"FILE
  # SHARES   NAME   DIV RATE   D
ATE     COST      PRICE     GAIN
  DIV TTL"
990 PRINT#-2,"====   ";:FORI=1TO
8:PRINT#-2,"-------- ";:NEXT:PRI
NT#-2," "
1000 FOR I=1TO 2:PRINT#-2,USING"
 ##     ";I;:FORJ=1TO8:PRINT#-2,A
$(I,J);" ";:NEXTJ:PRINT#-2," ":N
EXT I:PRINT#-2," "
1010 PRINT#-2,TAB(10);"TOTALS:
  ---GAIN---      -PORTFOLIO-
-DIVIDENDS-":PRINT#-2,TAB(20);:P
RINT#-2,USING"$$######.##      $$
######.##      $$######.##";TG;PF;
DT
1020 GOTO500                    END
```


↙ See List of Advertisers on page 131

ecution returns to line 200.

When you press E, execution passes to line 500. Here, you are given four options. The first allows a return to the modification screen—handy if you pressed E by mistake or wish to obtain a printout and then want to modify the file further. As a matter of fact, if an error occurs and you break out of the program, you could always type GOTO 500, select option 1, and reenter the program without disturbing any variables.

Line 510 uses the INKEY routine at line 600 to retrieve the option number desired. If it is not an allowable input, the screen is cleared (line 930) and the options are redisplayed. If you choose option 1, line 510 readjusts the DF flag and returns execution to line 160. If you choose option 4, line 510 causes a jump to line 580 where the program ends.

When you choose option 2, execution jumps to line 950. There a message is printed to prepare the printer. The subroutine at line 740 performs the "Press Enter When Ready" prompt and keyscanning. When you press the enter key, execution returns to line 960 where the last record containing data is found. If there is no data, the message "No Records on File" is printed, and execution returns to line 500.

Otherwise, lines 970 and 980 print the report header. Then lines 1000 and 1010 print the report. For a file size of 50 records or less, the complete report fits on a single page. If the file size is greater than 50 records, use continuous paper or adjust the print routine to allow for a second page. When printing is done, line 1020 returns execution to line 500.

The last option, 3, saves the modified file to tape. When selected, line 520 calls the subroutine at line 720 (tape message). When you have pressed the enter key (indicating the cassette is ready for recording), line 530 opens the buffer for output. Line 540 saves the header information. Then, lines 550 and 560 save each array element whether it contains data or not. Line 570 closes the buffer and returns execution to line 500.

Getting Started

Begin by typing in the program and saving it. Each time you run the program after CLOADing it, you get an OK prompt. Simply run it again and it executes normally. Select the Create New File option and then enter the owner, last update, and today's date. When the Modify screen appears, select M and begin entering your data.

After you have entered each file, press the clear key. After the calculations have been completed, press the right-arrow key to move the window to the next file. Then press M again and continue entering data. When all data has been entered, you can use the F option to get back to file 1. You can then press E to go to the option menu, where you can get a printed report, save the file to tape, return to the modify screen, or end.

A good regimen is to enter price quotations on a regular basis (daily, weekly, or monthly) and then print out the results for easy tracking and periodic comparison. The STT program is flexible enough to allow it to fit your particular method of tracking and analysis, and the printed records should prove very useful around tax time. ■

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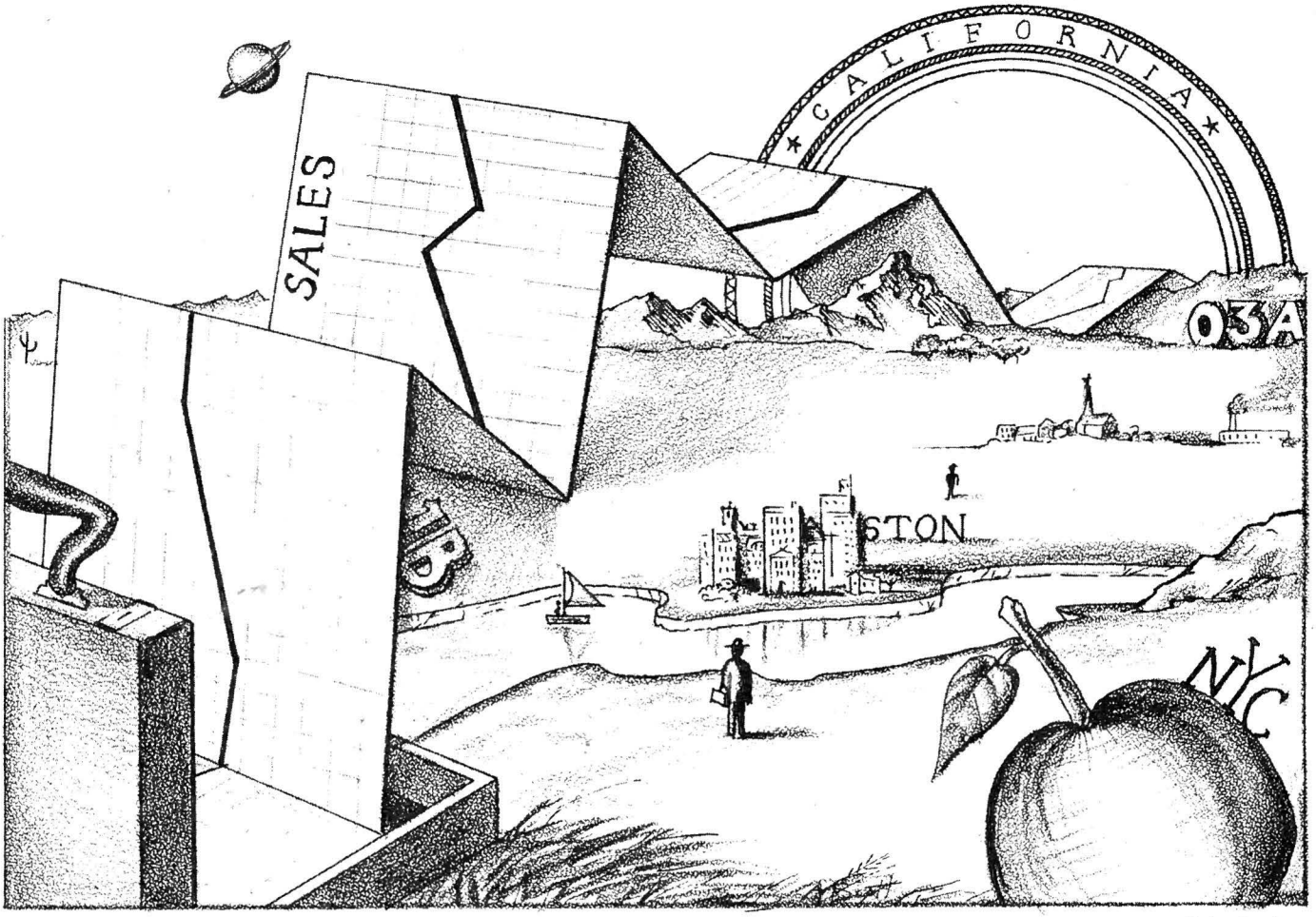
✓ See List of Advertisers on page 131

BY CHARLES B. LEVINSKI

ACTIVE NEGOTIATIONS



graphic by Alison Scott

This valuable business program gives your company the edge over your competitors in sales.

It is important for the marketing/sales department of a company to keep track of the potential clients with whom their salesmen are working. These active negotiations represent a major portion of a company's future dollar volume. But how do you keep track of potential sales when you have hundreds going on at any given moment? How do you assess their actual potential to become a sale? How do you approximate what your sales from active negotiations will be in a given time period? In a given product line? These and similar questions plagued our marketing department until we developed a solution.

If you need to know how your salesmen can use their time most effectively, and estimate your potential sales, this report will be useful, and has become a major tool for our company in tracking negotiations.

Because we used our CoCo only for printer demonstrations, we did not have disk drives for it. Therefore, we've written the entire report for a cassette system. We have used it for a year and had no I/O errors. If you have disks you can modify the software to work with them.

We use a 132-column Tally printer that requires separate line feeds as well as carriage returns, so you will find these listed individually in the print commands. If your printer does not need the line feeds, make sure there are enough carriage returns for proper formatting, and leave the line feeds out.

Organizational Assumptions

The software here is general but it makes several assumptions about the arrangement of your products and

System Requirements

32K RAM
Extended Color Basic
132-Column Printer

lines. You can easily modify most of these to conform to your marketing organization.

First, I have assumed that you've broken the country into individual territories, and that you've given each of these a three-digit code, as is common practice. The three digits allow regional and territorial division of the geographic marketplace. For example, the country might be divided into a series of regions, each with a regional sales manager. Each region is further divided into individual territories with one salesman who reports to the regional sales manager.

The first two digits can represent the region (for example, 01), while the last digit represents the territory. 01C would indicate a specific territory in the 01 region. This is a common organization for a national sales force. In the programs to be presented, all three digits of the territory code are alphanumeric and need not be in sequence. For example, four arbitrary territories in region 01 might be 01A, 01D, 01H, and 01Z.

I have assumed that part numbers do not exceed 10 digits and that they are alphanumeric. Further, I have assumed that the five left-most digits represent a series and are of interest in a summary report. For example, the part number A054300102 might represent one version of a series designated A0543. The trends evident from examining activity on a series are of interest.

Product codes and product lines are also important. I have allowed a single-digit alphanumeric product code (PC) for each category. For example, the letter I might represent dot-matrix printers, while N represents thermal printers.

I further distinguish product lines. Three product lines are included in the programs, each consisting of a number of product codes. A printer product line, for example, might consist of not only PC I and PC N, but PC H (for electrosensitive printers) as well.

The programs presented here are quarterly, but can run more or less frequently.

Reports Generated

This system has three programs: ACTNEG, ACTNEGIN, and EDITACNG. ACTNEG does most of the work and generates reports. ACTNEGIN generates an input form for your salesmen to fill out. The input form contains last quarter's information so no active negotiations are overlooked. EDITACNG allows you to edit data entered, and then it rearranges

Program Listing 1. Active Negotiations

```
50 CLS:INPUT"HAVE QUARTERS BEEN
SET <Y/N>";G$:IFG$="N"THENPRINT"
PLEASE RESET":END
100 'MAIN PROGRAM START
101 GOTO6500
105 DIMTQ(95),TD(95),PD(95),Q1(9
5),Q2(95),Q3(95),Q4(95),PN$(95),
PC$(95)
106 POKE150,41:'BAUD RATES-87=60
0,41=1200
107 A$="
     PART            TOTAL      TO
TAL    ORDER    OUR    PROB.     PRO
B.        DELIVERY ESTIMATE"
108 B$="       PROSPECT        TER
R    NUMBER     PC  QUANTITY    DOL
LARS   PROB.   PROB.   MULT.    DOLL
ARS   QTR 4 83 QTR 1 84 QTR 2 84
QTR 3 84"
109 C$="%                       % % %
  %         %   %%    ######    ####
####    ###     ###     ###    #####
###    ######    ######    ######
 ######"
110 D$=" PART      TOTAL      TOTA
L    PROB   PROBABLE          QTR 4
                QTR 1
  QTR 2                  QTR 3"
111 E$="NUMBER   QUANTITY    DOLLA
RS  MULT    DOLLARS     UNITS     D
OLLARS     UNITS     DOLLARS     UN
ITS     DOLLARS     UNITS     DOLLA
RS"
112 F$=" %    %   ########  ######
##    ###   ########  ########   ##
######   ########   ########   ####
####   ########   ########   ######
##"
119 CLS:PRINT@262,"active negoti
ations";:PRINT@488,"PRESS ANY KE
Y"
120 IFINKEY$=""THEN120
122 DIMT$(25)
125 CLS:INPUT"ENTER TODAY'S DATE
 (MM/DD/YY) ";DATE$
130 CLS:PRINTTAB(11)"MAIN MENU":
PRINTSTRING$(31,"-"):PRINT"1-ENT
ER DATA":PRINT"2-REPORT BY TERRI
TORY":PRINT"3-PRODUCT LINE 1 REP
ORT":PRINT"4-PRODUCT LINE 2 REPO
RT":PRINT"5-PRODUCT LINE 3 REPOR
T":PRINT"6-REPORT BY PRODUCT COD
E":PRINT:PRINT
140 INPUT"KEY NUMBER OF REPORT";
G
145 IFG<1ORG>6THEN130
150 ONG GOSUB1000,2000,3000,4000
,5000,6000
160 GOTO130
200 CLS:PRINT"INSERT DATA TAPE I
NTO RECORDER  PRESS PLAY-KEY ENT
ER WHEN READY":INPUTG$:OPEN"I",#
-1,"ACTNEG":RETURN
1000 'ENTER DATA
1010 CLS:PRINT"PLACE TAPE TO BE
RECORDED IN     RECORDER-PREPARE
TO RECORD       KEY ENTER":INPUTG
$
1020 CLS:OPEN"O",#-1,"ACTNEG"
1025 INPUT"PROSPECT";PR$:IFPR$="
@"THENCLOSE#-1:GOTO1999
1030 INPUT"TERRITORY";TE$:INPUT"
PART NO.";PN$:INPUT"PC";PC$:INPU
T"TOTAL QUANTITY";TQ:INPUT"TOTAL
 DOLLARS";TD:INPUT"ORDER PROBABI
LITY %";OP:INPUT"OUR PROBABILITY
";HP:INPUT"DELIVERY QTR 1";Q1:IN
PUT"DELIVERY QTR 2";Q2
1040 INPUT"DELIVERY QTR 3";Q3:IN
PUT"DELIVERY QTR 4";Q4:LINEINPUT
"STATUS:";SS$:PRINT:INPUT"DATA O
K <Y/N>";G$:IFG$="N"THENCLS:PRIN
TSTRING$(14,"*")"REDO"STRING$(14
,"*"):GOTO1025
1041 PRINT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$:CLS:GO
TO1025
1999 RETURN
2000 'REPORT BY TERR
2007 T$=""
2010 GOSUB200
2012 CLS:FORI=1TO16:PRINT"DO NOT
 TOUCH-PROCESSING!!!!!!!":NEXTI
2015 IFEOF(-1)THENCLOSE#-1:GOSUB
6410:RETURN
2020 INPUT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$
2022 GOSUB2030
2025 GOTO2015
2030 LN=LN+1:IFT$=TE$ AND LN<15
THEN GOTO2050:'TITLE PAGE
2033 LN=0
2040 GOSUB6410:BD=0:BP=0:T$=TE$:
PRINT#-2,CHR$(12);CHR$(10);CHR$(
10);TAB(59);" YOUR CORPORATION";
CHR$(13);CHR$(10);TAB(53);"ACTIV
E NEGOTIATION REPORT";CHR$(13);C
HR$(10);TAB(62);"TERR ";T$;TAB(9
7);DATE$;CHR$(10);CHR$(10);CHR$(
10);CHR$(10)
2045 PRINT#-2,A$;CHR$(10);CHR$(1
3);B$;CHR$(10);CHR$(13);CHR$(10)
;
2050 PRINT#-2,USINGC$;PR$;TE$;PN
$;PC$;TQ,TD,OP,HP,OP*HP/100;OP*H
P/10000*TD;Q1;Q2;Q3;Q4:PRINT#-2,
CHR$(10):PRINT#-2,"STATUS:";LEFT
$(SS$,122);CHR$(10):PRINT#-2,CHR
$(10)
2060 BD=BD+TD:BP=BP+(OP*HP/10000
*TD):RETURN
3000 'PRODUCT LINE 1
3007 T$=""
3010 GOSUB200
3012 CLS:FORI=1TO16:PRINT"DO NOT
 TOUCH-PROCESSING!!!!!!!":NEXTI
3015 IFEOF(-1)THENCLOSE#-1:GOSUB
6410:RETURN
3020 INPUT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$
3025 IFPC$="A"ORPC$="B"ORPC$="C"
ORPC$="D"ORPC$="E"ORPC$="F" THEN
GOSUB2030
3030 GOTO3015
4000 'PRODUCT LINE 2
4007 T$=""
4010 GOSUB200
4012 CLS:FORI=1TO16:PRINT"DO NOT
 TOUCH-PROCESSING!!!!!!!":NEXTI
4015 IFEOF(-1)THENCLOSE#-1:GOSUB
6410:RETURN
4020 INPUT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$
4025 IFPC$="G"ORPC$="H"ORPC$="I"
ORPC$="J" THENGOSUB2030
4030 GOTO4015
5000 'PRODUCT LINE 3
5007 T$=""
5010 GOSUB200
5012 CLS:FORI=1TO16:PRINT"DO NOT
 TOUCH-PROCESSING!!!!!!!":NEXTI
5015 IFEOF(-1)THENCLOSE#-1:GOSUB
6410:RETURN
5020 INPUT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$
5025 IFPC$="K"ORPC$="L"ORPC$="M"
 THENGOSUB2030
5030 GOTO5015
6000 'REPORT BY PC
6010 GOSUB200
6020 CLS:FORI=1TO16:PRINT"PROCES
SING-DO NOT TOUCH!!!!!!!":NEXTI
6030 I=0
6040 IFEOF(-1)THENCLOSE#-1:GOTO6
200
6050 INPUT#-1,PR$,TE$,PN$,PC$,TQ
,TD,OP,HP,Q1,Q2,Q3,Q4,SS$
6060 FL=0:'FLAG
6070 FORN=1TOI:IFFL=1THEN6080ELS
EIFLEFT$(PN$,5)=PN$(N) THENTQ(N)
=TQ(N)+TQ:TD(N)=TD(N)+TD:PD(N)=P
D(N)+((OP*HP)/10000*TD):Q1(N)=Q1
(N)+Q1:Q2(N)=Q2(N)+Q2:Q3(N)=Q3(N
)+Q3:Q4(N)=Q4(N)+Q4:FL=1
6080 NEXTN
6090 IFFL=1THEN6040
```

Listing 1 continued

Listing 1 continued

```
6100 I=I+1:PN$(I)=LEFT$(PN$,5):P
C$(I)=PC$:TQ(I)=TQ:TD(I)=TD:PD(I
)=OP*HP*TD/10000:Q1(I)=Q1:Q2(I)=
Q2:Q3(I)=Q3:Q4(I)=Q4:GOTO6040
6200 INPUT"MORE DATA TAPES <Y/N>
";G$:IFG$="Y"THENGOSUB200:GOTO60
40
6210 CLS:INPUT"PREPARE TO PRINT"
;G$:'PRINT ROUTINE
6220 READPC$:IFPC$="*"THENGOSUB6
370:RETURN
6230 DATA A,B,C,D,E,F,G,H,I,J,K,
L,M,*
6235 PN$(0)="ZZZZZ":LN=1
6240 GOSUB6370:'TITLE PAGE
6250 F9=0
6260 FORN=1TOI
6270 IFPC$(N)<>PC$ THEN6290
6280 IFPN$(N)<PN$(0) THENPN$(0)=
PN$(N):K=N:TQ(0)=TQ(N):TD(0)=TD(
N):PD(0)=PD(N):Q1(0)=Q1(N):Q2(0)
=Q2(N):Q3(0)=Q3(N):Q4(0)=Q4(N):F
9=1
6290 NEXTN
6300 IFF9=0THEN6220
6310 PRINT#-2,USINGF$;PN$(0);TQ(
0);TD(0);PD(0)/TD(0)*100;PD(0);P
D(0)/TD(0)*Q1(0);PD(0)*Q1(0)/TQ(
0);PD(0)/TD(0)*Q2(0);PD(0)*Q2(0)
/TQ(0);PD(0)/TD(0)*Q3(0);PD(0)*Q
3(0)/TQ(0);PD(0)/TD(0)*Q4(0);PD(
0)*Q4(0)/TQ(0);:PRINT#-2,CHR$(10
);CHR$(10)
6320 B1=B1+PD(0)*Q1(0)/TQ(0):B2=
B2+PD(0)*Q2(0)/TQ(0):B3=B3+PD(0)
*Q3(0)/TQ(0):B4=B4+PD(0)*Q4(0)/T
Q(0)
6330 LN=LN+1:IFLN>21THENLN=1:GOS
UB6370
6340 PC$(K)=" ":PN$(0)="ZZZZZ"
6350 GOTO6250
6370 'TITLE PAGE
6380 PRINT#-2,CHR$(10):PRINT#-2,
USING"                                  ####
####                ########
    ########                ########
";B1;B2;B3;B4:B1=0:B2=0:B3=0:B4=
0
6390 PRINT#-2,CHR$(12);CHR$(10);
CHR$(10);TAB(59);" YOUR CORPORAT
ION";CHR$(13);CHR$(10);TAB(53);"
ACTIVE NEGOTIATION REPORT";CHR$(
13);CHR$(10);TAB(64);"PC ";PC$;T
AB(97);DATE$;CHR$(10);CHR$(10);C
HR$(10)
6400 PRINT#-2,TAB(75);"PROBABLE
DELIVERY";CHR$(10);CHR$(13);D$;C
HR$(10);CHR$(13);E$;CHR$(10);CHR
$(13);CHR$(10);:RETURN
6410 PRINT#-2,CHR$(10);CHR$(10):
PRINT#-2,USING"
   ########
  ########";BD;BP:PRINT#-2,CHR$(
10):RETURN
6500 PMODE0:PCLEAR1:CLEAR1000:GO
TO105
                                        END
```

```
109 C$="%                       % % %
  %        %  %%   ######    ####
####    ###    ###    ###    #####
###   ######   ######   ######"
119 CLS:PRINT@259,"active negoti
ations input";:PRINT@488,"HIT AN
Y KEY"
2021 IFHP=0THEN2015:'DON'T PRINT
 ON INPUT FORM IF 0 PROB LAST TI
ME
2030 LN=LN+1:IFT$=TE$ AND LN<10
THEN GOTO2050:'TITLE PAGE
2050 PRINT#-2,USINGC$;PR$;TE$;PN
$;PC$;TQ,TD,OP,HP,OP*HP/100;OP*H
P/10000*TD;Q2;Q3;Q4:PRINT#-2,CHR
$(10):PRINT#-2,"STATUS:";CHR$(10
);CHR$(10);CHR$(10);CHR$(10)
```

Program Listing 2. Active Negotiations Input

the data into alphabetical order by territory. If you use disk drives, you don't need this last feature.

These programs generate five reports: report by territory, three product-line reports, and a report by product code.

The information supplied by the salesman is important in reviewing these reports. You must know the prospect's name and the salesman's three-digit territory code to know who is selling. The territory code is followed by the part number. Sometimes negotiations are not far enough along to have identified an exact part number, and in this case you use a series or a 10-digit description. The point here is to let the factory know what will be required.

Next is the product code for the product being negotiated. Even if you use a description rather than a part number, a valid product code must be inserted here. Following the product code is the total quantity of that part number that will be purchased over a one-year period, followed by the total dollar value for the quantity of parts being negotiated.

The next item to enter is the order probability or the probability of your prospect ordering the type of product being negotiated. It is not the probability that he will purchase the product from your firm, only that he will buy it. For example, a prospect might be trying to sell a system to one of his customers. If he doesn't make the sale he won't need your product or an equivalent. If there is a 75-percent chance that he needs a product like yours, enter 75 as the percentage.

Following the purchase probability is what I call "our probability." (You can replace "our" with your company name.) This is the probability that your prospect will order from your firm and not the competition. In our example above, if the prospect has an equal probability of purchasing from you or your competition, you would enter 50 as the percentage. This is in spite of the fact that there is only a 75-percent chance the prospect will buy anyone's product.

The delivery for each of the next four quarters of your planning cycle is then entered, in units. Suppose that the current planning cycle starts at quarter 1 and runs through quarter 4, and that our prospect needs delivery of 10 pieces of your product in quarter 2. Enter 0 under QTR 1, 3, and 4, and 10 under QTR 2.

The last item to enter is the status. This gives the user of the reports a brief but accurate status of the account in question on the day of data submission. This is also invaluable in determining who is dragging their feet: factory, salesman, or customer. The status is limited to 128 characters.

The report by territory is generated first; it is a duplicate of the input data with several calculations done for the user. The information is put neatly into territory order. You have for each negotiation the prospect's name, territory, part number, product code, total quantity, total dollars, order probability, our probability, probability multiplier, probable dollars, deliveries for the four planning quarters, and the status of that prospect. The items calculated are the probability multiplier and the probable dollars.

The probability multiplier is the product of the order probability and "our" probability. If your sales force has been realistic, this product is an accurate representation of the probability that your firm will receive this order (.75 times .50, or 37.5 percent). The probability multiplier relates to the second calculation, probable dollars, the product of the probability multiplier and the total dollars being negotiated. Statistically, over a large number of negotiations, the sum of the probable dollars for all the negotiations represents the amount of sales you should derive from negotiations.

A negotiation with a very large total dollars figure might yield a significant probable dollars figure even though the probability is 1 percent. Examine these carefully in your analysis so that they do not distort the probable dollars. You should also call the salesman immediately to determine if there is anything that will improve the probability of your getting that order.

The total dollars and probable dollars for each page are totaled at the bottom of the page.

The reports by product line are exactly the same as the reports by territory, except that they only list the product codes in a given product line. These are primarily for the use of the product-line managers.

The final report is the report by product code, which summarizes all the negotiations and provides a report by product code showing all the major series. Major series are defined as part numbers all having the same five left-most digits. This report consists of the series number (it still appears as part number on the report, but only the five left-most digits show), total quantity

and dollars being negotiated, probability multiplier for the entire series, probable dollars for the entire series, the probable units, and probable dollars for each of the planning quarters. Probable units are the product of the probability multiplier and the total units. At the bottom of each page is a total of probable dollars for each quarter.

With this report you can tell at a glance the activity on any given product series, including quantity being negotiated, probable dollars, and probable quantity to be purchased.

Program Operation

Program Listing 1 shows the most frequently used program, ACTNEG.

Line 50 assures that headings in the five reports are appropriate for the current planning cycle. If you respond with an N, the program execution ends and you correct the headings in lines 108 and 110. When they are corrected, run the program again and respond to the prompt with a Y.

Line 101 sends program execution to line 6500, which clears all but one of the graphics pages and reserves 1,000 bytes for string variables. This routine must be located at the end of the program, otherwise program execution is interrupted as soon as it encounters PCLEAR1. Line 105 dimensions the arrays in the program, while line 106 sets the baud rate to match your printer. (We used a serial-to-parallel converter and it required a 1,200 baud input.) If you require a baud rate other than the default value of 600 baud, POKE the appropriate values listed in the back of *Getting Started with Color Basic*, in this line.

Lines 107, 108, 110, and 111 define the headings for each of the reports, while lines 109 and 112 represent the PRINT USING statements for each report. Lines 119 and 120 set up the title screen, while 122 contains an added DIM statement. Line 125 solicits the date to appear at the top of each page, while 130 displays the menu, and 140 accepts your selection. Lines 145–160 check that your selection is within limits, execute your selection, and return you to the menu when done. Line 200 is a subroutine used to open tape files for input.

Line 1000 begins the enter-data routine. Lines 1010–1020 open files for output. Lines 1025–1040 solicit data and allow you to reenter that data if you've made a mistake. Line 1025, which inputs the prospect's name, contains an end-of-entry routine. If you are finished entering data, type @ when PROSPECT? appears. This automatically closes the file. (I opted for no prompt here; you might wish to use one.) Line 1041 outputs the data to tape, while 1999 returns you to the main menu.

Line 2000 begins the report-by-territory routine. Line 2007 sets T$ to null.

Here's how the output on these reports is generated. On this report, and the product-line reports, each territory appears on a separate page. If a certain territory has too many negotiations to fit on one page, the program automatically subtotals the current page and then continues the same territory on the next page. The program also goes to a new page each time the territory changes by monitoring the territory for each negotiation. For this reason, it is important that the final data be entered in territory sequence. Since this is impractical, the program EDITACNG is used to put the data in order.

Lines 2010–2020 input data from the previously recorded data tape, while line 2022 calls the subroutine at 2030. This subroutine handles line counting, territory changes, title pages, printing of data, and page totals, and is called by four of the five report programs. Line 2030 increments the line counter and checks to see if the territory has changed or the maximum number of allowable lines per page has been ex-

↙ See List of Advertisers on page 131

ceeded. If not, the program jumps to lines 2050–2060, which print the data, update the page total, and cause a return from subroutine.

If the territory has changed or the maximum number of lines has been exceeded, the program flow continues to line 2033. This resets the line counter to zero. Line 2040 calls line 6410 (which prints the page total), resets the page totals and updates the previous territory variable.

It then causes a form feed, which advances the printer to the top of the next page and prints a new title and heading. Execution continues with line 2050 as previously described. Line 2025 keeps sending the program back to the input statement until an end-of-file marker is found, at which time a RETURN sends the program back to the main menu.

Lines 3000–3030, 4000–4030, and 5000–5030 all work in exactly the same fashion as do lines 2000–2060. They all call the same subroutine. The only difference is in lines 3025, 4025, and 5025. These selectively ignore all product codes not in a given product line, generating the three reports by product line.

Line 6000 begins the report by product code. Lines 6010–6050 input the data to be summarized. Line 6060 resets a flag that determines whether a given record is part of a series previously identified. Line 6070 compares the record currently being examined to those series previously identified. If a match is found, the pertinent data, such as total units, total dollars, and so on, are added to the previous totals for that series. If no match for the current record is found, then the flag, which is not set, fails the test in line 6090 and creates a new series in line 6100. Line 6200 allows the use of more than one data tape in the event that you have too many negotiations to fit on one tape.

Lines 6210–6230 step through the product codes in sequence. Line 6235 sets the variable for the next series to be printed to ZZZZZ so that series appears in alphabetical order. It also sets the line counter to one.

Line 6240 calls a subroutine that prints the title page, while 6250 resets flag F9. Line 6260 steps through all the series found while line 6270 compares their product code to the current product code. Line 6280 places the series in alphabetical order, while line 6300 checks to see if there are more series with the current product code remaining. If not, the next product code is examined. Line 6310 prints the series with its data when the sequence is correct. Line 6330 is a line counter and title-page generator, while 6340 eliminates from future examination those series that have already been printed.

Line 6350 returns program execution to continue searching for series in a given product code. Line 6380 prints the page total while 6390 and 6400 issue a form feed and print the report-by-product-code heading. Line 6410 is the subtotal line for the reports by territory and product line. Finally, line 6500 is the initialization line for the computer memory.

Use ACTNEGIN to generate the input forms for your sales force. ACTNEGIN is exactly identical to ACTNEG except that the status for each account is left off, the quarters are shifted to show what the sales force said last quarter, a space is left for entry of data concerning the quarter not forecast last time around, and the output format is expanded (i.e., fewer lines per page) to leave space for alterations to last quarter's data. The differences between ACTNEG and ACTNEGIN are shown in Program Listing 2. Copy ACTNEG, Listing 1, to a separate tape and then make the changes shown in Listing 2. The operation of these new line numbers is as follows.

Line 10 is simply a corrected heading in a REM statement. Line 109 is a modified PRINT USING statement that leaves space for the next quarter to be forecast. Line 119 displays the proper program name, while 2021 checks whether the "our probability", used by the appropriate salesman last time, was zero. If so, this means that the salesman was reporting a lost opportunity and it need not be reported on again.

This is the only way a salesman can eliminate a negotiation; he must report its probability as zero, so you always have a record of what happened to any given negotiation. Line 2030 changes the line counter to allow more space for the salesman to change information, while 2050 changes the appearance of the printed input form, shifting quarters to conform with line 109, and blanking the status.

EDITACNG is the last program. It allows both editing of the input data and reordering it to appear in the desired territory order. Since disk drives are not used, EDITACNG loads the entire data base for the forecast to be edited into memory and manipulates it all there.

Line 15 clears space for the status comments while line 20 dimensions the needed arrays. Line 30 handles the simple menu and makes sure inputs are within allowable limits, while line 40

```
15 CLEAR8000
20 DIMPR$(200),TE$(200),PN$(200)
,PC$(200),TQ(200),TD(200),OP(200
),HP(200),Q1(200),Q2(200),Q3(200
),Q4(200),T$(27),SS$(200)
30 CLS:PRINT"1-EDIT":PRINT"2-PLA
CE IN TERRITORY SEQUENCE":PRINT:
INPUT"KEY CHOICE";G:IFG=1THENGOS
UB100ELSEIFG=2THENGOSUB500
40 GOTO30
100 CLS:INPUT"PREPARE TO PLAY TA
PE";G$:OPEN"I",#-1,"ACTNEG"
110 I=0
120 IFEOF(-1)THEN150ELSEI=I+1
130 PRINT@0,I
140 INPUT#-1,PR$(I),TE$(I),PN$(I
),PC$(I),TQ(I),TD(I),OP(I),HP(I)
,Q1(I),Q2(I),Q3(I),Q4(I),SS$(I):
GOTO120
150 CLOSE#-1
160 FORN=1TOI:CLS:PRINTPR$(N):PR
INTTE$(N):PRINTPN$(N):PRINTPC$(N
):PRINTTQ(N):PRINTTD(N):PRINTOP(
N):PRINTHP(N):PRINTQ1(N):PRINTQ2
(N):PRINTQ3(N):PRINTQ4(N):PRINTS
S$(N)
170 INPUT"OK <Y/N>";G$:IFG$="N"T
HENGOSUB220
180 NEXTN
190 CLS:INPUT"ENTER MORE";G$:IFG
$="N"THEN240
200 N=N+1:GOSUB220
210 GOTO190
220 CLS:INPUTPR$(N),TE$(N),PN$(N
),PC$(N),TQ(N),TD(N),OP(N),HP(N)
,Q1(N),Q2(N),Q3(N),Q4(N):LINEINP
UTSS$(N)
230 INPUT"OK <Y/N>";G$:IFG$="N"T
HEN220ELSERETURN
240 CLS:INPUT"PREPARE TO RECORD"
;G$
250 OPEN"O",#-1,"ACTNEG"
260 FORI=1TON:PRINT#-1,PR$(I);TE
$(I);PN$(I);PC$(I);TQ(I);TD(I);O
P(I);HP(I);Q1(I);Q2(I);Q3(I);Q4(
I);SS$(I):NEXTI
270 CLOSE#-1
280 RETURN
500 'RENUMBER ROUTINE
530 CLS:INPUT"PREPARE TO PLAY TA
PE";G$
540 OPEN"I",#-1,"ACTNEG"
550 I=0
560 IFEOF(-1)THEN600
570 PRINT@0,I
580 I=I+1
590 INPUT#-1,PR$(I),TE$(I),PN$(I
),PC$(I),TQ(I),TD(I),OP(I),HP(I)
,Q1(I),Q2(I),Q3(I),Q4(I),SS$(I)
595 GOTO560
600 CLOSE#-1
610 FORA=1TO26:READT$(A):NEXTA
620 DATA 01A,01B,01C,01D,01E,02A
,02B,02C,02D,02E,02F,02G,02H,03A
,03B,03C,03D,03E,03F,04A,04B,04C
,04D,04E,04F,04G,04H
630 CLS:INPUT"INSERT TAPE INTO P
LAYER AND     PREPARE TO RECORD"
;G$
635 OPEN"O",#-1,"ACTNEG"
640 FORA=1TO27
650 FORN=1TOI
660 CLS:PRINTPR$(N):PRINTTE$(N):
PRINTPN$(N):PRINTPC$(N)
670 IFTE$(N)=T$(A) THENPRINT#-1,
PR$(N),TE$(N),PN$(N),PC$(N),TQ(N
),TD(N),OP(N),HP(N),Q1(N),Q2(N),
Q3(N),Q4(N),SS$(N)
680 NEXTN
690 NEXTA
700 CLOSE#-1
710 RETURN
```

Program Listing 3. Active Negotiations Editor

Setting The Standard

WHAT THEY ARE

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Will you have to work overtime in the hour glass frame to get the job done?

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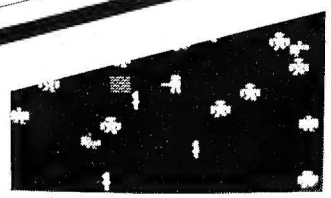

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This truly outstanding engineer designed, 100% machine language game with multi-colored high resolution characters and fast action will challenge the most avid arcade buff. Can be played by 1 or 2 players controlled with joy sticks or key board. Joy stick control is fast, smooth and accurate. As COLORPEDE slithers through the toad stools, you attempt to destroy the COLORPEDE, knock out the menacing Bouncing Bug and eliminate toad stools while accumulating higher and higher scores. Demonstration mode with top 5 scores. Pause feature. For 16K Color Computer and TDP-100.

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ROBOTTACK

Ultra fast arcade action with colorful high resolution graphics. You are the super human who must fight off the attacking robots and save the remaining humans from destruction. You have super powers, can shoot in any direction and move anywhere on the screen to accomplish your vital mission.

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loops back to the menu after returning from a subroutine.

Line 100 opens the data file to be read, while line 110 initializes the counter. Line 120 checks for the end of file and increments the counter, while line 130 displays the current number record being loaded for convenience. Line 140 actually completes the data input loop, while line 150 closes the file when all the data is loaded.

Lines 160–180 list the records entered and allow the operator to pass or reject them as needing alterations. If changes are needed, program execution is routed to the subroutine at line 220. Lines 220–230 perform the actual editing. When editing is complete, lines 190–210 allow the entry of additional new or previously overlooked negotiations. The actual editing is done in lines 220–230.

Line 240 begins the saving routine. In line 250 the file is opened, in 260 the data is actually read out, in 270 the file is closed, and in line 280 execution is returned to the menu display routine.

The "place in territory sequence" routine begins in line 500. Line 530 prompts the operator, line 540 opens the data file, and line 550 initializes a counter. Lines 560–600 read the data in much the same fashion as did lines 120–150.

Line 610 sets up an array storing the territories to be listed, while the data for the array resides in line 620. I use a total of 26 territories; this should be tailored to fit your sales territory organization.

Lines 630–635 set up the recorder to accept output. Lines 640 and 650 set up two nested loops to output the data in order. First, the first territory to be printed is selected. Then, in line 670, the program loops through all its records finding and saving to tape all those with the appropriate territory. Line 660 acts to show which negotiations are being reviewed and the review speed. This gives you some idea of which territory is currently being processed. Lines 680 and 690 close the loops, line 700 closes the file, and line 710 returns execution to the menu routine.

Using the Programs

Now that you have the three programs entered and saved, you are ready to use them. First, gather the information needed for your first run. Since you have no previous data, you can't use the ACTNEGIN program. Manually construct a form showing what information is needed.

"Send this form to your sales force and threaten to cut off their expense accounts if not returned when you specify."

Send this form to your sales force and threaten to cut off their expense accounts if it is not returned when you specify. I would suggest a letter or some other explanation detailing how to fill out the form; excerpts from this article are acceptable. From this point forward, you need only load the previous quarter's data tape and run it with the ACTNEGIN program to generate your input forms. When using ACTNEGIN, run only the report by territory. I will not be responsible for the accuracy of the other four reports if you run them from ACTNEGIN.

When you get the forms back, run ACTNEG and select "Enter Data" from the menu. Insert a good quality, reliable tape into the recorder and prepare to record. I cannot say enough about the importance of a quality tape. All your work will be in vain if you get an I/O error. I have always used Radio Shack tapes for this purpose.

Type in the data. When you have entered all the prospects' names, respond to the "Prospect?" prompt with an @. The tape that has been gathering data all this time is now closed. At this point, it's a good idea to run a copy of the report by territory and have your regional sales managers check it out. After you receive their corrections, load the original data tape using the EDITACNG program. Make corrections as necessary, and enter additions at the end of the edit routine.

Now, rewind the tape and call the place-in-territory-sequence routine. Follow the prompts and everything will be fine. I would suggest here that you keep the previous data tape (the one not in sequence) and the one you have just made. This way, if one crashes, you have only the last step to repeat to recover your position. Remember to use a bulk tape eraser when erasing tapes to prevent glitches.

When the reorganized data tape is ready, reload ACTNEG and run the reports you need. Rewind the data tape after each report.

I have set up the report-by-product-code routine of the ACTNEG program to handle multiple data tapes. The other routines and the EDITACNG program handle only one at a time, but allow the use of multiple tapes when the data exceeds what memory can handle. This number varies depending on the length of the status reported, but generally runs around 200 negotiations if your sales force isn't too long winded.

You must enter the data in two parts on two data tapes if your negotiations exceed 200. It is assumed you will keep these in territory sequence; tape 1 will contain regions 01 and 02 while tape 2 contains regions 03 and 04. In this way, the data is considered independent pieces of information until it has to be summarized. When running reports that are in territory sequence, simply run tape 1 first, followed by tape 2, tape 3, and so on. ■

Address correspondence to Charles B. Levinski, 10 Southside Ave., South River, NJ 08882.

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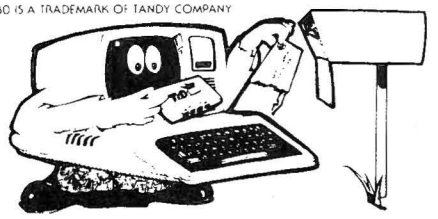

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CoCo PAYROLL

Handle your employee payroll with speed and efficiency. This business feature shows you how.

One of the many uses I've discovered for my Color Computer is this payroll program, originally written for the TRS-80 Model I. In converting the program I added several features missing in the original. It is set up for 30 employees and uses almost all the memory in a 16K computer.

Before loading the program from disk, you must enter PMODE 0,1 :PCLEAR 1:VERIFYON to free up all available memory and set the disk to verify each write operation. Load the program and delete line 180. This line branches to the subroutine that reads payroll data from the disk. The first time you run the program there will be no data on the disk so delete the line.

Type "RUN" and the computer presents the main menu. Choose the Add option to enter the employee list. The program must be set up on separate disks if there are employees with different pay periods, such as weekly or monthly. After entering the employee information, the data will be saved to disk automatically. Use the List option to print out a record for each employee and check the records carefully for errors. If you find any, use the Make Changes option to correct them.

You must reinput the data for each field as you are prompted. The data will be saved to disk automatically when you finish. Use the List option to print a new copy of any record that was changed.

To remove employees from the list, use the Delete option. Again, the data will be automatically saved to disk.

You are now ready to make a payroll run. When you choose the Calculate option, enter the ending date of the pay period in whatever format you want for the payroll record printout.

Each employee record appears on the screen and can be included or excluded from the run. If the computer includes the record, it will perform and print the calculation along with the year-to-date figures for that employee, and repeat the procedure for each employee in the file. After the program returns to the main menu, check the printout for errors. The data was not saved to disk auto-

Program Listing. Payroll System

```
100 'PAYROLL.BAS
110 'PAYROLL SYSTEM
120 'MIKE CHARLTON
130 'MARCH 1983
140 PMODE0,1:PCLEAR1:CLEAR1700
150 DIM EN$(30),NA$(30),SS$(30),
FS$(30),ND(30)
160 DIM PS$(30),HR(30),GP(30),PP
(30),OD(30)
170 DIM YG(30),YI(30),YF(30),YS(
30),YC(30),YO(30)
180 GOSUB10000
190 CLS:PRINT@4,"* * PAYROLL SYS
TEM * *"
200 PRINT@96,"(A)DD TO OR CREATE
 EMPLOYEE LIST";
210 PRINT"(L)IST AN EMPLOYEE'S R
ECORD"
220 PRINT"(D)ELETE EMPLOYEE"
230 PRINT"(C)ALCULATE PAYROLL"
240 PRINT"(M)AKE CHANGES TO DATA
"
250 PRINT"(S)AVE DATA TO DISK"
260 PRINT"(E)ND PROGRAM"
270 PRINT@362,"OPTION?";
280 O$=INKEY$:IF O$="" THEN 280
290 ON INSTR("EALDCMS",O$) GOTO
310,1000,2000,3000,4000,5000,600
0
300 GOTO270
310 CLOSE:END
1000 'ADD EMPLOYEES
1010 IF NE<30 THEN GOTO 1040
1020 CLS:PRINT"FILE IS FULL-CAN'
T ADD ANY MORE"
1030 PRINT:INPUT"PRESS ENTER FOR
 MENU";O$:GOTO190
1040 CLS:PRINT"THERE ARE";NE;"EM
PLOYEES ON FILE"
1050 I=NE+1:Q9=0
1060 INPUT"EMPLOYEE NO.";EN$(I)
1070 INPUT"NAME";NA$(I)
1080 INPUT"SOCIAL SEC. NO.";SS$(
I)
1090 INPUT"(M)ARRIED OR (S)INGLE
";FS$(I)
1100 INPUT"NO. OF DEPENDENTS";ND
(I)
1110 INPUT"(S)ALARIED OR (H)OURL
Y";PS$(I):IFPS$(I)="H"THENINPUT"
```

Listing continued

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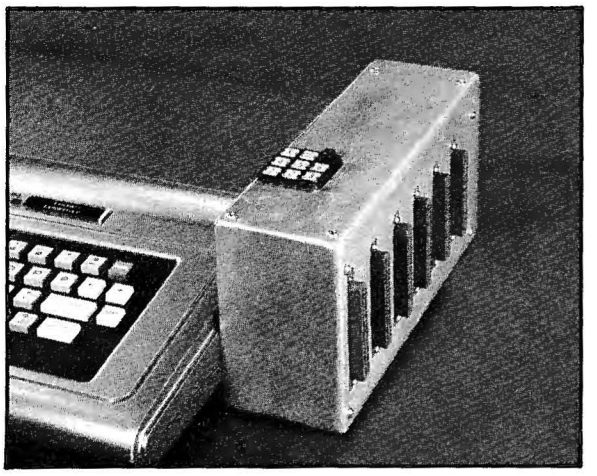

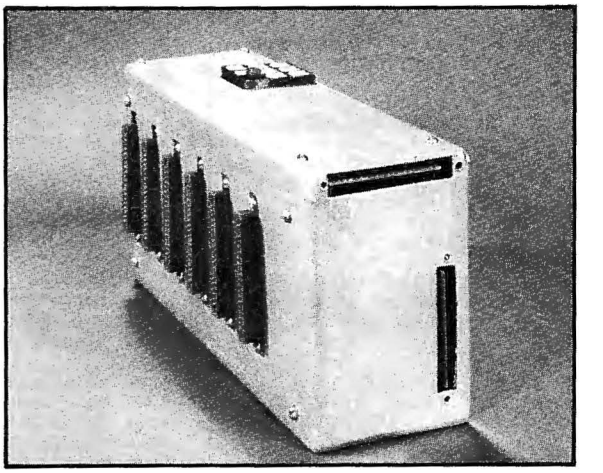

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Listing continued

```
HOURLY RATE";HR(I):GOTO1130
1120 INPUT"GROSS PAY PER PERIOD"
;GP(I)
1130 INPUT"PAY PERIODS PER YEAR"
;PP(I)
1140 INPUT"OTHER DEDUCTIONS (Y/N
)";AN$
1150 IFAN$="N"THENOD(I)=0:IFQ9=1
THENGOTO5080ELSEGOTO1180
1160 INPUT"WHAT PERCENTAGE";OD(I
)
1170 IFQ9=1THENGOTO5080
1180 NE=I
1190 PRINT@480,"ANOTHER ADDITION
 (Y/N)";
1200 O$=INKEY$:IF O$="" THEN1200
1210 ON INSTR("YN",O$)GOTO 1000,
1230
1220 GOTO1190
1230 GOSUB11000:GOTO190
2000 'LIST RECORD
2010 CLS:INPUT"EMPLOYEE NAME";N$
:GOSUB9000:PRINT:IFL=0THENPRINT"
NAME NOT IN FILE":INPUT"PRESS EN
TER FOR MENU";O$:GOTO190
2020 PRINT:PRINT"(S)CREEN OR (P)
RINTER";
2030 O$=INKEY$:IFO$=""THEN2030
2040 ON INSTR("SP",O$)GOTO2060,2
110
2050 GOTO2020
2060 GOSUB13000
2070 PRINT@485,"ANOTHER (Y/N)";
2080 O$=INKEY$:IFO$=""THEN2080
2090 ON INSTR("YN",O$)GOTO2000,1
90
2100 GOTO2070
2110 PRINT#-2,STRING$(80,95)
2120 PRINT#-2,NA$(I);TAB(28);"EM
P.#:";EN$(I);TAB(60);"SS#:";SS$(
I)
2130 PRINT#-2,"FILING STATUS:";F
S$(I);TAB(28);"NO. DEP.:";ND(I);
TAB(60);"PAY STATUS:";PS$(I)
2140 PRINT#-2,"HOURLY RATE:";HR(
I);TAB(22);"GROSS PAY:";GP(I);TA
B(42);"PAY PERIODS:";PP(I);TAB(6
0);"OTHER(%):";OD(I)
2150 PRINT#-2,"YEAR TO DATE"
2160 PRINT#-2,"GROSS PAY     FED
.TAX     FICA TAX     STATE TAX
    CITY TAX     OTHER"
2170 PRINT#-2,USING"#####.##
 #####.##      ####.##      ####
.##      ####.##      ####.##";Y
G(I);YI(I);YF(I);YS(I);YC(I);YO(
I)
2180 PRINT#-2,STRING$(80,95):PRI
NT#-2,"":GOTO190
3000 'DELETE EMPLOYEE
3010 CLS:PRINT"NAME OF EMPLOYEE
TO DELETE?"
3020 INPUTN$:GOSUB9000
3030 PRINT:IFL=0THENPRINT"NAME N
OT IN FILE":INPUT"PRESS ENTER FO
R MENU";O$:GOTO190
3040 GOSUB13000
3050 PRINT@485,"(D)ELETE OR (E)X
IT";
3060 O$=INKEY$:IFO$=""THEN3060
3070 ON INSTR("DE",O$)GOTO3090,1
90
3080 GOTO3050
3090 FORJ=I TO NE-1
3100 EN$(J)=EN$(J+1):NA$(J)=NA$(
J+1):SS$(J)=SS$(J+1):FS$(J)=FS$(
J+1):ND(J)=ND(J+1)
3110 PS$(J)=PS$(J+1):HR(J)=HR(J+
1):GP(J)=GP(J+1):PP(J)=PP(J+1):O
D(J)=OD(J+1)
3120 YG(J)=YG(J+1):YI(J)=YI(J+1)
:YF(J)=YF(J+1):YS(J)=YS(J+1):YC(
J)=YC(J+1):YO(J)=YO(J+1)
3130 NEXTJ:NE=NE-1:GOSUB11000:GO
TO190
4000 'CALCULATE PAYROLL
4010 CLS:PRINT@137,"ENDING DATE
OF"
4020 PRINT@171,"PAY PERIOD":PRIN
T@203,"";:INPUTDA$
4030 PRINT:PRINT:INPUT"PREPARE P
RINTER-PRESS ENTER";O$
4040 FOR I=1 TO NE
4050 GOSUB13010
4060 PRINT:INPUT"INCLUDE IN RUN
(Y/N)";O$
4070 IFO$="Y"THEN4100
4080 IFO$<>"N"THEN4060
4090 NEXTI:GOTO190
4100 PRINT#-2,STRING$(80,95)
4110 PRINT#-2,TAB(25)"PAY PERIOD
 ENDING ";DA$
4120 GOSUB12000
4130 NEXTI:GOTO190
5000 'CHANGE PAYROLL DATA
5010 CLS:INPUT"EMPLOYEE NAME";N$
:GOSUB9000:PRINT:IFL=0THENPRINT"
NAME NOT IN FILE":INPUT"PRESS EN
TER FOR MENU";O$:GOTO190
5020 GOSUB13000
5030 PRINT@485,"(C)HANGE OR (E)X
IT";
5040 O$=INKEY$:IFO$=""THEN5040
5050 ON INSTR("CE",O$)GOTO5070,1
90
5060 GOTO5030
5070 CLS:Q9=1:GOTO1060
5080 INPUT"YTD GROSS";YG(I):INPU
T"YTD FED.TAX";YI(I)
5090 INPUT"YTD FICA";YF(I):INPUT
"YTD STATE";YS(I)
5100 INPUT"YTD LOCAL";YC(I):INPU
T"YTD OTHER";YO(I)
5110 INPUT"PRESS ENTER FOR MENU"
;O$
6000 'DUMP DATA TO DISK
6010 GOSUB11000:GOTO190
9000 'FIND NAME
9010 FOR I=1 TO NE
9020 L=1:IF N$=NA$(I)THENRETURN
9030 NEXTI:L=0:RETURN
10000 'READ DATA FROM DISK
10010 OPEN "I",#1,"PAYROLL.FIL"
10020 INPUT #1,NE,DA$
10030 FOR I=1 TO NE
10040 INPUT #1,EN$(I),NA$(I),SS$
(I),FS$(I),ND(I)
10050 INPUT #1,PS$(I),HR(I),GP(I
),PP(I),OD(I)
10060 INPUT #1,YG(I),YI(I),YF(I)
,YS(I),YC(I),YO(I)
10070 NEXT I:CLOSE #1:RETURN
11000 'WRITE DATA TO DISK
11010 OPEN "O",#1,"PAYROLL.FIL"
11020 PRINT #1,NE;",";DA$
11030 FOR I=1 TO NE
11040 PRINT #1,EN$(I);",";NA$(I)
;",";SS$(I);",";FS$(I);",";ND(I)
11050 PRINT #1,PS$(I);",";HR(I);
",";GP(I);",";PP(I);",";OD(I)
11060 PRINT #1,YG(I);",";YI(I);"
,";YF(I);",";YS(I);",";YC(I);","
;YO(I)
11070 NEXT I:CLOSE #1:RETURN
12000 'CALCULATIONS
12010 IFPS$(I)="S"THENGOTO12050
12020 CLS:PRINTNA$(I):INPUT"NO.
REG. HOURS";NH
12030 INPUT"NO. OVERTIME HOURS";
OV
12040 GP(I)=(HR(I)*NH)+(OV*(HR(I
)*1.5)):GP(I)=INT(GP(I)*100+.5)/
100
12050 Z1=GP(I)*PP(I):Z2=Z1-(1000
*ND(I))
12060 IFFS$(I)="S"THENGOSUB18000
12070 IFFS$(I)="M"THENGOSUB19000
12080 FT=INT(FT*100+.5)/100
12090 FI=INT((GP(I)*.067)*100+.5
)/100:CT=INT((GP(I)*.01)*100+.5)
/100:OT=INT(((OD(I)/100)*GP(I))*
100+.5)/100
12100 IF FI+YF(I)>=2391.9THENFI=
2391.9-YF(I)
12110 GOSUB20000
12120 ST=(ST-(20*ND(I)))/PP(I)
12130 ST=INT(ST*100+.5)/100
12140 TD=FT+FI+ST+CT+OT
12150 TH=GP(I)-TD
12160 PRINT#-2,"":PRINT#-2,NA$(I
);TAB(24);"EMP.#:";EN$(I);TAB(56
);"SS#:";SS$(I)
12170 PRINT#-2,""
12180 PRINT#-2,"GROSS PAY     FE
D.TAX     FICA TAX     STATE TAX
    CITY TAX     OTHER"
12190 PRINT#-2,USING"####.##
  ####.##      ###.##      ##
#.##      ###.##      ###.##";G
P(I);FT;FI;ST;CT;OT
12200 PRINT#-2,""
12210 PRINT#-2,USING"NET PAY = #
###.##";TH
12220 YG(I)=YG(I)+GP(I):YI(I)=YI
(I)+FT:YF(I)=YF(I)+FI
12230 YS(I)=YS(I)+ST:YC(I)=YC(I)
+CT:YO(I)=YO(I)+OT
12240 PRINT#-2,TAB(33)"YEAR TO D
ATE"
12250 PRINT#-2,"GROSS PAY     FE
D.TAX     FICA TAX     STATE TAX
    CITY TAX     OTHER"
12260 PRINT#-2,USING"#####.##
  #####.##      ####.##      ###
#.##      ####.##      ####.##";
YG(I);YI(I);YF(I);YS(I);YC(I);YO
(I)
12270 PRINT#-2,STRING$(80,95)
12280 RETURN
13000 'DISPLAY ROUTINE
13010 CLS:PRINT"#";EN$(I);:PRINT
TAB(9)NA$(I):PRINTSS$(I):PRINT"F
ILING STATUS=";FS$(I);:PRINTTAB(
18)"NO.DEP=";ND(I)
13020 PRINT"PAY STATUS=";PS$(I):
PRINT"HOURLY RATE=";HR(I):PRINT"
GROSS PAY=";GP(I):PRINT"PAY PERI
ODS=";PP(I):PRINT"OTHER(%)=";OD(
I)
13030 PRINT"YTD GROSS=";YG(I):PR
INT"YTD FED.TAX=";YI(I):PRINT"YT
D FICA=";YF(I):PRINT"YTD STATE="
;YS(I):PRINT"YTD LOCAL=";YC(I):P
RINT"YTD OTHER=";YO(I)
13040 RETURN
18000 'FED.TAX-SINGLE
18010 IFZ2<=1400THENFT=0:RETURN
18020 IFZ2>1400ANDZ2<=3200THENFT
=(.12*(Z2-1400))/PP(I):RETURN
18030 IFZ2>3200ANDZ2<=8900THENFT
=(.16*(Z2-3200)+216)/PP(I):RETUR
N
18040 IFZ2>8900ANDZ2<=12500THENF
T=(.2*(Z2-8900)+1128)/PP(I):RETU
RN
18050 IFZ2>12500ANDZ2<=16900THEN
FT=(.24*(Z2-12500)+1848)/PP(I):R
ETURN
18060 IFZ2>16900ANDZ2<=22500THEN
FT=(.3*(Z2-16900)+2904)/PP(I):RE
TURN
18070 IFZ2>22500ANDZ2<=27800THEN
FT=(.34*(Z2-22500)+4584)/PP(I):R
ETURN
18080 IFZ2>27800THENFT=(.37*(Z2-
27800)+6386)/PP(I):RETURN
19000 'FED.TAX-MARRIED
19010 IFZ2<=2400THENFT=0:RETURN
19020 IFZ2>2400ANDZ2<=6075THENFT
=(.12*(Z2-2400))/PP(I):RETURN
19030 IFZ2>6075ANDZ2<=11975THENF
T=(.16*(Z2-6075)+441)/PP(I):RETU
RN
19040 IFZ2>11975ANDZ2<=18535THEN
FT=(.19*(Z2-11975)+1385)/PP(I):R
ETURN
19050 IFZ2>18535ANDZ2<=23600THEN
FT=(.24*(Z2-18535)+2631.4)/PP(I)
:RETURN
19060 IFZ2>23600ANDZ2<=28900THEN
FT=(.27*(Z2-23600)+3847)/PP(I):R
ETURN
19070 IFZ2>28900ANDZ2<=34200THEN
FT=(.32*(Z2-28900)+5278)/PP(I):R
ETURN
19080 IFZ2>34200THENFT=(.37*(Z2-
34200)+6974)/PP(I):RETURN
20000 'STATE TAX
20010 Z3=((GP(I)-FT)*PP(I))-650
20020 IFZ3<=3000THENST=.02*Z3:RE
TURN
20030 IFZ3>3000ANDZ3<=4000THENST
=.03*(Z3-3000)+60:RETURN
20040 IFZ3>4000ANDZ3<=5000THENST
=.04*(Z3-4000)+90:RETURN
20050 IFZ3>5000ANDZ3<=8000THENST
=.05*(Z3-5000)+130:RETURN
20060 IFZ3>8000THENST=.06*(Z3-80
00)+280:RETURN
```

END

COLOR COMPUTER SOFTWARE

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HAYWIRE—This challenging combination of angry robots and the evil menace will provide many hours of fun and excitement. Haywire is the best Color Computer version of the Berzerk arcade game you can get. **Cassette—$24.95 / Disc $27.95.**

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matically. Therefore, if you find errors in the payroll, end the program, reload the program from disk, and run it again.

If there are no errors in the payroll, save the data to disk. Before ending the session, you can list each employee record to the printer as a back-up. If the payroll disk is destroyed, you can easily recreate it from this back-up.

"...use this program along with your current manual payroll...until you are confident of it."

Figure 1 shows a typical printout from a payroll run for three hourly employees paid weekly. Figure 2 shows the printout of records for the same employees.

You might require the following program changes. The federal tax tables used are the ones in effect through July 1, 1983 (lines 18000–19080). The FICA percentage and cutoff are good through December 31, 1983. The state tax is for Kentucky and probably will be incorrect for other states.

You must edit lines 20000–20060 for the appropriate state calculation. The calculation for city tax is in line 12090 and is set for 1 percent in the variable CT. The other tax category is a percentage that you can set to the desired level when inputting employee records. For hourly employees, overtime is paid at 1.5 times regular pay. You can change this in line 12040.

As with any newly computerized system, you should use this program along with your current manual payroll for several pay periods until you are confident of it. ■

Address correspondence to Mike Charlton, 3936 Yates Drive, Owensboro, KY 42301.

```
-------------------------------------------------------------------------
                        PAY PERIOD ENDING 3-25-83

BILL DOE                EMP.#:1010                      SS#:400-50-600

GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 500.00        71.21        33.50         19.98         5.00        25.00

NET PAY =  345.31
                              YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 6000.00      854.52       402.00        239.76        60.00       300.00
-------------------------------------------------------------------------
-------------------------------------------------------------------------
                        PAY PERIOD ENDING 3-25-83

JERRY DOE               EMP.#:1011                      SS#:400-60-500

GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 460.00        66.23        30.82         18.26         4.60        23.00

NET PAY =  317.09
                              YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 5520.00      794.76       369.84        219.12        55.20       276.00
-------------------------------------------------------------------------
-------------------------------------------------------------------------
                        PAY PERIOD ENDING 3-25-83

SAM DOE                 EMP.#:1012                      SS#:400-40-500

GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 420.00        78.58        28.14         15.50         4.20        21.00

NET PAY =  272.58
                              YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 5040.00      942.96       337.68        186.00        50.40       252.00
-------------------------------------------------------------------------
```

Fig. 1. Payroll Run for Three Hourly Employees Paid Weekly

```
-------------------------------------------------------------------------
BILL DOE                EMP.#:1010                      SS#:400-50-600
FILING STATUS:M         NO. DEP.: 3                     PAY STATUS:H
HOURLY RATE: 12.5   GROSS PAY: 500     PAY PERIODS: 52   OTHER(%): 5
YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 6000.00      854.52       402.00        239.76        60.00       300.00
-------------------------------------------------------------------------

-------------------------------------------------------------------------
JERRY DOE               EMP.#:1011                      SS#:400-60-500
FILING STATUS:M         NO. DEP.: 2                     PAY STATUS:H
HOURLY RATE: 11.5   GROSS PAY: 460     PAY PERIODS: 52   OTHER(%): 5
YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 5520.00      794.76       369.84        219.12        55.20       276.00
-------------------------------------------------------------------------

-------------------------------------------------------------------------
SAM DOE                 EMP.#:1012                      SS#:400-40-500
FILING STATUS:S         NO. DEP.: 1                     PAY STATUS:H
HOURLY RATE: 10.5   GROSS PAY: 420     PAY PERIODS: 52   OTHER(%): 5
YEAR TO DATE
GROSS PAY     FED.TAX     FICA TAX     STATE TAX     CITY TAX      OTHER
 5040.00      942.96       337.68        186.00        50.40       252.00
-------------------------------------------------------------------------
```

Fig. 2. Record Printout for Employees in Fig. 1

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SHOW AS YOU GO

In a recent meeting, a coworker, Al, used his TRS-80 to display a line graph while he gave a short presentation. Unfortunately, I found myself thinking about the drop in September while he was talking about the rise in March. Al was upstaged by his graph.

A computer graphic should be dynamic and produce a dramatic effect. The Program Listing allows you to "draw" a graph as you need it during a presentation.

Finding a way to draw the graph point by point was easy. An INKEY command in front of a loop of statements allows you to draw lines by pressing one key. I also wanted to print values on the axes of the graph and to center the title, however, which was a more challenging task.

Don't let your computer upstage you! Use it to complement your business graphics presentations.

One big deficiency of the Color Computer is having to use the DRAW statement to get letters and numbers on the graphics screen. But I did not want to recode the program for each new title or set of values.

After several days of playing around, I decided to define a string array A$(58). Each element contains a set of DRAW instructions. The array produces the ASCII character set of letters, numbers, and special characters. They are in the same order as the ASCII character codes in the *Going Ahead with Extended Color Basic* manual.

All you have to do is put a title line or an axis value into a string variable and pick out each character in the string with a MID$ function. Set a numeric variable equal to the character's ASCII code value minus 32. The numeric variable then becomes the index for picking the correct array element, which is moved into a DRAW statement.

For example, the command N = ASC ("A") – 32 results in N = 33. Line 470

```
A$(33) = "XP$:BD7U6E1R2F1D2L3R3D4"
```

is a set of DRAW instructions for the letter A.

The program indexes each array element to the decimal number of its ASCII character. I use the LEN function to center the title and right-justify

Line Numbers	Function
10–120	Subroutine calls
130–730	Dimension arrays and load alphanumerics
750–880	Prompt for graph title
900–1090	Prompt for vertical axis values
1100–1120	Subroutine for too small a value
1130–1150	Subroutine for too large a value
1170–1290	Prompt for time scale of horizontal axis
1330–1520	Prompt for values for each point in time
1530–1610	Coded values if prompts not desired
1630–1850	Draw title on screen
1870–2040	Draw in axes and tics
2060–2250	Compute vertical axis values
2270–2420	Subroutine to draw in vertical axis values
2440–2620	Draw and paint graph
2640–2760	Subroutine to print years for horizontal axis
2780–2830	Subroutine to print months for horizontal axis

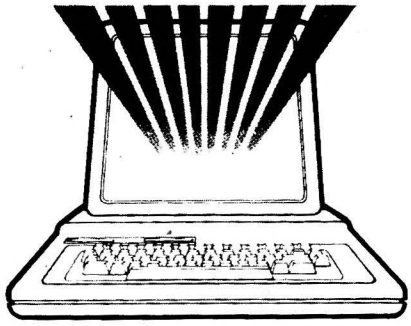
Table 1. Line Descriptions

System Requirements

16K RAM
Extended Color Basic

SUPER SCREEN

the Color Computer Supercharger



- **A big 51 character by 24 line screen.**
- **Full upper and lower case characters.**
- **Easily combine text with hi-res graphics.**
- **PRINT @ is completely functional on the big screen.**
- **The powerful ON ERROR GOTO is fully implemented.**
- **Auto-key repeat for greater keyboard convenience.**
- **Control codes for additional functions.**
- **Works with 16K, 32K or 64K computers.**
- **Available on disc or cassette.**

51 CHARACTER BY 24 LINE DISPLAY

Super Screen is a powerful, machine language program that significantly upgrades the performance and usefulness of 16K or greater, Extended and Disc Basic Color Computers. The standard Color Computer display screen is totally inadequate for serious, personal or business applications so Super Screen replaces it with a brand new, 51 character wide by 24 line screen including full upper and lower case characters. Instead of a confusing checkerboard appearance, you now have true lower case letters along with a screen that is capable of displaying 1224 characters. The difference is startling! Your computer takes on new dimensions and can easily handle lines of text that were simply too long and complex to display on the old screen.

COMBINE TEXT WITH HI-RES GRAPHICS

You can now write truly professional looking programs that combine text with hi-res graphics. Super Screen allows you to create graphics displays with the Basic LINE, DRAW and CIRCLE statements and then notate the graphics with descriptive text. You can even use PRINT @ if you wish for greater programming convenience. Super Screen's versatility will amaze you.

PRINT @ IS FULLY IMPLEMENTED

The PRINT @ statement is a valuable asset to the programmer when formatting text on the screen. The standard Color Computer will report an error if you specify a location higher than 511 but Super Screen allows locations all the way to 1223! You get a big screen and a powerful formatting tool as well. Of course, Super Screen also supports the CLS command allowing you to clear the big screen using standard Basic syntax.

ON ERROR GOTO

That's right! Super Screen gives you a full implementation of ON ERROR GOTO including the ERR and ERL functions. Now you can trap errors and take corrective action to prevent crashed programs and lost data using the same standard syntax as other computers. The ON ERROR GOTO capability overcomes a serious deficiency of Color Computer Basic and greatly improves your capability to handle sophisticated tasks. All well written, 'user friendly' programs use error trapping techniques and yours can too! Now that's power!

AUTO KEY REPEAT

No more frustration as you edit a long line in your Basic program; just hold the space bar down and automatically step to the desired position in the line. Need a line of asterisks? Hold the key down and auto repeat will give them to you. Those of you who spend many hours at your keyboard will appreciate this outstanding addition to Super Screen's long list of impressive capabilities.

CONTROL CODES FOR ADDITIONAL FUNCTIONS

Super Screen recognizes several special control code characters that allow selection of block or underline, solid or blinking cursor and other functions. You can 'Home up' the cursor or you may erase from the cursor to the end of a line or to the end of the screen just like many other computers. These special codes give you an extra dimension of versatility and convenience that put Super Screen in a class by itself.

AND MORE GOOD NEWS...

Super Screen comes with complete, well detailed instructions and is available on cassette or disc. It adjusts automatically to any 16K or greater, Extended or Disc Basic Color Computer or TDP-100 and uses only 2K of memory in addition to the screen memory reserved during power up. Guaranteed to be the most frequently used program in your software library...once you use it, you won't be without it! Super Screen's low price will really please you; only $29.95 on cassette or $32.95 on disc!

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vertical axis values. The length of the title and value strings determines margins for the title and the printing start point for the axis values.

Operating the Program

You should consider several things before running the program. You can use one or two title lines, each with up to 30 characters. The time variable runs along the horizontal axis, indicating either 12 months or 12 years.

The units for the vertical axis can be whatever you want and can range from 0 to 999. No negative numbers, decimals, or numbers of more than three digits are allowed. I recommend that you start the vertical scale with zero and because the scale is divided into quartiles, that you use an upper limit that is divisible by four. The value points for the graph must be within the limits set for the vertical axis.

No coding changes are necessary to run the program as it is listed. It includes prompts for the two title lines, low and high values for the vertical axis, horizontal axis units (months or years), and values for each point of the graph. If the horizontal axis is years, the program also asks you for the starting year.

After the prompts, the program draws the axes and prints the titles and values. The program draws and paints the graph section by section each time you press a key.

If you do not want to go through the prompts, you can code the parameters for the graph into the program. Delete lines 20–50 and remove the remark in line 60. Put the necessary values in lines 1530–1600. The program then draws the graph skeleton immediately.

The INPUT statement does not accept the colon and comma keys, so you cannot include them in a title line if you are using the prompts. No problem occurs if you code a colon or comma into lines 1530 or 1540.

The program is set to run in high-resolution PMODE 4,1. You can change line 1640 to PMODE 3,1 or PMODE 2,1 and can change the PAINT statement in line 2580 to use different colors.

You can use this technique for drawing letters and numbers on the graphics screen in other programs, but the array and operating code take up about 2,200 bytes.

This program draws only one graph. You can add another dimension to variables TI$, T2$, M$, VL$, VH, YR, and VA(12), and you can repeat lines 1630–2830 for multiple graphs. The program uses more than 7,000 bytes (counting all spaces and remarks), so you might need 32K for expansion.

Instead of hitting a key each time you want to add to the graph, you can create a more impressive effect coding in a timer and carefully coordinating your speech with the graph. Set up a numeric array for holding time intervals, then delete the INKEY command in line 2600 and replace it with the TIMER code described in the Extended Basic manual. This requires a carefully rehearsed speech, but you will leave the audience scratching their heads. ■

A$(58)	Draw instructions for numbers and letters
IN$	INKEY test variable
M$	Months or years on horizontal axis
MN$	String of month labels
P$	Starting column for title lines
SY$	Starting column for vertical values
TI$	Title line 1
T2$	Title line 2
VA$	Display point in time for value prompt
VR$	Single character in vertical value string
VV$	String for vertical value label
C	Index for drawing horizontal labels
C1	Column for start point of graph line
C2	Column for end point of graph line
J	Index for month label
K	Index for horizontal point
L	Length of title line 1
L2	Length of title line 2
LY	Length of vertical value
M	Index for retrieving first letter of month
N	Index to draw vertical values
P	Index for length of title line
P1	Row for start point of graph line
P2	Row for end point of graph line
SY	Starting column for printing axis value
VA(12)	Values of graph points
VH	High vertical axis value
VL	Low vertical axis value
VV	Vertical value to print on screen
X	Index for title letters
XX	Index for printing years
YE	Year displayed in prompt for value
YR	Starting year of graph
YS	Row to start printing axis value
Z	ASCII value of a single character in title

Table 2. Variables

Address correspondence to Glen Tapanila, 316 Laurelhurst Drive, Tumwater, WA 98501.

Program Listing. Show-as-You-Go Graph

```
10 GOSUB 130
20 GOSUB 750
30 GOSUB 900
40 GOSUB 1170
50 GOSUB 1320
60 REM GOSUB 1530
70 GOSUB 1630
80 GOSUB 1870
90 GOSUB 2060
100 GOSUB 2270
110 GOSUB 2440
120 GOTO 120
130 DIM A$(59)
140 DIM VA(12)
145 MN$="JANFEBMARAPRMAYJUNJULAU
GSEPOCTNOVDEC"
150 A$(1)="XP$;BR2D4R1U4BD7L2"
160 A$(2)="XP$;BR1D2BR3U2"
170 A$(3)="XP$;BR2BD1D6U2L2R6L2D
2U6D2R2L6"
180 A$(4)="XP$;BR5BD1U1L5G1D1F1R
4F1D2G1L4H1BD2BR3U9"
190 A$(5)="XP$;R2D2L2U2BR5D1G5D1
BR3U2R2D2L2"
200 A$(6)="XP$;BR1R3D2L3U1D1F6H2
L1G1L2H1U3R1"
210 A$(7)="XP$;BR3D2"
220 A$(8)="XP$;BR4G2D3F2"
230 A$(9)="XP$;BR2F2D3G2"
240 A$(10)="XP$;BD2BR1F4BU4G4BU2
L1R7"
250 A$(11)="XP$;BR1BD4R4L2U2D4"
260 A$(12)="XP$;BR3BD8U1R1D2"
270 A$(13)="XP$;BR1BD4R4"
280 A$(14)="XP$;BR3BD6D1R1U1"
290 A$(15)="XP$;BD7E6"
300 A$(16)="XP$;BR1R2F1D5G1L2H1U
5"
310 A$(17)="XP$;BR3D7"
320 A$(18)="XP$;R5D2G3L1D2R5"
330 A$(19)="XP$;R5D2G1L1R1F1D3L5
"
340 A$(20)="XP$;D4R5U4D7"
350 A$(21)="XP$;R5L5D3R4F1D2G1L4
"
360 A$(22)="XP$;BR4L2G3D3F1R3E1U
2H1L3"
370 A$(23)="XP$;R5D1G5D1"
380 A$(24)="XP$;BR1R3F1D1G1F1D2G
1L3H1U2E1R2L2H1U1"
390 A$(25)="XP$;BR1R4D6G1L3R3E1U
3L4U3"
400 A$(26)="XP$;BR3BD1D1R1U1BD5L
1D1R1"
410 A$(27)="XP$;BR3BD1D1R1U1BD5L
1D1R1D2"
420 A$(28)="XP$;BR3BD1G3F3"
430 A$(29)="XP$;BD2R4BD2L4"
440 A$(30)="XP$;BD1F3G3"
450 A$(31)="XP$;BD2U1E1R2F1D1G1L
1D4"
```

Listing continued

See List of Advertisers on page 131

```
460 A$(32)="XP$;BR2BD3D3R1E1U2H1
L2G1D4F1R4"
470 A$(33)="XP$;BD7U6E1R2F1D2L3R
3D4"
480 A$(34)="XP$;R4F1D1G1L4R4FD2G
1L4U7"
490 A$(35)="XP$;R4D1BD4D2L4U7"
500 A$(36)="XP$;R3F2D3G2L3U7"
510 A$(37)="XP$;R4L4D4R3L3D3R4"
520 A$(38)="XP$;R4L4D4R3L3D3"
530 A$(39)="XP$;R4D2BD3L1R1D2L4U
7"
540 A$(40)="XP$;D7BR4U7D4L4"
550 A$(41)="XP$;BR2R2L1D7L1R2"
560 A$(42)="XP$;R6L3D7L3U2"
570 A$(43)="XP$;D7BR5U1H3R1E3"
580 A$(44)="XP$;D7R4"
590 A$(45)="XP$;D7BR4U7G2D1U1H1"
600 A$(46)="XP$;D7BR4U7D5H3"
610 A$(47)="XP$;R4D7L4U7"
620 A$(48)="XP$;R4D3L4U3D7"
630 A$(49)="XP$;R4D7H2F3H1L4U7"
640 A$(50)="XP$;R4D3L4R1F3D1BL4U
7"
650 A$(51)="XP$;BR4D1U1L3G1D2R3F
1D2G1L3U1"
660 A$(52)="XP$;R4L2D7"
670 A$(53)="XP$;D6F1R2E1U6"
680 A$(54)="XP$;D5F2E2U5"
690 A$(55)="XP$;D7E2R1F2U7"
700 A$(56)="XP$;D1F2D1F2D1BU7D1G
2D1G2D1"
710 A$(57)="XP$;D1F2D4U4E2U1"
720 A$(58)="XP$;R4D1G2D1G2D1R4"
730 RETURN
741 REM prompt for graph title
750 CLS
760 INPUT "ENTER TITLE LINE 1";T
I$
770 L=LEN(TI$)
780 IF L<31 THEN GOTO 820
790 PRINT "TITLE LINE MUST BE LE
SS THAN 30"
800 PRINT "SPACES.  REENTER"
810 GOTO 760
820 INPUT "ENTER TITLE LINE 2";T
2$
830 L2=LEN(T2$)
840 IF (L2<31) THEN GOTO 880
850 PRINT "ENTER TITLE BETWEEN 1
 AND 30"
860 PRINT "SPACES ONLY.  REENTER
"
870 GOTO 820
880 RETURN
891 REM prompt for graph vertica
l axis values
900 CLS
910 PRINT "WHAT IS THE LOW VALUE
"
920 INPUT "OF THE VERTICAL AXIS
";VL
930 IF VL<0 GOSUB 1100 ELSE GOTO
 950
940 GOTO 910
950 IF VL>999 GOSUB 1130 ELSE GO
TO 970
960 GOTO 910
970 PRINT "WHAT IS THE HIGH VALU
E"
980 INPUT "OF THE VERTICAL AXIS?
";VH
990 IF VH<4 GOSUB 1100 ELSE GOTO
 1010
1000 GOTO 970
1010 IF VH>999 GOSUB 1130 ELSE G
OTO 1030
1020 GOTO 970
1030 IF VH<VL+4 GOTO 1050 ELSE G
OTO 1090
1040 CLS
1050 PRINT "THERE IS NOT ENOUGH"
1060 PRINT "DIFFERENCE BETWEEN T
HE LOW"
1070 PRINT "AND HIGH VALUES.  PL
EASE"
1080 PRINT "CORRECT.":GOTO 910
1090 RETURN
1100 PRINT "WE NEED A LARGER NUM
BER!!"
1110 PRINT "PLEASE REENTER.  SOR
RY."
1120 RETURN
1130 PRINT "NO MORE THAN THREE D
IGITS!!"
1140 PRINT "PLEASE REENTER.  SO
RRY."
1150 RETURN
1161 REM prompt for horizontal a
xis.
1170 CLS
1180 PRINT "THE HORIZONTAL AXIS
CAN BE"
1190 PRINT "EITHER MONTHS OR YEA
RS."
1200 PRINT "ENTER 'M' IF IT IS T
O BE"
1210 INPUT "MONTHS.";M$
1220 IF M$="M" GO TO 1290
1230 PRINT "THEN WE WILL USE YEA
RS"
1240 PRINT "AS THE HORIZONTAL AX
IS."
1250 PRINT "WE WILL HAVE UP TO 1
2 YEARS."
1260 PRINT "USE ONLY THE LAST TW
O"
1270 PRINT "NUMBERS OF THE YEAR"
1280 INPUT "WHAT YEAR SHALL WE S
TART WITH?";YR
1290 RETURN
1301 REM prompt for values for e
ach month or year
1320 CLS
1340 PRINT "NOW WE WILL ASK FOR
```

Listing continued

Now NRI takes you inside the new TRS-80 Model 4 microcomputer with disk drive to train you at home as the new breed of computer specialist!

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```
VALUES"
1350 PRINT "FOR EACH MONTH OR YE
AR."
1360 PRINT "JUST HIT ENTER KEY F
OR A ZERO"
1370 PRINT "VALUE OR IF WE ARE A
SKING"
1380 PRINT "FOR A FUTURE YEAR."
1390 J=-2
1400 YE=YR-1:FOR I=1 TO 12
1410 J=J+3:YE=YE+1
1420 IF M$="M" THEN VA$=MID$(MN$
,J,3) ELSE VA$=STR$(YE)
1430 PRINT "WHAT IS THE VALUE FO
R*** " VA$
1440 INPUT "???";VA(I)
1450 IF VA(I)<VL GOTO 1470
1460 IF VA(I)>VH GOTO 1480 ELSE
GOTO 1510
1470 PRINT "****** VALUE TOO LOW
 ******":GOTO 1490
1480 PRINT "****** VALUE TOO HIG
H ******"
1490 PRINT "      REENTER"
1500 GOTO 1420
1510 NEXT
1520 RETURN
1530 TI$="TITLE LINE 1 - UP TO 3
0 SPACES"
1531 L=LEN(TI$)
1540 T2$="TITLE LINE 2 - UP TO 3
0 SPACES"
1541 L2=LEN(T2$)
1550 M$="M" ' "M" for month, els
e it's year
1560 YR=00 ' 1st year value on h
orizontal axis
1570 VA(1)=00:VA(2)=00:VA(3)=00:
VA(4)=00:VA(5)=00:VA(6)=00
1580 VA(7)=00:VA(8)=00:VA(9)=00:
VA(10)=00:VA(11)=00:VA(12)=00
1590 VL=0    ' low value of verti
cal axis
1600 VH=100 ' high value of vert
ical axis
1610 RETURN
1621 REM draw title lines
1630 PMODE 4,1
1640 PCLS
1650 SCREEN 1,1
1660 IF L<1 GOTO 1750
1670 X=(256-(L*8))/2:X=FIX(X):X=
X-8
1680 FOR P=1 TO L
1690 Z=(ASC(MID$(TI$,P,1)))-32
1700 X=X+8
1710 X$=STR$(X)
1720 P$="BM"+X$+",4"
1730 DRAW A$(Z)
1740 NEXT
1750 IF L2<1 GOTO 1850
1760 X=(256-(L2*8))/2:X=FIX(X):X
=X-8
1770 FOR P=1 TO L2
1780 Z=ASC(MID$(T2$,P,1))
1790 Z=Z-32
1800 X=X+8
1810 X$=STR$(X)
1820 P$="BM"+X$+",14"
1830 DRAW A$(Z)
1840 NEXT P
1850 RETURN
1861 REM draw axis and tics
1870 LINE (24,28)-(24,177),PSET
1880 LINE (24,177)-(244,177),PSE
T
1890 LINE (24,28)-(27,28),PSET
1900 LINE (24,65)-(27,65),PSET
1910 LINE (24,103)-(27,103),PSET
1920 LINE (24,141)-(27,141),PSET
1930 LINE(42,174)-(42,176),PSET
1940 LINE(62,174)-(62,176),PSET
1950 LINE(82,174)-(82,176),PSET
1960 LINE(102,174)-(102,176),PSE
T
1970 LINE(122,174)-(122,176),PSE
T
1980 LINE(142,174)-(142,176),PSE
T
1990 LINE(162,174)-(162,176),PSE
T
2000 LINE(182,174)-(182,176),PSE
T
2010 LINE(202,174)-(202,176),PSE
T
2020 LINE(222,174)-(222,176),PSE
T
2030 LINE(244,174)-(244,176),PSE
T
2040 RETURN
2051 REM compute vertical axis v
alues
2060 VV$=STR$(VL)
2070 YS=170
2080 GOSUB 2270
2090 VV=FIX(((VH-VL)/4)+VL)
2100 VV$=STR$(VV)
2110 YS=138:SY=0
2120 GOSUB 2270
2130 VV=FIX((((VH-VL)/4)*2)+VL)
2140 VV$=STR$(VV)
2150 YS=100:SY=0
2160 GOSUB 2270
2170 VV=FIX((((VH-VL)/4)*3)+VL)
2180 VV$=STR$(VV)
2190 YS=61:SY=0
2200 GOSUB 2270
2210 VV=FIX(VH)
2220 VV$=STR$(VV)
2230 YS=24:SY=0
2240 GOSUB 2270
2250 RETURN
2261 REM put values in vertical
axis
2270 LY=LEN(VV$)
2280 IF LEFT$(VV$,1)=" " THEN VV
```

Listing continued

Listing continued

```
$=RIGHT$(VV$,LY-1)
2290 LY=LEN(VV$)
2300 ON LY GOTO 2330,2320,2310
2310 SY$="0":GOTO 2340
2320 SY$="8":GOTO 2340
2330 SY$="16":GOTO 2340
2340 FOR N=1 TO LY
2350 VR$=MID$(VV$,N,1)
2360 Z=ASC(VR$)-32
2370 P$="BM"+SY$+","+STR$(YS)
2380 SY=VAL(SY$)+8
2390 SY$=STR$(SY)
2400 DRAW A$(Z)
2410 NEXT
2420 RETURN
2431 REM draw graph and paint in
2440 K=1:C=24:M=-2:YR=YR-1
2450 IF M$="M" THEN GOTO 2470
2460 XX=2:GOSUB 2640:GOTO 2480
2470 XX=6:GOSUB 2780
2480 P1=FIX((149*VA(1))/(VH-VL))
:C1=24
2490 IN$=INKEY$:IF IN$="" GOTO 2
490
2500 FOR K=2 TO 12
2510 IF M$="M" THEN GOSUB 2780 E
LSE GOSUB 2640
2520 P2=FIX((149*VA(K))/(VH-VL))
2530 C2=C1+20
2540 P3=177-P1:P4=177-P2
2550 LINE (C1,P3)-(C2,P4),PSET
2560 LINE (C2,P4)-(C2,177),PSET
2570 IF P1<5 AND P2<5 GOTO 2590
2580 PAINT(C2-10,174),1,1
2590 P1=P2:C1=C2
2600 IN$=INKEY$:IF IN$="" GOTO 2
600
2610 NEXT
2620 RETURN
2631 REM subroutine for printing
 years
2640 XX=XX+12:YR=YR+1
2650 XX$=STR$(XX):YR$=STR$(YR)
2660 LY=LEN(YR$)
2670 IF LEFT$(YR$,1)=" " THEN YR
$=MID$(YR$,2,LY-1)
2675 IF YR<10 THEN YR$="0"+YR$
2680 P$="BM"+XX$+",180"
2690 Z=(ASC(MID$(YR$,1,1)))-32
2700 DRAW A$(Z)
2710 XX=XX+8
2720 XX$=STR$(XX)
2730 Z=(ASC(MID$(YR$,2,1)))-32
2740 P$="BM"+XX$+",180"
2750 DRAW A$(Z)
2760 RETURN
2771 REM subrouting for printing
 months
2780 XX=XX+20
2790 XX$=STR$(XX):M=M+3
2800 Z=(ASC(MID$(MN$,M,1)))-32
2810 P$="BM"+XX$+",180"
2820 DRAW A$(Z)
2830 RETURN
```

END

✓ See List of Advertisers on page 131

BY GERALD SPROUSE

COLOR MAIL LIST

Bogged down by organizing and typing those address labels? Here are two neat ways your CoCo can help.

From the response I received concerning my cassette-based mailing-list program published in *80 Micro* (January 1983, p. 126), I believe this is a popular application for the CoCo. Therefore, I've decided to upgrade the earlier program and present a second, both of which require a disk drive.

Revised Program

The revised Program Listing 1 includes new features such as disk data files and the option of printing an individual label for each member of an organization, instead of all names on one label.

Since the program reads the mailing list into memory for processing, you can set up multiple disk files, each containing 60 addresses. If you have the available memory, clear additional string space and increase the value of T in line 10 to provide room for more addresses in each file.

As before, the program allows eight data fields for each label. Fields 1–4 contain names of specific individuals of each organization. Field 5 is the organization name, and field 6 is the street address. The city, state, and zip code are in field 7, and the telephone number is in field 8.

Menu Options

The main menu allows the following options:

- A adds names to the mailing list. This option provides instructions for data entry. When the file is full, store the file using the W option and begin a new file by using the R option.
- R reads in a mailing list from a disk file. It then prompts you for a file name. This option also starts a new file.
- L lists the names on the screen. This option also lets you select other data fields for listing on the screen. For example, use of field 5 lists all organization names.
- C changes the mailing list. The program presents a new menu with four options: D (delete a name from the list), C (change one of the eight fields for each address), A (return to find another address), and E (exit this option to the main menu).

The computer assigns a number to each address, and you must enter this number to find a specific address for deletion or change. The screen displays the number during option L.

- P prints address labels. Two options are available: S (prints a separate label with organization name and address for each name in fields 1–4) and C (prints labels showing all entered names). You can use two labels to align the printer before printing the entire list.

At present the program prints two identical labels for each address. If you only need one label, edit lines 1220–1250, 1270–1290, 1320–1360, 1380–1410, 1520, 1550, 1580, 1610, and 1630–1650 to delete ";TAB(42);M$(I,X)" from each line.

- D prints an address list with phone numbers.
- W writes the entire address list to a disk data file. It then prompts you for a file name.
- E ends the program.

Program Structure

In line 10, T controls the total number of addresses in the list, while L controls the length of each address field. Clear additional string space if you increase T.

Lines 20–130 are the main menu. Lines 140–290 are the A option. Lines 300–370 are the L option, lines 380–390 are the W option, line 400 is the R option, lines 410–630 are the C option, lines 640–810 are the P option, lines 820–860 are the D option, and lines 870–1680 are the various subroutines called from the main program.

System Requirements

16K RAM
Disk Basic
Line Printer VII
One Disk Drive

New Program

Compared to the previous listing, Program Listing 2 only allows one name and no organization name for each label. But it does sort the addresses by last name and zip code so that you can print labels alphabetically or by zip code. Once you've entered the addresses, the program does not move them on the disk, but it uses pointer files for the sorted lists.

Since I've written the sort routine in Basic, it limits the practical number of addresses that should be stored on the disk file. Tests with the program show that it takes three minutes to sort 100 addresses and 16 minutes to sort 200. If you require only one sort, you could delete the second by eliminating either lines 360–550 or 550–770.

The program allows the following seven data field and corresponding maximum field lengths:

Data Field	*Character Length*
Last Name	18
First Name	18
Street Address	30
City	20
State	2
Zip Code	10
Telephone	10

Adjust line 10 to clear the string space you require. You can also change the value of NN to control the number of addresses allowed in the file.

Menu Options

The main menu allows the following options:

- A adds names to the list. This option gives you instructions for data entry. Before it stores each address, it lets you make corrections. After you've entered all the addresses, the program does both sorts before returning to the main menu.
- C changes the mailing list. Entering the last name locates a specific address to edit. Because there may be multiple addresses with the same last name, the

Program Listing 1. CoCo Mailing List 1

```
10 CLEAR 9000:T=60:L=38:DIMM$(T,
8):N=0:M=7
20 CLS:PRINT"COLOR COMPUTER MAIL
ING LIST     FOLLOWING OPTIONS A
VAILABLE:"
30 PRINT"    <A>DD NAMES TO THE M
AILING          LIST"
40 PRINT"    <R>EAD MAILING LIST
FROM FILE    <C>HANGE THE MAILING
 LIST"
50 PRINT"    <L>IST NAMES ON THE
SCREEN       <P>RINT MAILING LABE
LS"
60 PRINT"    <W>RITE MAILING LIST
 TO FILE     <D>PRINT ADDRESS LIS
T"
70 PRINT"    <E>ND"
80 PRINT"  NUMBER OF NAMES IN LI
ST=";N
90 PRINT "KEY IN YOUR OPTION"
100 A$=INKEY$:IFA$=""THEN100
110 ON INSTR("EARCLPWD",A$) GOTO
130,140,400,410,300,640,380,820
120 GOTO20
130 END
140 CLS:PRINT"ADD NAMES TO THE M
AILING LIST"
150 PRINT"DO YOU WANT INSTRUCTIO
NS ON HOW TO ENTER DATA(Y/N)?"
160 A$=INKEY$:IFA$=""THEN160
170 IFA$="N"THEN230
180 CLS:PRINT"NAME 1":PRINT"NAME
 2":PRINT"NAME 3":PRINT"NAME 4"
190 PRINT"ORGANIZATION":PRINT"AD
DRESS":PRINT"CITY,STATE,ZIP":PRI
NT"TELEPHONE"
200 PRINT"ABOVE ARE THE DATA ENT
RY ITEMS. TYPE EACH ITEM AND PRE
SS ENTER."
210 PRINT"TO IGNORE AN ITEM JUST
 PRESS     ENTER.  "
220 LINEINPUT"PRESS ENTER TO BEG
IN";A$
230 CLS:IFN<T THEN250
240 GOTO280
250 N=N+1
260 GOSUB870:IFM$(N,0)<>"" THEN2
30
270 N=N-1:GOTO20
280 PRINT " OUT OF MEMORY "
290 LINE INPUT"KEY <ENTER> TO CO
NTINUE";A$:GOTO 20
300 CLS:IFN=0THENGOSUB1100:GOTO2
0
310 PRINT"KEY IN SEARCH FIELD(1
TO 8)"
320 A$=INKEY$:IFA$=""THEN320
330 IFA$<"1"ORA$>"8"THEN310ELSEF
=VAL(A$)-1:I=1
340 J=1:CLS
350 PRINTI;" ";M$(I,F):J=J+1:I=I
+1:IFI>N THEN370:ELSEIFJ<11THEN3
50
360 PRINT"":GOSUB980:LINE INPUT"
";A$:GOTO340
370 PRINT" END OF LIST ":GOSUB98
0:LINE INPUT"";A$:GOTO20
380 CLS:IFN=0THEN GOSUB1100:GOTO
20
390 PRINT"WRITE MAILING LIST TO
DISK FILE":PRINT"":GOSUB 1670:GO
SUB1000:GOTO20
400 CLS:PRINT"READ MAILING LIST"
:GOSUB1670:GOSUB1110:GOTO20
410 CLS:IFN=0THENGOSUB1100:GOTO2
0
420 PRINT "CHANGE"
430 PRINT "TO DISPLAY ADDRESS, E
NTER       RECORD# (IF UNKNOWN U
SE <L>, "
440 PRINT "FROM MAIN MENU.)  TO
EXIT THIS  MODE PRESS ENTER "
450 PRINT"":LINE INPUT"NUMBER";A
$:I=VAL(A$):IFA$=""THEN20
460 CLS
470 PRINT"      <D>ELETE NAME
                <C>HANGE A FIELD"
480 PRINT"      <A>NOTHER NAME  "
```

Listing 1 continued

program will search until you indicate it has found the correct address, or until it has searched all addresses.

- P prints the address labels alphabetically or by zip code. For the last option, you must input a range of zip codes. For either option, you can get a trial run of two labels to align the printer. Note that the program prints the labels two across.
- L lists the entire address list with phone numbers. Note that this list is in the order of original data entry.
- E ends the program.

"Tests with the program show that it takes three minutes to sort 100 addresses and 16 minutes to sort 200."

Program Structure

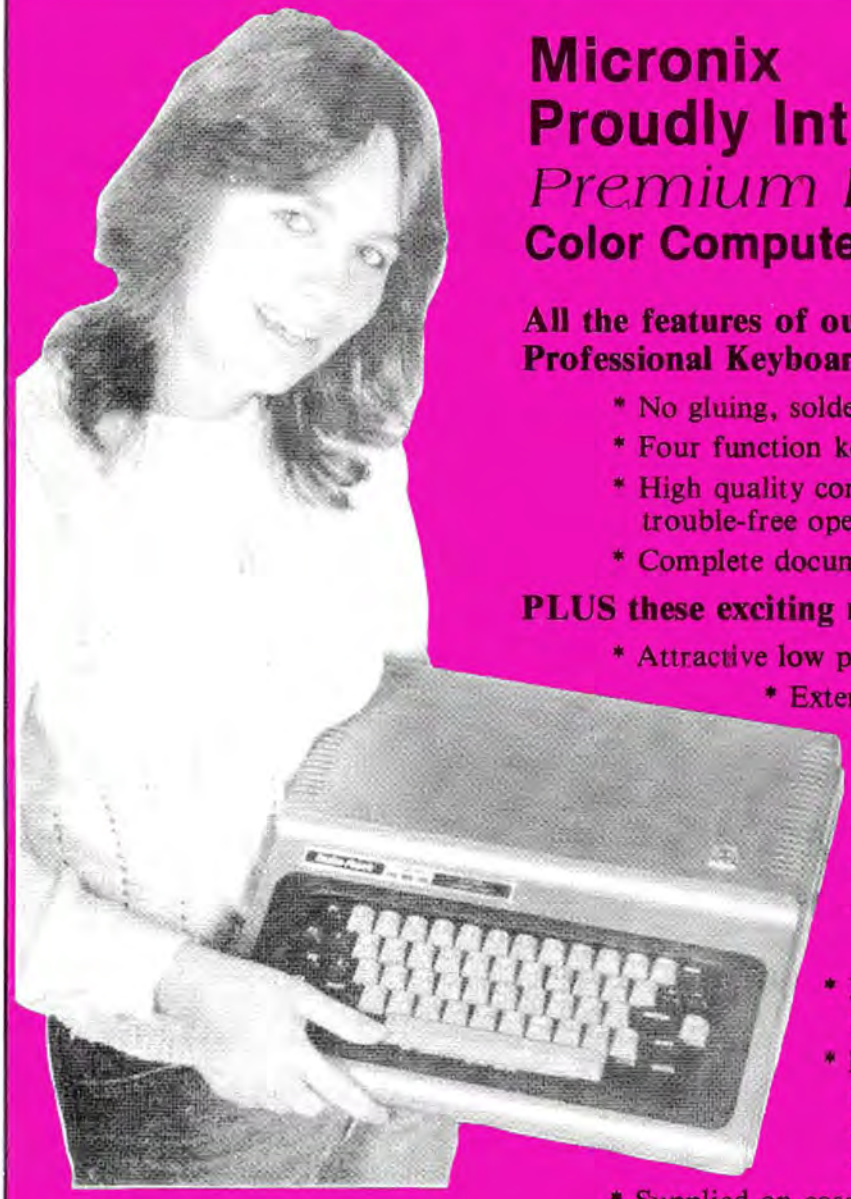
In line 10, variable NN controls the total number of addresses that you can store in the disk data file. Clear additional string space as required. Lines 20–180 are the main menu. Lines 190–780 are the A option, lines 790–1040 are the C option, lines 1050–1490 are the P option, and lines 1500–1570 are the L option. Lines 1580–2170 are the various subroutines called from the main program. ■

Contact Gerald Sprouse at 9977 Camto Chirimolla, San Diego, CA 92131.

Listing 1 continued

```
490 PRINT"      <E>XIT"
500 FORJ=0TOM:PRINTJ+1;M$(I,J):N
EXT
510 PRINT"KEY IN SELECTION"
520 A$=INKEY$:IFA$=""THEN520
530 IFA$<>"C"THEN600
540 PRINT"TYPE IN THE NUMBER OF
FIELD AND THEN ENTER THE NEW VAL
UE"
550 PRINT"KEY IN FIELD(1 TO 8)"
560 A$=INKEY$:IFA$=""THEN560
570 IFA$<"1"ORA$>"8"THEN550ELSEJ
=VAL(A$)-1
580 LINE INPUT"NEW ITEM";M$(I,J)
:IF LEN(M$(I,J))<L+1 THEN460
590 PRINT"TOO LONG, REENTER":GOT
O580
600 IFA$<>"E"THEN620
610 GOTO20
620 IFA$="A"THEN410
630 IFA$<>"D"THEN460ELSEM$(I,0)=
"":GOSUB1180:GOTO410
640 CLS:IFN=0THENGOSUB1100:GOTO2
0
650 PRINT"PRINT MAILING LABELS"
660 PRINT" ENTER <S> TO PRINT LA
BELS WITH  SINGLE NAMES.  <C> TO
 CONTINUE.
670 A$=INKEY$: IF A$="" THEN 670
680 A1$="":IF A$="S" THEN A1$="S
"
690 PRINT"DO YOU WANT A TRIAL RU
N(Y/N)?"
700 A$=INKEY$:IFA$=""THEN700
710 IFA$="N"THEN730
720 FORJ=1TO2:I=1:GOSUB1210:NEXT
:GOTO690
730 PRINT"PRESS <P> TO START PRI
NTING,          <E> TO EXIT"
740 A$=INKEY$:IFA$=""THEN740
750 IFA$="E"THEN20
760 I=1
770 IF A1$="S" THEN GOSUB1520:GO
TO 790
780 GOSUB 1210
790 I=I+1
800 IFI<=N THEN770
810 GOTO20
820 CLS:IFN=0THENGOSUB1100:GOTO2
0
830 I=1
840 GOSUB1430:I=I+1
850 IFI<=N THEN 840
860 GOTO20
870 LINE INPUT"NAME 1";M$(N,0):I
F LEN(M$(N,0))>L THEN GOSUB970:G
OTO870
880 IF M$(N,0)=""THEN960
890 LINE INPUT"NAME 2";M$(N,1):I
F LEN(M$(N,1))>L THEN GOSUB970:G
OTO890
900 LINE INPUT"NAME 3";M$(N,2):I
F LEN(M$(N,2))>L THEN GOSUB970:G
OTO900
910 LINE INPUT"NAME 4";M$(N,3):I
F LEN(M$(N,3))>L THEN GOSUB970:G
OTO910
920 LINE INPUT"ORGANIZATION";M$(
N,4):IF LEN(M$(N,4))>L THEN GOSU
B970:GOTO920
930 LINE INPUT"ADDRESS";M$(N,5):
IF LEN(M$(N,5))>L THEN GOSUB970:
GOTO930
940 LINE INPUT"CITY,STATE,ZIP";M
$(N,6):IF LEN(M$(N,6))>L THEN GO
SUB970:GOTO940
950 LINE INPUT"TELEPHONE";M$(N,7
)
960 RETURN
970 PRINT"TOO LONG, REENTER":RET
URN
980 PRINT"PRESS ENTER TO CONTINU
E";:RETURN
990 PRINT"NO DATA IN MEMORY":RET
URN
1000 PRINT"WRITING DATA":OPEN"D"
,#1,F$:CLOSE#1
1010 OPEN"D",#1,"NEW/DAT"
1020 FOR I=1 TO N
1030 WRITE#1,M$(I,0),M$(I,1),M$(
I,2),M$(I,3),M$(I,4),M$(I,5),M$(
I,6),M$(I,7)
1040 PUT#1,I
1050 NEXTI
1060 CLOSE#1
1070 KILL F$
1080 RENAME "NEW/DAT" TO F$
1090 RETURN
1100 GOSUB990:GOSUB980:LINE INPU
T"";A$:RETURN
```

Listing 1 continued



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Listing 1 continued

```
1110 OPEN"D",#1,F$
1120 FOR J=1 TO LOF(1)
1130 GET#1,J
1140 INPUT#1,M$(J,0),M$(J,1),M$(
J,2),M$(J,3),M$(J,4),M$(J,5),M$(
J,6),M$(J,7)
1150 NEXTJ
1160 CLOSE#1
1170 N=J-1:RETURN
1180 CLS:PRINT"RECOVERING SPACE"
1190 N=N-1:FORJ=I TO N:FORK=0 TO
 7:M$(J,K)=M$(J+1,K):NEXT:NEXT
1200 RETURN
1210 IFM$(I,2)="" THEN 1310
1220 PRINT#-2,M$(I,0);TAB(42);M$
(I,0)
1230 PRINT#-2,M$(I,1);TAB(42);M$
(I,1)
1240 PRINT#-2,M$(I,2);TAB(42);M$
(I,2)
1250 PRINT#-2,M$(I,3);TAB(42);M$
(I,3)
1260 PRINT#-2,"":PRINT#-2,""
1270 PRINT#-2,M$(I,4);TAB(42);M$
(I,4)
1280 PRINT#-2,M$(I,5);TAB(42);M$
(I,5)
1290 PRINT#-2,M$(I,6);TAB(42);M$
(I,6)
1300 PRINT#-2,"":PRINT#-2,"":PRI
NT#-2,"":RETURN
1310 IFM$(I,1)="" THEN 1380
1320 PRINT#-2,M$(I,0);TAB(42);M$
(I,0)
1330 PRINT#-2,M$(I,1);TAB(42);M$
(I,1)
1340 PRINT#-2,M$(I,4);TAB(42);M$
(I,4)
1350 PRINT#-2,M$(I,5);TAB(42);M$
(I,5)
1360 PRINT#-2,M$(I,6);TAB(42);M$
(I,6)
1370 PRINT#-2,"":RETURN
1380 PRINT#-2,M$(I,0);TAB(42);M$
(I,0)
1390 PRINT#-2,M$(I,4);TAB(42);M$
(I,4)
1400 PRINT#-2,M$(I,5);TAB(42);M$
(I,5)
1410 PRINT#-2,M$(I,6);TAB(42);M$
(I,6)
1420 PRINT#-2,"":PRINT#-2,"":RET
URN
1430 PRINT#-2,M$(I,0):IFM$(I,1)=
""THEN1470
1440 PRINT#-2,M$(I,1):IFM$(I,2)=
""THEN1470
1450 PRINT#-2,M$(I,2):IFM$(I,3)=
""THEN1470
1460 PRINT#-2,M$(I,3)
1470 PRINT#-2,M$(I,4)
1480 PRINT#-2,M$(I,5)
1490 PRINT#-2,M$(I,6)
1500 PRINT#-2,M$(I,7)
1510 PRINT#-2,"":PRINT#-2,"":RET
URN
1520 PRINT#-2,M$(I,0);TAB(42);M$
(I,0)
1530 GOSUB1630
1540 IFM$(I,1)="" THEN RETURN
1550 PRINT#-2,M$(I,1);TAB(42);M$
(I,1)
1560 GOSUB1630
1570 IFM$(I,2)="" THEN RETURN
1580 PRINT#-2,M$(I,2);TAB(42);M$
(I,2)
1590 GOSUB1630
1600 IFM$(I,3)="" THEN RETURN
1610 PRINT#-2,M$(I,3);TAB(42);M$
(I,3)
1620 GOSUB1630:RETURN
1630 PRINT#-2,M$(I,4);TAB(42);M$
(I,4)
1640 PRINT#-2,M$(I,5);TAB(42);M$
(I,5)
1650 PRINT#-2,M$(I,6);TAB(42);M$
(I,6)
1660 PRINT#-2,"":PRINT#-2,"":RET
URN
1670 LINE INPUT"INPUT FILE NAME"
;F1$:F$=F1$+"/DAT"
1680 RETURN
```

END

Program Listing 2. CoCo Mailing List 2

```
10 CLEAR 10000:NN=300
20 DIM B$(NN),V(NN)
30 OPEN"D",#1,"LIST/DAT",108
40 FIELD#1,18 AS NL$,18 AS NF$,3
0 AS AD$,20 AS CI$,2 AS ST$,10 A
SZI$,10 AS TE$
50 N=LOF(1)
60 CLS:PRINT" COLOR COMPUTER MAI
LING LIST.      THE FOLLOWING OP
TIONS ARE"
70 PRINT"   AVAILABLE:"
80 PRINT"  <A>DD NAMES TO LIST
           <C>HANGE AN ENTRY"
90 PRINT"  <P>RINT LABELS
           <L>IST ADDRESSES WITH
 PRINTER"
100 PRINT"  <E>ND"
110 PRINT"":PRINT" CURRENTLY ";N
;" NAMES ARE"
120 PRINT" STORED ON THIS DISK":
PRINT""
130 PRINT" KEY IN YOUR OPTION"
140 A$=INKEY$:IFA$="" THEN 140
150 ON INSTR("ACPLE",A$) GOTO 19
0,790,1050,1500,180
160 ON INSTR("acple",A$) GOTO 19
0,790,1050,1500,180
170 GOTO 60
180 CLOSE#1:END
190 CLS:PRINT" ADD ADDRESS TO LI
ST"
200 PRINT" DO YOU NEED INSTRUCTI
ONS ON     DATA ENTRY (Y/N)?"
210 A$=INKEY$:IFA$="" THEN 210
220 IF A$="n" OR A$="N" THEN 280
230 CLS:PRINT" LAST NAME":PRINT"
 FIRST NAME":PRINT" STREET ADDRE
SS"
240 PRINT" CITY":PRINT" STATE":P
RINT" ZIP CODE":PRINT" TELEPHONE
":PRINT""
250 PRINT" ABOVE ARE DATA ENTRY
ITEMS.      TYPE EACH ITEM AND PR
ESS"
260 PRINT" <ENTER>
           TO IGNOR AN ITEM KEY
<ENTER>"
270 LINE INPUT" PRESS <ENTER> TO
 BEGIN";A$
280 IF N<NN THEN 300
290 PRINT"DISK FULL, EXIT PROGRA
M BEFORE  INSERTING NEW DISK":GO
TO 350
300 N=N+1
310 CLS:GOSUB 1810
320 IFL1$="" THEN N=N-1:GOTO 350
330 GOSUB1830:GOSUB1850:GOSUB187
0:GOSUB1890:GOSUB1910:GOSUB1930
340 GOSUB1970:GOSUB1580:PUT#1,N:
GOTO 280
350 CLS:PRINT" SORTING DATA BY Z
IP CODE"
360 OPEN"O",#2,"POINTF/DAT":CLOS
E#2
370 OPEN"I",#2,"POINTF/DAT"
380 K=1
390 IF EOF(2)=-1 THEN 410
400 INPUT#2,B$,V:B$(K)=B$:V(K)=V
:K=K+1:GOTO 390
410 J=K-1:CLOSE#2
420 FOR K=J+1 TO N
430 GET#1,K:B$(K)=ZI$:V(K)=K
440 NEXT K
450 FOR P=1 TO N-1
460 J=P
470 IF B$(V(J))<=B$(V(J+1)) THEN
 500
480 T=V(J):V(J)=V(J+1):V(J+1)=T:
J=J-1
490 IF J<>0 THEN 470
500 NEXTP
510 OPEN"O",#2,"POINTF/DAT"
```

Listing 2 continued

Listing 2 continued

```
520 FOR K=1 TO N
530 B$=B$(K):V=V(K):WRITE#2,B$,V
540 NEXTK
550 CLOSE#2
560 CLS:PRINT" SORTING DATA BY L
AST NAME"
570 OPEN"O",#2,"POINTL/DAT":CLOS
E#2
580 OPEN"I",#2,"POINTL/DAT"
590 K=1
600 IF EOF(2)=-1 THEN 620
610 INPUT#2,B$,V:B$(K)=B$:V(K)=V
:K=K+1:GOTO 600
620 J=K-1:CLOSE#2
630 FOR K=J+1 TO N
640 GET#1,K
650 L1$=NL$:S=INSTR(L1$,"  "):IF
 S=0 THEN S=LEN(L1$)+1
660 B$(K)=LEFT$(L1$,S-1):V(K)=K
670 NEXT K
680 FOR P=1 TO N-1
690 J=P
700 IF B$(V(J))<=B$(V(J+1)) THEN
 730
710 T=V(J):V(J)=V(J+1):V(J+1)=T:
J=J-1
720 IF J<>0 THEN 700
730 NEXT P
740 OPEN"O",#2,"POINTL/DAT"
750 FOR K=1 TO N
760 B$=B$(K):V=V(K):WRITE#2,B$,V
770 NEXTK
780 CLOSE#2:GOTO 60
790 CLS:PRINT" TO FIND SPECIFIC
ADDRESS ENTER"
800 GOSUB 1810:K1$=L1$
810 OPEN"I",#2,"POINTL/DAT"
820 K=1
830 IF EOF(2)=-1 THEN 870
840 INPUT#2,B$,V
850 B$(K)=B$:V(K)=V
860 K=K+1:GOTO 830
870 CLOSE#2
880 K=1
890 IF K>N THEN 1020
900 IF B$(V(K))=K1$ THEN 920
910 K=K+1:GOTO 890
920 GET#1,V(K)
930 GOSUB 1600
940 CLS:PRINT" IS THIS THE ADDRE
SS(Y/N)?"
950 PRINTL1$:PRINTL2$:PRINTL3$:P
RINTL4$:PRINTL5$:PRINTL6$:PRINTL
7$
960 A$=INKEY$:IF A$="" THEN 960
970 IF A$="y" OR A$="Y" THEN 990
980 K=K+1:GOTO 890
990 GOSUB 1970:GOSUB 1580
1000 PUT#1,V(K)
1010 GOTO 60
1020 SOUND 128,10:PRINT" NOT FOU
ND ON THIS DISK, EXIT"
1030 PRINT" PROGRAM BEFORE REMOV
ING DISK.   KEY <ENTER> TO CONTI
NUE."
1040 LINE INPUT"";A$:GOTO 60
1050 CLS:IF N=0 THEN GOSUB 1800:
GOTO 60
1060 CLS:PRINT" PRINT MAILING LA
BELS"
1070 PRINT" THE FOLLOWING PRINT
OPTIONS     ARE AVAILABLE: "
1080 PRINT" <Z> BY ZIP CODE-IN O
RDER        <N> BY LAST NAME-ALP
HABETICAL"
1090 PRINT" <E> EXIT"
1100 A$=INKEY$:IFA$="" THEN 1100
1110 ON INSTR("ZNE",A$) GOTO 114
0,1360,60
1120 ON INSTR("zne",A$) GOTO 114
0,1360,60
1130 GOTO 1050
1140 CLS:PRINT" INPUT THE DESIRE
D RANGE OF ZIP  CODES TO PRINT."
1150 LINE INPUT" LOWEST";X$:B2=V
AL(X$)
1160 LINE INPUT" HIGHEST";Y$:B3=
VAL(Y$)
1170 OPEN"I",#2,"POINTF/DAT"
1180 K=1
1190 IF EOF(2)=-1 THEN 1230
1200 INPUT#2,B$,V
1210 B$(K)=B$:V(K)=V
1220 K=K+1:GOTO 1190
1230 CLOSE#2
1240 PRINT" DO YOU WANT A TRAIL
RUN(Y/N)?"
1250 A$=INKEY$:IFA$="" THEN 1250
1260 A1=0
1270 IF A$="y" OR A$="Y" THEN A1
=2
1280 K=1
1290 B1=VAL(B$(V(K)))
1300 IF K>N THEN 60
1310 IF B1<=(B2-1) AND B3>=B1 TH
EN K=K+1:GOTO 1290
1320 GOSUB2110
1330 IFA1=2 THEN 1240
1340 K=K+1;GOTO 1290
1350 GOTO 60
1360 CLS:OPEN"I",#2,"POINTL/DAT"
1370 K=1
1380 IF EOF(2)=-1 THEN 1410
1390 INPUT#2,B$,V:B$(K)=B$:V(K)=
V
1400 K=K+1:GOTO 1380
1410 A1=0:PRINT" DO YOU WANT A T
RAIL RUN(Y/N)?"
1420 A$=INKEY$:IFA$="" THEN 1420
1430 IF A$="y" OR A$="Y" THEN A1
=2
1440 K=1
1450 IF K>N THEN 60
1460 GOSUB 2110
1470 IF A1=2 THEN 1410
1480 K=K+1:GOTO 1450
1490 GOTO 60
1500 IF N=0 THEN GOSUB 1800:GOTO
 60
```

Listing 2 continued

Listing 2 continued

```
1510 CLS:PRINT" PRINT ADDRESS LI
ST":LINE INPUT" KEY <ENTER> WHEN
 READY";A$
1520 N=LOF(1)
1530 FOR K=1 TO N
1540 GET#1,K:GOSUB1600:PRINT#-2,
L2$;" ";L1$
1550 PRINT#-2,L3$:PRINT#-2,L4$;"
, ";L5$;" ";L6$:PRINT#-2,L7$:PRI
NT#-2,""
1560 NEXTK
1570 GOTO 60
1580 LSET NL$=L1$:LSET NF$=L2$:L
SET AD$=L3$:LSET CI$=L4$:LSET ST
$=L5$
1590 LSET ZI$=L6$:LSET TE$=L7$:R
ETURN
1600 L1$=NL$:S=INSTR(L1$,"  "):I
FS=0THEN S=LEN(L1$)+1
1610 L1$=LEFT$(L1$,S-1)
1620 L2$=NF$:S=INSTR(L2$,"  "):I
FS=0 THEN S=LEN(L2$)+1
1630 L2$=LEFT$(L2$,S-1)
1640 L3$=AD$:S=INSTR(L3$,"  "):I
F S=0 THEN S=LEN(L3$)+1
1650 L3$=LEFT$(L3$,S-1)
1660 L4$=CI$:S=INSTR(L4$,"  "):I
F S=0 THEN S=LEN(L4$) + 1
1670 L4$=LEFT$(L4$,S-1)
1680 L5$=ST$:L6$=ZI$:L7$=TE$:RET
URN
1690 LSET NL$=M1$:LSET NF$=M2$:L
SET AD$=M3$:LSET CI$=M4$:LSET ST
$=M5$
1700 LSET ZI$=M6$:LSET TE$=M7$:L
SET AN$=M8$:RETURN
1710 M1$=NL$:S=INSTR(M1$,"  "):I
F S=0 THEN S=LEN(M1$)+1
1720 M1$=LEFT$(M1$,S-1)
1730 M2$=NF$:S=INSTR(M2$,"  "):I
F S=0 THEN S=LEN(M2$)+1
1740 M2$=LEFT$(M2$,S-1)
1750 M3$=AD$:S=INSTR(M3$,"  "):I
F S=0 THEN S=LEN(M3$)+1
1760 M3$=LEFT$(M3$,S-1)
1770 M4$=CI$:S=INSTR(M4$,"  "):I
F S=0 THEN S=LEN(M4$)+1
1780 M4$=LEFT$(M4$,S-1)
1790 M5$=ST$:M6$=ZI$:M7$=TE$:RET
URN
1800 CLS:LINE INPUT" NO DATA AVA
ILABLE, KEY <ENTER>  TO CONTINUE
";A$:RETURN
1810 LINE INPUT" LAST NAME      "
;L1$:IF LEN(L1$)>18 THEN GOSUB 1
950: GOTO 1810
1820 RETURN
1830 LINE INPUT" FIRST NAME     "
;L2$:IF LEN(L2$)>18 THEN GOSUB 1
950:GOTO 1830
1840 RETURN
1850 LINE INPUT" STREET ADDRESS"
;L3$:IF LEN(L3$)>30 THEN GOSUB 1
950:GOTO 1850
1860 RETURN
1870 LINE INPUT" CITY           "
;L4$:IF LEN(L4$)>20 THEN GOSUB 1
950:GOTO 1870
1880 RETURN
1890 LINE INPUT" STATE          "
;L5$:IF LEN(L5$)>2 THEN GOSUB 19
60:GOTO 1890
1900 RETURN
1910 LINE INPUT" ZIP CODE       "
;L6$:IF LEN(L6$)>10 THEN GOSUB 1
950:GOTO 1910
1920 RETURN
1930 LINE INPUT" TELEPHONE      "
;L7$:IF LEN(L7$)>10 THEN GOSUB 1
950:GOTO 1930
1940 RETURN
1950 SOUND 128,10:PRINT" TOO LON
G, REENTER":RETURN
1960 SOUND 128,10:PRINT" REENTER
 WITH JUST TWO LETTERS":RETURN
1970 CLS:PRINT" ANY CHANGES OR C
ORRECTIONS?":PRINT" FIELD #   EN
TRY"
1980 PRINT" 1  ";L1$:PRINT" 2  "
;L2$:PRINT" 3  ";L3$:PRINT" 4  "
;L4$
1990 PRINT" 5  ";L5$:PRINT" 6  "
;L6$:PRINT" 7  ";L7$
2000 PRINT" KEY IN FIELD # OR KE
Y <E> TO    EXIT"
2010 A$=INKEY$:IFA$="" THEN 2010
2020 IFA$="1" THEN GOSUB 1810:GO
TO 2100
2030 IFA$="2" THEN GOSUB 1830:GO
TO 2100
2040 IFA$="3" THEN GOSUB 1850:GO
TO 2100
2050 IFA$="4" THEN GOSUB 1870:GO
TO 2100
2060 IFA$="5" THEN GOSUB 1890:GO
TO 2100
2070 IFA$="6" THEN GOSUB 1910:GO
TO 2100
2080 IFA$="7" THEN GOSUB 1930:GO
TO 2100
2090 IF A$="e" OR A$="E" THEN RE
TURN
2100 GOTO 1970
2110 GET#1,V(K):GOSUB1600:K=K+1:
IFK>N THEN 2130
2120 GET#1,V(K):GOSUB1710:GOTO 2
140
2130 K=K-1:GET#1,V(K):GOSUB 1710
2140 PRINT#-2,L2$;" ";L1$;TAB(42
);M2$;" ";M1$
2150 PRINT#-2,L3$;TAB(42);M3$
2160 PRINT#-2,L4$;", ";L5$;" ";L
6$;TAB(42);M4$;", ";M5$;" ";M6$
2170 PRINT#-2,"":PRINT#-2,"":RET
URN
```

END

BY KARL ANDREASSEN

COLORFUL CRYPTOLOGY—PART V

Ed. note—Beginning in our September 1983 issue, Karl Andreassen introduced HOT CoCo *readers to the basics of cryptology and looked at the Color Computer as a means of making and breaking secret messages. This month he touches on nonalphabetic symbols and the very secure but unwieldy secret code.*

I received a letter asking about codes—particularly, those that require the use of a book or magazine for encoding and decoding. The introductory blurb is a sample of this kind of cryptic communication.

Barring an episode of pure luck, such codes are virtually impossible to break without knowing what books, which editions, and what procedure to apply. Once a cryptocracker has breached such a system, the originator changes the books or the procedure, and the cracker has to begin from scratch.

I have been intentionally careless in preparing the above line of code. If you look carefully at the first code group, you will note that the letters HCC are remarkably coincidental to the first letters of the title of your favorite magazine.

Following HCC are the digits 1 and 4. You might take these to signify 14, but *HOT CoCo* hasn't seen 14 issues as yet. So look at the table of contents. There you'll find a line expressing the volume and issue number. So get your volume 1, number 4, and see if it decodes.

The next symbol in the code is logically a page number, 91. Look for paragraph 5 on page 91. Write the eighth word in the fifth paragraph as the first word of the message.

HCC14 91 5 8 23 4
23 92 4 12 82 6 10
91 4 38–39

When you get to the two groups of numerals with a dash between them, write both the 38th and 39th words as the final two words of your message. The message reads, "Yek eht tuohtiw elbakaerbnu era sedoc" (A mirror reveals all).

So, if codes are virtually unbreakable, why aren't they used instead of less secure ciphergrams? If you took the trouble to look up the code line, you already know the answer. How long did it take you to come up with the complete statement? If you think that was a long time, you should try to encode a fairly long message this way.

Time is the most serious deterrent to using these codes. There's also a problem in that they require both sender and receiver to have the same book.

Contrast such a cumbersome system with a nice, clean substitution cipher and the keyword to encode and decode the message. You can remember both the system and key and never write them down.

Single substitution ciphers are fun to tackle, and can be opened in various ways. But as you must suspect by now, there are more secure ciphers possible, with little increase in enciphering and deciphering complexity.

Suppose, for instance, that you add a number of different alphabets to the system, using each one in turn as you encounter each plaintext letter. Easy to remember, and easy to apply—if you know the system and the key.

Such is the versatility of ciphers, as opposed to codes. The best rule is to use the type of system that affords you the most security, within the bounds of time and effort.

Sometimes cryptographers use nonalphabetic symbols, as you saw last month. The stars were arranged in message form. To solve the message you first must reduce the patterns to letters.

You could use other type symbols, such as !, @, #, $, %, ^, &, *, (,), or +. Moving your fingers up one row on the keyboard (if you are a touch-typist) will produce a rudimentary cipher. There are any number of arbitrary symbol alphabets that you can construct, using only the symbols on your CoCo keyboard.

Numerals alone present a variety of possibilities for communicating in relative secrecy. You need 25 or 26 numeral combinations for direct substitution, so don't overlook the ASCII numeral set that exists within the CoCo. Key in the following to see the ASCII series for capital letters:

```
10 FOR X=1 TO 26
20 PRINT ASC(CHR$(X+64))"= "
CHR$(X+64),
30 NEXT X
```

Writing a cryptogram using ASCII numbers is simply a matter of asking your CoCo to print them as you touch the plaintext letters on the keyboard:

```
10 Z$=INKEY$:IF Z$=""THEN 10
20 IF Z$=" "THEN PRINT " "; :GOTO 10
30 PRINT ASC(Z$); :GOTO 10
```

Note that in line 20 the quotation marks have a space between them, while there is no space between them in line 10.

If you discover a cryptogram in ASCII cipher (all numerals between 65–90), change line 30 and add line 40 to decipher:

```
30 A$=A$+Z$ :IF LEN(A$)=2 THEN 40 ELSE 10
40 PRINT CHR$(VAL(A$)); :A$="" :GOTO 10
```

In case the result is not plaintext, consider the possibility that the sender used two types of encipherment: a cipher alphabet plus ASCII.

In explanation of the decipher program, you must collect two digits per cycle. Line 30 collects them as A$ until the count is correct (as measured by LEN(A$)) and then refers the pair of digits to line 40 for execution.

Since the digits are in memory as strings, you must use VAL to change them to numerals before they can become usable ASCII symbols. In this form, CHR$ will transform them to their letter equivalents, which become your plaintext. Then A$ is nulled with A$="" to renew the cycle. Use the break key to end the cycle.

Using Graphic Symbols

Among the crypto possibilities open to us through our CoCo is a set of graphics symbols, in both black and white and color. You can type these, like ASCII numbers, directly from the keyboard through use of short, experimental programs, quite similar to the ones I've given.

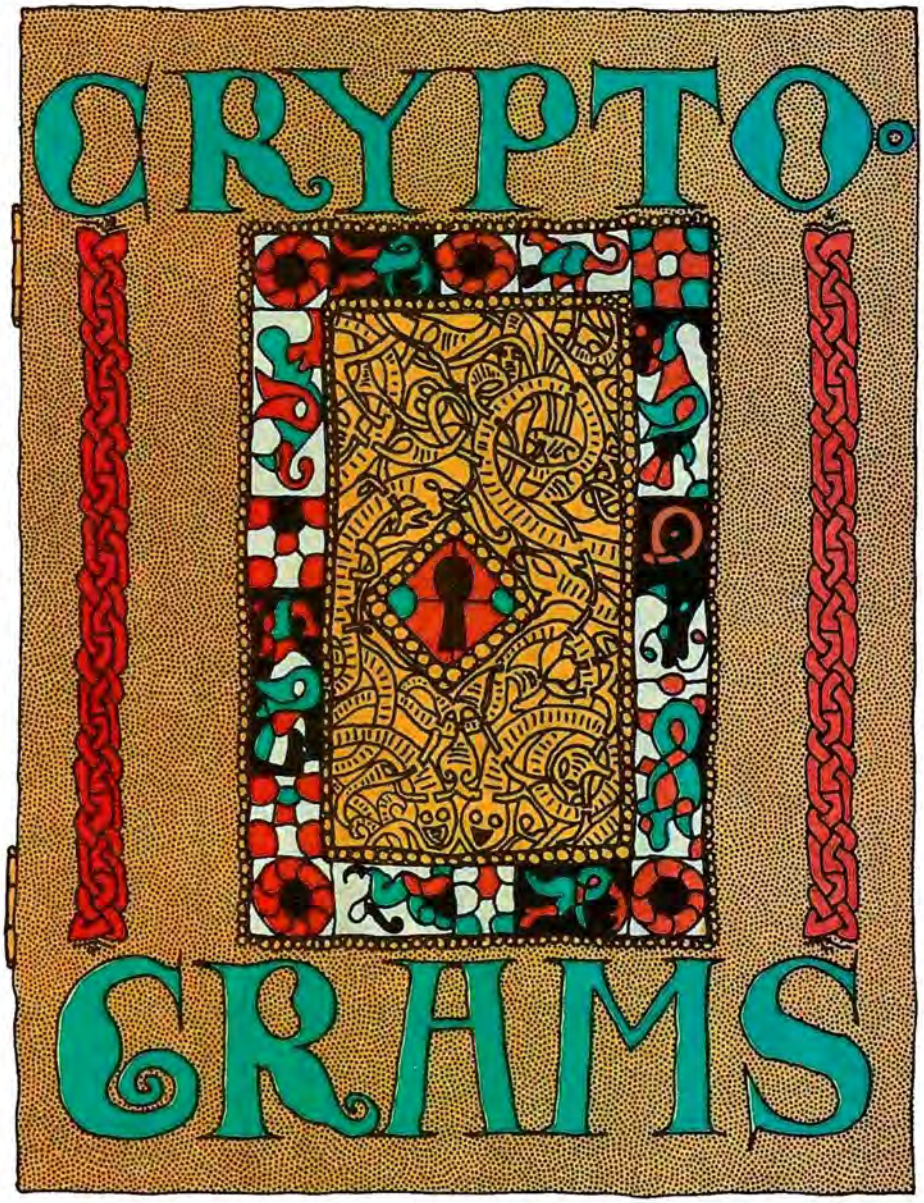
You can introduce numerous variations for direct typing, but each will have the disadvantage of being common knowledge among CoCo users. For instance, change the numeral 2 in line 30 to 3. You may now print the graphics characters by typing any three-digit number between 125–143 (125–255 in Extended Color Basic).

A quick jump of the imagination and a bit of programming will make it possible for you to touch each letter of the alphabet and see a corresponding graphic symbol appear on screen. Each unique symbol will of course stand for the letter that caused it to appear, and you will be creating a cryptogram. I'll give you such a program soon, and you might try writing one yourself.

In the meantime, here is a 107-word message to work on, using code-book cryptography with the one codebook I am sure is available to all of us:

HCC14 91 7 1-24 92 1 1-29 93 9 1-51 ■

Write to Karl Andreassen at 24750 Chianti Road, Cloverdale, CA 95425.



ONE OF THE WAYS TO MAKE YOUR COMPUTER MORE SECURE IS TO ENCIPHER IMPORTANT DATA BEFORE FILING IT ON TAPE OR DISK

THE COMPUTER IS AN IDEAL CRYPTO MACHINE FOR USE AT THE ORIGINATING POINT OF AN ENCIPHERED MESSAGE BUT UNTIL IT CAN BE PASSED OVER AS A WRISTWATCH YOU MUST USE HUMAN FACULTIES FOR SOME VITAL COMMUNICATIONS

A CLUE TO THE STARS CRYPTOGRAM SPACES ARE EQUALLY AS IMPORTANT AS THE STARS AND THE MESSAGE MAY NOT BE AS LONG AS IT MAY AT FIRST APPEAR

WHILE KEYWORDS ARE VERY IMPORTANT IN CREATING EFFECTIVE ENCIPHERED MESSAGES THE REAL KEY IS PRACTICE IF YOU BREAK AT LEAST ONE CRYPTOGRAM A DAY FOR A YEAR.IT WILL BECOME ALMOST EASY NOTE THE ALMOST

EVERY FIXED STAR IS THE HUB OF A SYSTEM OF PLANETS AND EVERY PLANET HAS THE POTENTIAL OF SUPPORTING SOME KIND OF LIFE HOW LONG BEFORE WE ENGINEER AN ATMOSPHERE FOR MARS AND SEED THE MOONS OF JUPITER

Answer to Last Month's Cryptograms (Except the Star Message)

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TUTORIAL

BY MARK SILVERBLATT

COLORMANIA

PART I

Attention Colormaniacs! Your disease is incurable but this prescription treats it with pleasure.

I am a Colormaniac. I was first infected just over two years ago. Fortunately, the incubation period was long enough for me to put personal affairs in order before the advanced stages set in. Early symptoms were successfully treated with liberal doses of Tandy's *Getting Started with Color Basic* and *Going Ahead with Extended Color Basic*, but I quickly developed a tolerance and required stronger and more frequent treatments.

Advanced Colormania is a condition best characterized by heavily callused fingertips, disk-shaped cornea, vague nightmares of open FOR...NEXT loops and type-mismatch errors, and, most significantly, a strong desire to know more than is presented in the two manuals mentioned. You're on your own for treating the first three symptoms, but there's hope for the fourth.

The Radio Shack books are excellent, and a novice can build a firm foundation in Basic programming through them, but having done that, isn't it time to start building the rest of the house?

While the typical Colormaniac continues to seek improved Basic techniques, he eventually asks the 64K question: What is machine language? It's a real mystery to many, and some even begin to learn about it, only to be frightened off by its foreboding complexity. Have you ever asked an advanced computerist what machine language is, and come away knowing that you didn't understand what you thought you heard, but certain that you didn't want to hear any more until you understood the strange vocabulary he threw at you?

Don't try to dive into machine language without first defining terms, understanding the number relationships involved, and getting some idea of what happens inside the computer. If you are reluctant, perhaps a demonstration of the power of machine language will provide some incentive. Later in this article I'll present a simple Basic program, then write and explain the operation of an equivalent machine-language subroutine.

The machine-language version runs about 350 times faster, while occupying less memory. This is why all those fancy arcade games with fast graphics and great sound effects are written in machine language. Basic just isn't fast enough to read the joystick, fire the phaser, draw the ray's path, explode the target, update the score, generate sound effects, and make it seem like it's all happening at once.

This is also why the better word processors and text editors; multivoice music programs; and all Radio Shack program packs, CoCo disks, and game cassettes are written in machine language.

Don't misunderstand; Basic continues to be an important programming tool, and you will continue to do bigger and better things with it, even as you learn machine language. Eventually you'll compare the two and see some applications where Basic is the obvious choice.

An understanding of machine- and Assembly-language programming requires prior study of a few preliminary areas, the first of which is number systems.

Although most of us are accustomed to calculating with the decimal (base 10) system, the computer's circuits deal almost exclusively in binary (base 2) numbers. You frequently, for the sake of convenience, express the computer's operations in the hexadecimal (base 16) number system. Before proceeding, look at number systems in general. There are several rules that hold true no matter which number system you use.

- The base of a number system tells you how many values are possible in any given digit.
- In determining the value of any number, you assign a value to each column, reading from right to left. For now, forget about anything to the right of a decimal point. You are talking strictly about whole numbers. The value of the digit in the far right column is the value of that digit times the base to the zero power. Remember that any number to the zero

System Requirements

16K RAM
Extended Color or Color Basic
Editor/Assembler (optional)

power is always one. Moving left one column, the value of the digit in the next column is the value of that digit times the base to the first power. Remember that any number raised to the first power is always that number. For example:

$1^0=1$ $5^0=1$ $99^0=1$
$1^1=1$ $5^1=5$ $99^1=99$

● As you continue to move left one column at a time, the value of the digit in each column is the value of that digit times the base to the second, third, fourth, fifth power, etc.

Now, apply these three rules to an ordinary decimal number, 50,598. You read and work with numbers like this every day, and usually don't think about interpreting them in this manner. Since this is a decimal (base 10) number, there can be any of 10 digit values in each column, namely 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9.

The far right column in our example contains the digit 8, and its value would be 8 times 10 to the zero power, or 8 times 1, or 8. In the second column, it's 9 times 10 to the first power or 9 times 10, or 90. The process is completed in Fig. 1b.

This is simple stuff, but I want to remind you how numbers work before moving on to binary and hex. How would you convert the same number expressed in binary back to decimal? This is base 2, meaning that only two possible digits, 0 or 1, can appear in any column. The aforementioned rules and procedures still apply, and the process appears in Fig. 2b.

Remember that you are reading the binary number from right to left, examining each bit (binary digit), to see whether it will (if the bit is 1) or will not (if the bit is 0) represent the base 2 raised to the power 0, 1, 2, 3, 4, and so on, according to the column being examined.

By using binary values, you can employ digital electronic circuits, where a value can be represented on a series of wires (a bus) by either the presence (binary 1) or absence (binary 0) of a specific level of electric current on each wire. Compare this to analog circuits, where an infinite number of possible voltage levels can exist in any one wire. We have seen how easily you can convert binary to decimal by simply evaluating the digits, reading right to left, and incrementing the power to which the base (2) is raised in each column.

Converting decimal to binary is the same process in reverse. It's helpful to have a table of powers of two, as shown in Fig. 2a. The conversion is then a simple process of assigning the binary digits. In this conversion, however, you form the binary number working from left to right.

You compare the column value of the first binary digit (32,768 when building a 16-digit binary) to the number; if the decimal number is equal to or greater than the column value, then that bit becomes a one, and the decimal number is reduced by the value of the column, forming a remainder. If the decimal number is less than the column value, then the bit is zero and the decimal value remains unchanged. In either case, you then move one column to the right and repeat the process as illustrated in Fig. 2c.

You have seen that converting decimal to and from binary is simple enough, and by now you realize that doing it repeatedly is about as exciting as strep throat. But didn't you buy a sophisticated computer to, among other things, handle some of the more mun-

a. Decimal—powers of 10:

$10^0=1$ $10^2=100$ $10^4=10{,}000$
$10^1=10$ $10^3=1{,}000$ $10^5=100{,}000$

b. Example for Evaluating Decimal Number:

5 0 5 9 8

$8\times10=8\times$	$1=$	8
$9\times10=9\times$	$10=$	90
$5\times10=5\times$	$100=$	500
$0\times10=0\times$	$1{,}000=$	0
$5\times10=5\times$	$10{,}000=$	+50,000
		=50,598

Fig. 1. Powers of 10 (a) and Evaluation of Decimal Number (b)

a. Binary—powers of Two:

$2^0=1$	$2^4=16$	$2^8=256$	$2^{12}=4096$
$2^1=2$	$2^5=32$	$2^9=512$	$2^{13}=8192$
$2^2=4$	$2^6=64$	$2^{10}=1024$	$2^{14}=16384$
$2^3=8$	$2^7=128$	$2^{11}=2048$	$2^{15}=32768$

b. Example for Converting Binary to Decimal:

1100 0101 1010 0110

$0\times2^0=0\times$	1=	0
$1\times2^1=1\times$	2=	2
$1\times2^2=1\times$	4=	4
$0\times2^3=0\times$	8=	0
$0\times2^4=0\times$	16=	0
$1\times2^5=1\times$	32=	32
$0\times2^6=0\times$	64=	0
$1\times2^7=1\times$	128=	128
$1\times2^8=1\times$	256=	256
$0\times2^9=0\times$	512=	0
$1\times2^{10}=1\times$	1,024=	1,024
$0\times2^{11}=0\times$	2,048=	0
$0\times2^{12}=0\times$	4,096=	0
$0\times2^{13}=0\times$	8,192=	0
$1\times2^{14}=1\times$	16,348=	16,384
$1\times2^{15}=1\times$	32,768=	+32,768
		=50,598

c. Example for Converting Decimal Number to Binary, Building the Binary from Left to Right:

NUMBER = 50,598 REM = Remainder

1??? ???? ???? ???? NUM>	32,768 so bit =1; REM = NUM − 32,768 = 17,830
11?? ???? ???? ???? REM>	16,384 so bit =1; REM = REM − 16,384 = 1,446
110? ???? ???? ???? REM<	8,192 so bit =0; REM still = 1,446
1100 ???? ???? ???? REM<	4,096 so bit =0; REM still = 1,446
1100 0??? ???? ???? REM<	2,048 so bit =0; REM still = 1,446
1100 01?? ???? ???? REM>	1,024 so bit =1; REM = REM − 1,024 = 422
1100 010? ???? ???? REM<	512 so bit =0; REM still = 422
1100 0101 ???? ???? REM>	256 so bit =1; REM = REM − 256 = 166
1100 0101 1??? ???? REM>	128 so bit =1; REM = REM − 128 = 38
1100 0101 10?? ???? REM<	64 so bit =0; REM still = 38
1100 0101 101? ???? REM>	32 so bit =1; REM = REM − 32 = 6
1100 0101 1010 ???? REM<	16 so bit =0; REM still = 6
1100 0101 1010 0??? REM<	8 so bit =0; REM still = 6
1100 0101 1010 01?? REM>	4 so bit =1; REM = REM − 4 = 2
1100 0101 1010 011? REM=	2 so bit =1; REM = REM − 2 = 0
1100 0101 1010 0110 REM=	0 so bit =0; Done.

Fig. 2. Powers-of-two table (a) is helpful in converting both binary to decimal (b) and back again (c).

dane tasks in life? If you need to manipulate binary and hex numbers to talk to the computer, why not use it to help you convert number systems?

Extended Color Basic includes a feature for converting decimal to hex and back, but neither Extended nor non-Extended Color Basic can handle binary directly. Hex-Bin (Program Listing 1) accepts input in either decimal, binary, or hex; it then computes and prints the equivalent in the other two bases. Analysis of the program shows that it is accomplishing the conversions in the same manner I describe here. It does not require Extended Color Basic, and it handles any decimal number between 0 and 65,535.

You should remember that decimal 65,535 is the largest number that can be represented by 16 binary digits, because:

1111 1111 1111 1111 (binary) = 65,535 (decimal)

Now, try figuring the largest number that can be represented by eight binary digits (1111 1111). It'll come in handy in a little while.

Why Should I Care About All This?

Sooner or later you'll be interested in the internal workings of the 6809E microprocessor. Technically, it is an LSI 40-pin DIP IC. That means it's a large-scale integration (particularly dense packing of lots of low-current transistor switches) integrated circuit with 40 connecting pins, and that it is a rectangular, dual in-line package (DIP) with the pins in two parallel rows, 20 per side.

Sixteen of these pins comprise the address bus, and they are connected to the program memory (RAM) and Basic interpreter (ROM), plus any program packs or disk controller connected to the side port. They are also connected, though less directly, to the printer, joystick, and cassette interfaces.

When I say that the 6809 can address 64K, I mean that it can access any of 65,535 addresses by means of binary signals on the 16-bit address bus. In this way it tells the rest of the system the address to which it is about to write, or the address from which it wants to read data.

Much of the data handled is in 8-bit format. In addition to its 16-bit address bus, the 6809 also has an 8-bit data bus, used to send and receive 8 bits (1 byte) of data at a time.

Perhaps you've wondered what the POKE command can be used for. The syntax is POKE address, value, and the limits for address and value are 65535 and 255, respectively. Trying to go higher than POKE 65535,255 brings up an FC (function call) error, because the POKE command references the address and data buses, 16 and 8 pins respectively, and the binary signals carried are therefore limited in value to the largest numbers that can be represented by 16 or 8 bits.

Back in the dark ages of home computers, around 1975 or so, the simpler machines did not have keyboards. Instead, they had front panels consisting of rows of toggle switches for control of address or data buses. To enter a program, the user had to set each switch to represent 1 bit of the value desired, in binary, and then press a button to let the computer know to accept that byte. Entering the shortest program took quite a while, and a single bit error halfway through could result in anything from simple migraine to severe paranoic depression. Use of hexadecimal keypads on home computers was, then, a giant step forward.

Since hex means "six" and deca means "ten," the hexadecimal number system is based on 16. Just as in decimal and binary, the base indicates both the number of possible values in any column and the relationship between columns. The first 10 digits used for column values are the same as in decimal, 0–9, then the letters A–F represent the decimal equivalent values 10–15. The value of each hex digit depends on the column in which it appears, just as in the other base systems. Hex 5, for example, when appearing in column 2 equals 5 times the base raised to the column number, or 5 times 16 raised to the second power, or 5 times 256, or 1,280.

Figure 3a shows the 16 hex digits, with decimal and binary equivalents of each. The decimal equivalents are shown in four columns, according to the position in which the hex digit might appear. Reading the table in columns should help reduce the tedious math involved in converting.

Program Listing 1. Decimal-to-Binary-to-Hex Converter for Color or Extended Color Basic Machines

```
49 ' ##MAIN MENU##
50 CLS:PRINT"BASE CONVERSION":PR
INT
60 PRINT"CHOOSE BASE FOR INPUT":
PRINT
70 PRINT "1-DECIMAL":PRINT
80 PRINT "2-BINARY":PRINT
90 PRINT "3-HEXADECIMAL":PRINT
100 PRINT "SELECT ONE":PRINT
110 I$=INKEY$:IFI$=""THEN110
120 MS=VAL(I$):IF MS<1ORMS>3THEN
110
130 PRINT@511,"":ON MS GOTO 200,
400,600
198 '
199 ' ##DECIMAL INPUT##
200 INPUT"<ENTER> DECIMAL NUMBER
";D
210 IF D=0 THEN RUN 10
220 IF D>65535 THEN PRINT:PRINT"
SORRY, YOU'VE EXCEEDED MY LIMIT
OF 65535":PRINT:GOTO 200
230 PRINT:GOSUB 700:PRINT:GOSUB3
00:GOSUB800:PRINT:RUN200
298 '
299  END '## DECIMAL TO BINARY #
#
300 PV=32768:T=D:PRINT"BINARY (%
): ";
310 IF T=>PV THEN BIT$="1":T=T-P
V ELSE BIT$="0"
320 B$=B$+BIT$
330 PV=PV/2
340 IF PV=>1THEN310
350 PRINT LEFT$(B$,4);" ";
360 PRINT MID$(B$,5,4);" ";
370 PRINT MID$(B$,9,4);" ";
380 PRINT RIGHT$(B$,4):PRINT::RE
TURN
398 '
399 END' ##BINARY TO DECIMAL##
400 PRINT"<ENTER> BINARY (%)":PR
INT"(RIGHT TO LEFT):"
410 I$=INKEY$:IFI$=""THEN410
420 IF ASC(I$)=13 THENPRINT@511,
"":GOTO510
430 IFI$<>"1"ANDI$<>"0"THEN410
440 B$=I$+B$:K=501
450 FOR N=1 TO LEN(B$)
460 PRINT@K-N, MID$(B$,LEN(B$)-N
+1,1);
470 IF INT(N/4)=N/4 THEN K=K-1
480 NEXT N
490 IF LEN(B$)=16THEN500ELSE410
500 PRINT@511,"":PRINT:PRINT"(16
 BIT MAX)
510 IFLEN(B$)=0THENRUN50 ELSEFOR
 N=1TOLEN(B$)
520 IF VAL(MID$(B$,LEN(B$)-N+1,1
))=1 THEN D=D+2^(N-1)
530 NEXT N:D=INT(D)
540 PRINT:PRINT"DECIMAL:"D:PRINT
:GOSUB700:GOSUB800:RUN400
598 '
599 END '## INPUT HEX AND CONVER
T TO DECIMAL##
600 PRINT"<ENTER> HEX NUMBER ($)
: ";
610 I$=INKEY$:IFI$=""THEN610
620 H=ASC(I$):IF H=13 THEN 660
630 IF H>47 AND H<58 THEN D=D*16
+H-48:GOTO 650 '0 thru 9
640 IF H<65 OR H>70 THEN 610 ELS
E D=D*16+H-55 'A thru F
650 PRINT I$;:H$=H$+I$:IF LEN(H$
)<4 THEN 610
660 IF LEN (H$)=0 THEN RUN 50 EL
SEPRINT:PRINT:PRINT "DECIMAL :";
D:PRINT:GOSUB300
670 GOSUB800:PRINT:RUN600
698 '
699 END '##CONVERT DECIMAL TO HE
X##
700 PV=4096:T=D:PRINT"HEX ($): "
;
710 FOR N= 1 TO 15
720 IF T>PV*N-1 THEN NEXT
730 N=N-1:IF N<10 THEN M=N+48 EL
SE M=N+55
740 PRINT CHR$(M);
750 T=T-PV*N:PV=PV/16:IF PV=>1 T
HEN 710
760 PRINT:RETURN
798 '
799 END '##BORDER##
800 PRINTSTRING$(32,42);:PRINT"<
ENTER> ZERO/NULL TO RESTART":PRI
NTSTRING$(32,42);:RETURN
```

END

Figure 3 shows converting between hex and decimal, which is performed essentially the same as you did with binary. In converting decimal to hex, however, you now have 15 choices for each hex digit, whereas in binary you had only two. Use Fig. 3a to find each value.

Start with decimal 50,598; examination of the table shows that this is greater than hex C000 but less than hex D000. You therefore select hex C for column 3, subtract its value from the decimal number, move right one column, and continue converting the remainder. Remember that column 3 is really the fourth column from the right, as you count right to left starting with zero. Figure 3c shows the rest of the conversion.

After working with hex numbers for a while, you'll notice that you can represent any 4-bit binary number (a nibble, half a byte) by a single hex digit, and that you can write any 8-bit binary (a byte) as two hex digits, and so on. In this way, attaching a 16-key hexadecimal keyboard to a microcomputer allowed the user to enter programs much more easily than repeatedly setting toggle switches. You will often use hex numbers to represent addresses and data, mostly for the sake of convenience.

Instead of saying that the 16-bit bus can address decimal 65,535 or binary 1111 1111 1111 1111 locations, you can say that there are hex FFFF possible locations. Using the Binary Equiv. column in Fig. 3a permits rapid conversion between binary and hex.

From here on, and to avoid confusing one base with another, adhere strictly to the following rules:

- Binary values will be prefaced by a percent sign (%).
- Hexadecimal numbers will be prefaced by either a dollar sign ($) or Basic's ampersand H (&H).
- Decimal will be the default, i.e., if no base is specified, use base 10.

a. Hex Code with Decimal and Binary Equivalents:

HEX	DECIMAL EQUIVALENTS ACCORDING TO COLUMN IN WHICH LOCATED				BINARY EQUIV
	COL 3	COL 2	COL 1	COL 0	
0	0	0	0	0	0000
1	4,096	256	16	1	0001
2	8,192	512	32	2	0010
3	12,288	768	48	3	0011
4	16,384	1,024	64	4	0100
5	20,480	1,280	80	5	0101
6	24,576	1,536	96	6	0110
7	28,672	1,792	112	7	0111
8	32,768	2,048	128	8	1000
9	36,864	2,304	144	9	1001
A	40,960	2,560	160	10	1010
B	45,056	2,816	176	11	1011
C	49,152	3,072	192	12	1100
D	53,248	3,328	208	13	1101
E	57,344	3,584	224	14	1110
F	61,440	3,840	240	15	1111

b. Example for Converting Hex to Decimal:

```
$ C 5 A 6
        └ 6×16⁰=6×      1=      6
      10×16¹=10×       16=    160
    5×16²=5×          256=  1,280
12×16³=12×          4,096= +49,152
                           ------
                           =50,598
```

c. Example for Converting Decimal to Hex, Building the Hex from Left to Right:

NUM = 50,598 REM = Remainder

```
$ C ? ? ?  NUM>   49,152 so digit =C;  REM=NUM−45,192=1,446
$ C 5 ? ?  REM>    1,280 so digit =5;  REM=REM−1,280=166
$ C 5 A ?  REM>      160 so digit =A;  REM=REM−160=6
$ C 5 A 6  REM=        6 so digit =6;  REM=0; done.
```

Fig. 3. Hex code table (a) will save scratchpad time in converting hex to decimal (b) and back again (c).

Basic Versus Machine Language

When you program in Basic, the computer must interpret each byte of code in order to run the program. If the program starts with 10 FOR X=1 TO 5, the computer first examines the F, checking to see if that is an instruction. It isn't, so the computer takes the next byte of code, and examines FO. Still not satisfied that it has found an instruction, it fetches the third byte of code, and examines FOR. That's a recognizable keyword, and the CoCo begins to understand what you want it to do.

This is a simplification, as the computer actually "tokenizes" a Basic program, storing it in sort of a shorthand in memory so a keyword like FOR doesn't really occupy 3 bytes. For the time being, however, think of a Basic program as being stored in memory the same as you would see it listed on the screen.

Expecting that FOR will be followed by a variable name and then the equal sign, the CoCo continues to read the program, and, assuming that syntax is correct, does the expected counting.

Most significant here is the fact that the computer doesn't remember what it's doing when running a Basic program; when it encounters the inevitable NEXT X, it returns to the initial FOR X, and reads it again. This example was a loop for counting X from one to five, and the FOR instruction is therefore read six times. On the sixth reading of the FOR instruction the computer says "Well, I'm done now; time to jump to the instruction after NEXT."

This is why Basic is called an interpreter, since each byte of code must be interpreted before the microprocessor knows what to do with it. In fact, the Basic ROMs actually comprise a lookup table where each word of Basic is located and translated into a set of machine-language instructions that the 6809 can understand.

The 6809 speaks only machine language, and each time an instruction is encountered, it must be interpreted before it can be executed. Remember how I said that the data bus was an 8-bit bus? Any of 255 ($FF or %1111 1111) values can therefore be read as instructions. There are actually more than 255 possible machine-language instructions, as a

few require 2 bytes.

To understand the operations contained in the instruction set, look first at Fig. 4, which is a programming model of the 6809. The microprocessor is made up of registers, each of which holds either 8 or 16 bits of information (data). The majority of instructions tell it to manipulate specific registers in a predetermined manner. Those registers that are accessible to the programmer are:

- The A accumulator (8-bit), which is a temporary holding location for a byte of data.
- The B accumulator, which is another 8-bit storage place for data.
- The D accumulator, which is actually the A and B registers strung together (concatenated). You might have heard that the 6809 is an 8-bit microprocessor that thinks it's a 16-bit processor; hence the schizophrenia. The ability to manipulate 16 bits of data in the D accumulator with a single instruction sets the 6809 apart from the popular Z80 (TRS-80 Models I and III, Timex/Sinclair TMS1000, and others) and the 6502 (Apple, VIC-20, et al.) microprocessors, where only 8 bits at a time can be manipulated.
- The PC or program counter (16-bit), which allows the 6809 to keep track of the address in memory from which it is getting instructions.
- The S (hardware) and U (user) stack pointers (16-bit), which are used mainly to store addresses and values while executing subroutines.
- The X and Y index registers (16-bit), used for indexed addressing, allow a program to specify relative rather than fixed addresses, by holding an offset value to be added to or subtracted from the address in the program counter. In other words, use of these registers permits an instruction to command, "Fetch the value xxx bytes away from the present location," instead of specifying an address. It is this feature that allows writing PIC (position-independent code), or machine-language programs that are relocatable, and can be run anywhere in memory.
- The DP or direct-page register (8-bit) is used as the most-significant byte of an address, allowing the great flexibility in advanced programming.
- The CC or condition-code register (8-bit) is actually eight flag registers rolled into one. Each of the 8 bits in the CC is an individual indication of such things as: "Was the result of the last operation a zero?", "Was that last number negative or positive?", or "Did I have a carry or a borrow in that last addition or subtraction?".

```
5 CLEAR200,16000
10 POKE 275,62:POKE276,129
20 FOR N=16001 TO 16014:READ D:P
OKE N,D:NEXT
30 INPUT"PRESS ENTER TO BEGIN";D
$:CLS:PRINT"COUNT TO 65535 IN BA
SIC- THIS   COULD TAKE A WHILE;
YOU MIGHT   WANT TO GET A CUP OF
 COF
FEE-    PLEASE STANDBY.
50 FORN=0TO65535:NEXTN
70 PRINT "COUNT DONE"
80 PRINT:INPUT"PRESS ENTER TO BE
GIN MACHINE    LANGUAGE COUNT TO
 65535";D$
90 X=USR(0)
100 PRINT"COUNT DONE. WASN'T THA
T BETTER?":PRINT:INPUT"PRESS ENT
ER TO REPEAT ML COUNT";D$:GOTO90
120 DATA 204,255,255,74,38,253,9
0,39,4,134,255,32,246,57
```

Program Listing 2a. Basic Versus Machine Language Demo Program, Color Basic

```
10 DEFUSR0=&H0E00
20 FOR N=&HE00 TO &HE00 + 13: RE
AD D$:POKE N,VAL("&H"+D$):NEXT
30 INPUT"PRESS ENTER TO BEGIN";D
$:CLS:PRINT"COUNT TO 65535 IN BA
SIC- THIS   COULD TAKE A WHILE;
YOU MIGHT   WANT TO GET A CUP OF
 COF
FEE-    PLEASE STANDBY.
40 TIMER=0
50 FORN=0TO65535:NEXTN
60 B=TIMER:SOUND100,5:M=B/3600:S
=INT((M-INT(M))*60):M=INT(M)
70 PRINT"BASIC COUNT DONE-APPROX
 ELAPSED TIME"M"MINUTES"S"SECOND
S."
80 PRINT:INPUT"PRESS ENTER TO BE
GIN MACHINE    LANGUAGE COUNT TO
 65535";D$
90 TIMER=0:X=USR0(Y):S=TIMER
100 SOUND100,5:PRINT"COUNT DONE-
 APPROX ELAPSED TIME "S/60"SECON
DS
110 PRINT"ML RAN"INT(B/S):PRINT"
TIMES FASTER THAN BASIC"
120 DATA CC,FF,FF,4A,26,FD,5A,27
,04,86,FF,20,F6,39
```

Program Listing 2b. Basic Versus Machine Language Demo Program, Extended Color Basic

Putting It to Work

Earlier I threatened to demonstrate the machine-language equivalent of a simple Basic routine; the time has come. See Program Listing 2, and consider the

```
<----------------------16 bits---------------------->
<--------8 bits--------><--------8 bits-------->

< -Accumulator A -><-Accumulator B ->
<----------Double Accumulator D---------->
<--------------Index Register Y -------------->
<--------------Index Register Y -------------->
<---------Hardware Stack Pointer S --------->
<-----------User Stack Pointer U ----------->
<-----------Program Counter PC ----------->
     Direct Page
< ---Register DP --->
   Condition Code
< ---Register CC --->
```

Fig. 4. Programming model of the 6809 microprocessor. Remember that the D accumulator is not a separate register, but is rather the A and B accumulators strung together. When 2 bytes are loaded into D, the most-significant byte will be in A, and the least-significant in B.

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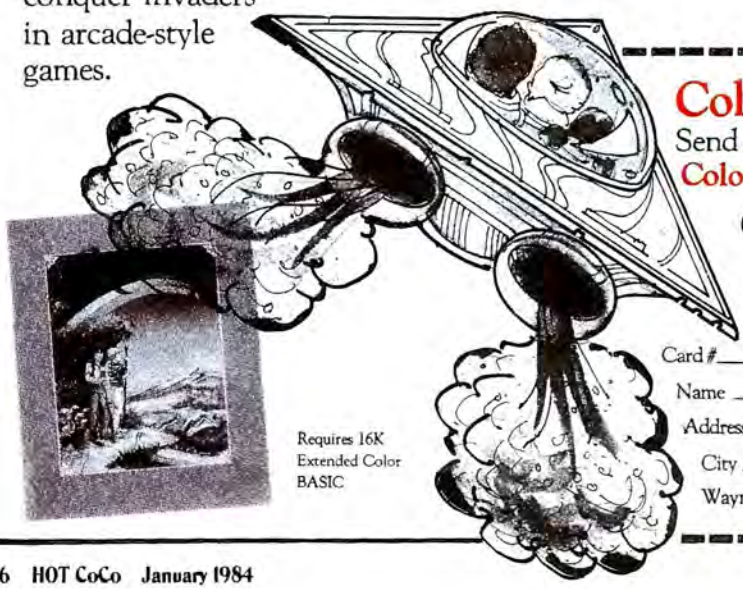

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following program line:

```
50 FOR N=0 TO 65535:NEXTN
```

This is simple but experience shows that looping 65536 (0–65535) times takes just over two minutes in Basic. You can accomplish the same thing in machine language if you:

- Set the D accumulator to $FFFF. Remember that D is actually A and B concatenated.
- Decrement the A accumulator by one, and test to see if it has reached zero; if not, decrement and test again. Since A was initialized with 255 ($FF), it takes 256 iterations before zero is reached.
- Once the A accumulator reaches zero, move on to the B accumulator and decrement/test it in the same manner. If B has reached zero you are finished; if not, reload A with $FF and jump back to the second step.

This is essentially the same as nested FOR...NEXT loops in Basic. Every time A completes 256 loops, B completes one loop. Once B has completed its 256 loops, you have looped a total of 256 times 256, or 65,536 times.

To begin writing the machine-language routine, you must tell the 6809 that you are going to load a value into the D accumulator. You accomplish this by feeding the 8-line data bus with the binary coding, 1 1 0 0 1 1 0 0.

At least that's how the Stone Age hobby computerist would have done it with his front-panel switches. The second-generation pioneer used a hex keypad and entered the equivalent, or $CC. The instruction $CC tells the 6809 that the 2-byte D accumulator is to load itself with the next 2 bytes of memory following the instruction. Since you want it filled, those bytes will both be $FF. You then program the CoCo to decrement the A register with the instruction $4A. So far our program is CC FF FF 4A.

I'm not pulling these instructions from under a rock somewhere, or inventing them for the purpose of illustration. Although there are several fine books available on the 6809 instruction set and machine/Assembly-language

```
*******************************************************
*
*   ASSEMBLER OUTPUT FOR "COUNTER" ML ROUTINE
*
*   FIELDS ARE, FROM LEFT TO RIGHT
*
*     1. REFERENCE LINE NUMBERS
*     2. ADDRESSES TO WHICH OBJECT CODE WILL BE
*        ASSEMBLED
*     3. ACTUAL OBJECT CODE (PROGRAM)
*     4. LABELS
*     5. OPCODE MNEMONICS
*     6. OPERANDS/ADDRESSES
*     7. COMMENTS
*
*  COLUMNS 4,5,6 AND 7 ARE THE SOURCE CODE; THE
*  REMAINDER IS GENERATED BY THE ASSEMBLER
*
*******************************************************

0001 0E00                    NAM COUNTER
0002 0E00                    ORG $0E00
0003 0E00  CCFFFF   START    LDD #$FFFF      FILL A&B REGISTERS
0004 0E03  4A       ALOOP    DECA            DECREMENT REGIST A
0005 0E04  26FD              BNE ALOOP       REPEAT IF A NOT EMPTY
0006 0E06  5A       BLOOP    DECB            DECREMENT REGIST B
0007 0E07  2704              BEQ DONE        JUMP TO END IF B EMPTY
0008 0E09  86FF              LDA #$FF        RE-FILL REGIST A
0009 0E0B  20F6              BRA ALOOP       JUMP BACK TO FIRST LOOP
0010 0E0D           DONE     RTS
```

Program Listing 3. Machine Language Counter Program

Line 0004—DECA simply decrements the A accumulator.

Line 0005—Says, "Branch if not equal" to the line where LOOP-A appears in the label field. The BNE instruction always refers to the instruction immediately preceding it, and in this case means that the branch takes place if the result of the last operation was not zero. This is similar to Basic's IF statement, and if the test is not met, i.e., if the A accumulator has not been decremented down to zero, control falls through to the next line.

Line 0006—Decrement the B accumulator.

Line 0007—BEQ (branch if equal) DONE tells us to branch to line 0010, where DONE appears in the label field, but only if the result of the last operation was zero. Otherwise you proceed to the next instruction.

Line 0008—Load A with $FF.

Line 0009—BRA (branch always) is an unconditional branch, and in this case takes you back to LOOP-A.

Line 0010—RTS (return from subroutine) transfers control back to the address stacked (stored in the H register) when this machine-language program was called from Basic.

Table 1. Source Program Line Descriptions

See List of Advertisers on page 131

programming, the ultimate information source is Motorola's own *6809 Microprocessor Programming Manual*, available from Motorola Semiconductor Products Inc., P.O. Box 20924, Phoenix, AZ 85036. Through use of this or another 6809 instruction set reference, you can continue to write the machine-language program.

There is an easier way. Just as you learned to convert between number systems by hand and then put the computer to work to do it for you, here again the computer can perform the drudgery of converting the algorithm to machine-language instructions, through use of an editor/assembler program. See Program Listing 3, which is an output from the editor/assembler. There are seven fields (columns), and from left to right they are:

- The output line numbers, starting with 0001. These aren't necessary, but are a convenience generated automatically by the editor/assembler for our reference only. Some editor/assemblers don't even generate this field. For now, skip lines 0001 and 0002, and look at line 0003.
- The address field indicates locations in memory where the machine code is located. Notice that the program starts at $0E00, meaning that this is the address in RAM where the first byte of the program is stored.
- The actual machine-language code that comprises the program. Notice that the first few bytes I mentioned before, $CC FF FF, appear here, followed by the rest of the program.
- The label field. Labels are for branching, and are explained shortly.
- The op-code (operation code) field is the instruction that the programmer writes to tell the editor/assembler what he wants the program to do. Instead of having to remember that $CC is the instruction for loading the D accumulator, you need only to remember (or look up) the mnemonic memory jogger to represent the instruction. In this case, the op-code is LDD, an abbreviation for "load accumulator D."
- The operand or address field is used with most instructions, telling the editor/assembler what you want it to do. In this case, the op-code LDD is followed by the operand #$FFFF, specifying that you want the D accumulator loaded with $FFFF. Had you instructed LDD $FFFF instead of LDD #$FFFF, omitting the # symbol, the assembler would interpret this as not to load D with $FFFF but with whatever value was stored at memory location $FFFF. In other words you can have either direct or indirect addressing, and the # symbol is one of several syntax rules that the Assembly-language programmer must learn.
- The comment field is similar to remarks in Basic programming, and simply provides the programmer with a place to leave notes for himself.

Fields 4, 5, 6, and 7—the label, op-code, operand/address, and comments fields—are called "source code" and are written by the programmer with the editor portion of the editor/assembler program. The assembler portion then analyzes the source code and generates "object code" (field 3), which is the actual machine-language program. In other words, assembly is the process of translating the op-codes and operands of source code into bytes of machine-language object code.

Examining line 0001 of this program, you see in the op-code and operand fields "NAM counter." NAM is not a real op-code, but is rather a pseudo-op, used simply to give the program a name. Notice that no object code is generated in this line. Likewise, line 0002 contains the ORG pseudo-op, and tells the assembler what address to use to originate the program, but generates no code in field 3. It is because I used ORG $0E00 that the object code beginning in line 0003 is assembled to that address.

"You can also walk from Chicago to St. Louis, but there are certainly easier ways to get there..."

Notice that LOOP-A appears in the label field for line 0004 and again in the operand field for line 0005. This is a label chosen by the programmer, and is used for jumps, more properly called branches, similar to Basic's GOTO command.

When used in the label field it simply establishes a reference point. Then, when seen in the operand/address field, it directs a branch (either forward or backward) to the line in which it appears in the label field. You should by now understand enough about the source program to examine the rest of it. See Table 1 for line descriptions.

There are several ways to load and run a machine-language program. It can be loaded from tape to memory with CLOADM and started with EXEC, or can be POKEd directly into memory by a Basic driver as you do here; see Listing 2. Line 120 holds the object code in a DATA statement, and a loop in line 20 reads the data and POKEs it into the desired locations. Line 10 tells Basic the location at which the machine-language routine begins, and transfers control to the routine in line 90.

In the Extended Basic version, Listing 2a, the DATA statement is in hex, &H in line 20 reads the data before it is POKEd in as object code, DEFUSR0 places the machine-language routine's address in memory, and the actual machine-language code begins at $0E00, which is the beginning address of graphics page 1.

In the non-Extended version, Listing 2b, the same data is in decimal, the machine-language routine is POKEd to the 14 consecutive bytes of RAM starting at 16001, and this starting address is passed to Basic by two POKE statements in line 10. All these procedures are documented in the Radio Shack manuals.

In this example, the machine-language routine occupies almost as much memory as the equivalent Basic FOR...NEXT loop, but this is not truly representative. Machine-language typically uses a small fraction of the RAM required by Basic for the same application.

I have not intended this to be a thorough coverage of all 6809 machine-language instructions, but rather a cursory introduction to the process of machine- and Assembly-language programming.

An editor/assembler is not an absolute necessity, as you can do a "hand assembly" and enter the object code directly to memory. You can also walk from Chicago to St. Louis, but there are certainly easier ways to get there, and I highly recommend the purchase of an editor/assembler for anyone interested in machine-language programming. There are several on the market; my personal favorite is the Micro Works SDS80C, or, for disk users, their Macro-80C. Likewise, a solid tutorial and reference text is quite helpful, and Lance Leventhal's *6809 Assembly-Language Programming* is probably the most comprehensive work available.

Finally, remember that if your Colormania goes into remission, it's only temporary. ■

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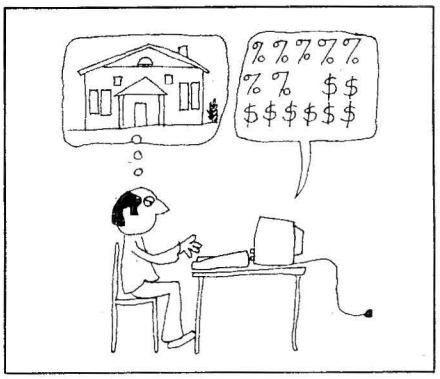
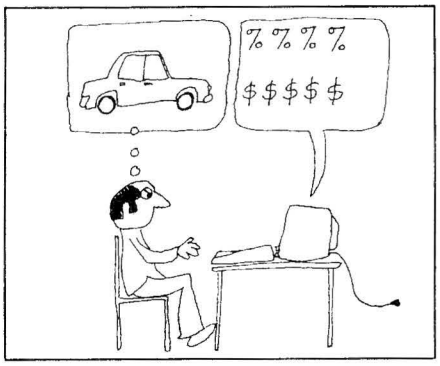
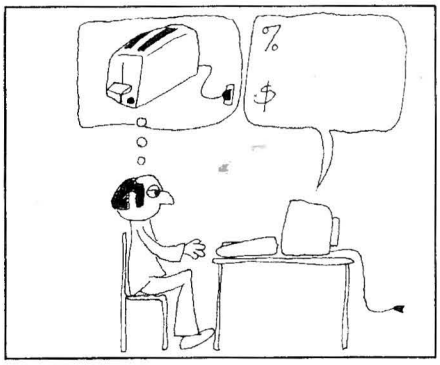
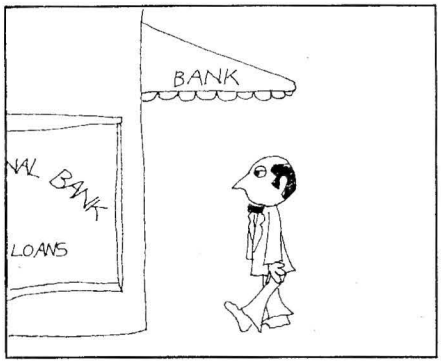
BY RICHARD TUCKER

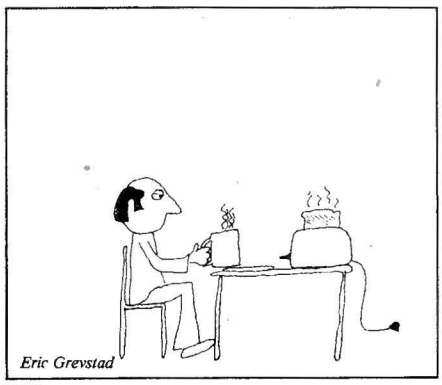
4K LOAN ANALYSIS











So, you think there aren't serious programs for 4K Color Basic? Take a look at this loan analyzer.

If you have a 4K Color Computer like mine, there aren't many serious programs available. I decided to fix this problem by writing a loan program that would tell me the monthly payments for a loan at a specified interest.

I dug around in my old high-school notes and found the equation for determining monthly payments:

$$PMT = P \times j(1+j)^{-M} \text{ where } j = (1 - i/c)^{c/12} - 1$$

It's not necessary to understand the equation to use the program, but the following information will be helpful as you go through the program line by line:

PMT = the monthly payment
M = the number of monthly payments to pay off the loan
i = the interest rate as a decimal
c = the number of times the interest is compounded yearly
j = the corrected interest based on c compoundings yearly

Program Listing 1 is the loan-analysis program, with REM statements to break up the various sections for easier identification. (Program Listing 2 gives changes for the MC-10.)

- Lines 40–100 print the main program title. This is straightforward, but look at the screen-centering routine of line 50. By tabbing one-half the width of the screen, minus half the length of the string, you can center the string on the screen. If you change the string, it will still be centered.
- Lines 180–330 are my Color Computer adaptation of William Barden Jr.'s "gee whiz" input routine as described in *Programming Techniques for Level II Basic* (RS#62-2062). Using this as a subroutine, I made a screen that appears like a form to be filled in.
- Before my adapted subroutine begins execution, a subroutine at line 420 creates a dummy string ZA$ equal to the maximum number of characters to be input. When the program enters the input subroutine, ZC equals the starting position on the screen for the number to be input.
- Line 180 prints the dummy string on the screen. This shows the maximum space for input characters.
- Line 200 sounds a beep to prompt the operator.
- Line 220 gets a character from the keyboard.
- Line 230 checks to see if this character is a control character or a letter.
- Line 240 checks to see if the character is a backspace.
- Lines 250 and 260 do a backspace.
- Lines 270 and 280 check for the enter

System Requirements

4K RAM
Color Basic
MC-10 (with changes)

```
30 '    MAIN TITLE
40 CLS:PRINT:PRINT:LA$="loan ana
lysis":L1$="FOR 4K COLOUR BASIC"
50 PRINTTAB(16-(LEN(LA$)/2));LA$
60 PRINT@77,CHR$(128);
70 PRINT@78,"analysis"
75 PRINTTAB(16-(LEN(L1$)/2));L1$
80 PRINT:PRINT:PRINT:PRINT"COPYR
IGHT 1983 BY RICHARD TUCKER";
90 PRINT"168 OXFORD ST.WOODSTOCK
 ONTARIO"
100 GOSUB160:FORX=1TO1000:NEXTX
110 GOTO 460
120 '
130 '    SUBROUTINES
140 '
150 '    SOUND
160 SOUND180,3:RETURN
170 '    BILL BARDEN'S GEE WHIZ
INPUT ROUTINE
180 PRINT@ZC,ZA$;:ZF=LEN(ZA$)
190 PRINT@ZC,CHR$(32);CHR$(8);
200 GOSUB160
210 ZG=1
220 ZH$=INKEY$:IFZH$=""GOTO220
230 IFZH$>CHR$(31)GOTO 290
240 IFZH$<>CHR$(8)GOTO270
250 IFZG=1GOTO220ELSEPRINTCHR$(8
);
260 ZG=ZG-1:GOTO220
270 IFZH$<>CHR$(13)GOTO290
280 PRINT@ZC,ZA$:RETURN
290 ZG=ZG+1
300 IF ZG>ZF+1 THENPRINTCHR$(8):
ZG=ZG-1
310 PRINTZH$;
320 ZA$=LEFT$(ZA$,(ZG-2))+ZH$
330 GOTO220
340 '    PRINT MAIN FORM
350 LA$="LOAN ANALYSIS"
360 PRINTTAB(16-(LEN(LA$)/2));LA
$
370 AA$="LOAN AMOUNT:":AB$="ANNU
AL % INTEREST:":AC$="ANNUAL COMP
OUND:"
380 AD$="TERM IN MONTHS:":AE$="M
ONTHLY PAYMENTS=":AF$="TOTAL INT
EREST="
390 PRINT@104,AA$:PRINT@130,AB$:
PRINT@164,AC$:PRINT@197,AD$:PRIN
T@259,AE$:PRINT@325,AF$
400 RETURN
410 '    REVERSE INPUT FIELD
420 ZA$=CHR$(128)
430 FORX=1TON:ZA$=ZA$+CHR$(128):
NEXTX
440 RETURN
450 '    MAIN ROUTINE
460 CLS:GOSUB350:ZC=117:N=10:GOS
UB420:GOSUB180:P1=VAL(ZA$)
470 ZC=149:N=4:GOSUB420:GOSUB180
:J=VAL(ZA$)
480 ZC=181:N=3:GOSUB420:GOSUB180
:C=VAL(ZA$)
490 ZC=213:N=5:GOSUB420:GOSUB180
:M=VAL(ZA$)
500 J=J/100
510 YX=1+J/C:YY=C/12
520 GOSUB930:I=YP-1
530 YZ=1/(1+I):Z1=YZ
540 FOR X=1TO M-1:YZ=YZ*Z1:NEXT
550 P3=P1*I/(1-YZ)
560 ZZ$=STR$(P3):GOSUB1030
570 PRINT@277,"$";ZZ$
580 P4=P3*M-P1
590 ZZ$=STR$(P4):GOSUB1030
600 PRINT@341,"$";ZZ$
610 AT$="PAYMENT SCHEDULE (Y/N)"
620 PRINT@(432-(LEN(AT$)/2)),AT$
630 GOSUB160
640 AZ$=INKEY$:IFAZ$=""GOTO640
650 IF AZ$="N" THEN GOTO860
660 '    AMORTIZATION SCHEDULE
670 CN=1:CT=12:PR=P1
680 PS$=" PMT     INTEREST     PRI
NCIPAL"
690 CLS:PRINT PS$:PRINT
700 IF(M-CT)<0 THEN CT=M
710 FOR Y=CN TO CT
720 PN$=STR$(Y):IR=PR*I:IR$=STR$
(IR):PR=PR-(P3-IR)
730 IF PR<0 THEN PR$="0.00":GOTO
 750
740 PR$=STR$(PR)
750 PRINTTAB(3-(LEN(PN$)/2))PN$;
760 ZZ$=IR$:GOSUB1030:IR$=ZZ$:PR
INTTAB(11-X+2)IR$;
770 ZZ$=PR$:GOSUB1030:PR$=ZZ$:PR
INTTAB(24-X+2)PR$
780 NEXT Y
790 AT$="DO YOU WISH TO CONTINUE
 (Y/N)"
800 PRINT@(464-(LEN(AT$)/2)),AT$
810 GOSUB160
820 AZ$=INKEY$:IF AZ$="" THEN 82
0
830 IF AZ$="N" THEN 860
840 CN=CN+12:CT=CT+12
850 IF CN<=M THEN680
860 CLS:PRINT@258,"I'M DONE ! WA
NT TO GO AGAIN ?"
870 FORX=1TO5:GOSUB160:NEXTX
880 ZZ$=INKEY$:IF ZZ$="" THEN 88
0
890 IF ZZ$<>"Y" THEN END ELSE GO
TO460
900 END
910 '    YX TO POWER YY=YP
920 '    USES SUB FOR LOGE
930 GOSUB980
940 Y1=YY*YB:Y2=Y1*Y1/2:Y3=Y1*Y1
*Y1/6:Y4=Y1*Y1*Y1*Y1/24
950 Y5=Y1*Y1*Y1*Y1*Y1/120:Y6=Y1*
Y1*Y1:Y6=Y6*Y6/720
960 YP=1+Y1+Y2+Y3+Y4+Y5+Y6:RETUR
N
970 '    FINDS YB=LOGE(YX)
980 YA=YX-1
990 Y1=YA:Y2=YA*YA/2:Y3=YA*YA*YA
/3:Y4=YA*YA*YA*YA/4
1000 Y5=YA*YA*YA*YA*YA/5:Y6=YA*Y
A*YA:Y6=Y6*Y6/6
1010 YB=Y1-Y2+Y3-Y4+Y5-Y6:RETURN
1020 '    PRINT USING SUBROUTINE
1030 X=1:YX=0
1040 IF MID$(ZZ$,X,1)<>"." THEN
X=X+1:IF X>9 THEN1080 ELSE 1040
1050 IF MID$(ZZ$,X+3,1)>"4" THEN
 YX=.01:ZZ=VAL(LEFT$(ZZ$,X+2))+Y
X:ZZ$=STR$(ZZ)
1060 IF LEN(ZZ$)<X THEN ZZ$=ZZ$+
".00"
1070 IF LEN(ZZ$)<(X+2) THEN ZZ$=
ZZ$+"0"
1080 ZZ$=LEFT$(ZZ$,X+2):RETURN
```

Program Listing 1. Loan Analysis in 4K

END

- Line 350 contains a subroutine that prints the main form on the screen.
- Lines 460–650 contain the main routine.
- Lines 670–900 print the amortization schedule, 12 months to a screen.
- Line 1030 contains a subroutine that rounds off each calculated dollar value to two decimal places before that value is printed.

It might be a good idea to look at that subroutine in some detail, because it is an excellent example of the capabilities of the string commands LEFT$ and MID$:

- Before the calculated dollar value enters the subroutine at 1030, the program must make the number equal to the dummy string ZZ$. Line 1030 simply initializes the counter variable X and the roundoff variable YX.
- Line 1040 compares each character of the string ZZ$ with the decimal point.
- Once it finds the decimal point, line 1050 checks the third digit after the decimal to see if it is greater than four. If it is, this line adds .01 to the number by converting ZZ$ back to a number ZZ, adding .01, and converting back to a string again.
- Lines 1060 and 1070 add the proper number of zeros if the original number was an even number of dollars or dimes.
- Line 1080 then removes the numbers past the second decimal place and returns. ■

Address correspondence to Richard Tucker, 168 Oxford St., Woodstock, Ontario, Canada N4S 6B1.

Delete all REMS and REM Apostrophes
Change line 250 to read IF ZG = 1 GOTO 220
Add line 255 PRINT CHR$(8);
Change line 1040 to read IF MID$(ZZ$,X,1) <>"." THEN X = X + 1:GOTO 1045
Add line 1043 GOTO 1050
Add line 1045 IF X>9 THEN 1080
Add line 1047 GOTO 1040

Program Listing 2. Changes to Run on the MC-10

key. If it is pressed, they return to the main program with ZA$ equal to the characters pressed.

- Lines 290 and 300 check to see if the string length has exceeded the allowable maximum. If it has, the program substitutes a backspace for the character typed.
- Line 310 prints the character typed.
- Line 320 adds that character to the string.

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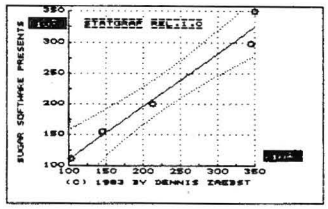

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BY MARK D. GOODWIN

JOURNEY TO THE CENTER OF THE ROM—PART III

Now you can disassemble the Color Basic ROM and make your own source-code listing—even in 4K.

I'm devoting this month's article to the 6809 disassembler that appears in the accompanying Program Listing. This single-pass disassembler is written in position-independent code and will run on all versions of the Color Computer.

Assembling the Program

You can assemble this program with any editor/assembler. Simply type it in as it appears in the listing. I used an SDS 80C Micro editor/assembler. If you use Radio Shack's Editor/Assembler be sure to change the @ characters in the Label field to characters that are acceptable. You must also double check for typos before attempting to assemble it. There are a lot of data items, and one little typo could cause enormous problems.

Readers with a disk-based Color Computer system must change the ORG in line 2 from $600 to $1000 before assembling the program; otherwise, the disassembler will overlay the disk communications area and a crash will result.

Running the Program

Once you've correctly assembled the program, you can make your own source-code listing of the Color Basic ROM. If your machine has at least 16K of RAM, you should follow the normal procedures for loading and executing a machine-language program.

Because the disassembler uses almost all of the available memory on a 4K computer, it will overlay the stack area while loading. This will cause the Color Basic CLOADM routine to crash. To avoid this, use the following procedure with 4K machines to correctly load and execute the disassembler:

- Turn on the computer.
- Position the cassette recorder to the disassembler program.
- Press the play button on the cassette recorder.
- Type CLEAR0 and press enter.
- Type CLOADM and press enter.
- The disassembler program should now load.
- If it doesn't, repeat the above six steps until it does.
- Press the stop button on the cassette recorder.
- Type EXEC and press enter.
- Now the disassember program should be functioning properly.

Once you've loaded and executed the disassembler, a prompt will signal you to enter the starting address. Because the Color Basic ROM begins at memory location $A000, you should type A000 and press enter. The disassembler will now ask if you want to send the output to a printer. If so, press the Y (yes) key. If not, press the N (no) key.

The disassembler will now disassemble the Color Basic ROM. If you are

System Requirements

4K RAM
Editor/Assembler

using a printer, the disassembler will print 60 lines per page and then pause at the end of each page. If you are not using a printer, the disassembler will display 16 lines and then pause.

If you want the disassembly of the Color Basic ROM to continue, press any key except break. If you do not want the disassembly to continue, press break.

Looking Ahead

Next month I will present explanations for all the locations in the Basic communications area. After that, I will start the actual line-by-line commenting of the Color Basic ROM.

There will be no accompanying text with next month's installment. I believe that the material in future installments of the series is self-explanatory. However, should you have a specific question about any of the material in this series please feel free to write me. ■

Contact Mark Goodwin at Star Route 79, Box 103, Orland, ME 04472.

Program Listing. 6809 Disassembler

```
0001 0600
                        *
                        * 6809 Disassembler V1.0
                        * By Mark D. Goodwin
                        *
0002 0600                       ORG $600
0003 0600 10EF8D04CB    ST      STS STACK,PCR   Save stack.
0004 0605 6F8D04C5              CLR CRT,PCR     Flag video.
0005 0609 6F8D0965              CLR NL,PCR      Zero # lines.
0006 060D BDA928                JSR $A928       Clear the screen.
0007 0610 308D046D              LEAX M1,PCR     Point to message.
0008 0614 17042F                LBSR DISM       Display message.
0009 0617 BDA390                JSR $A390       Get the input.
0010 061A 25E4                  BCS ST          Loop if BREAK pressed.
0011 061C 3001                  LEAX 1,X        Bump input pointer.
0012 061E A684                  LDA ,X          Get the character.
0013 0620 27DE                  BEQ ST          Loop if no input.
0014 0622 6FE2                  CLR ,-S         Zero the result.
0015 0624 6FE2                  CLR ,-S
0016 0626 A680          A@      LDA ,X+         Get the character.
0017 0628 8030                  SUBA #$30       Check for < 0.
0018 062A 251C                  BLO D@          Jump if it's < 0.
0019 062C 8109                  CMPA #9         Check for <= 9.
0020 062E 2308                  BLS B@          Jump if it's <= 9.
0021 0630 8007                  SUBA #7         Check for < A.
0022 0632 2514                  BLO D@          Jump if it's < A.
0023 0634 810F                  CMPA #15        Check for > F.
0024 0636 2210                  BHI D@          Jump if it's > F.
0025 0638 48            B@      ASLA            Shift the binary value.
0026 0639 48                    ASLA
0027 063A 48                    ASLA
0028 063B 48                    ASLA
0029 063C C604                  LDB #4          B=Number of shifts.
0030 063E 48            C@      ASLA            Shift into Carry.
0031 063F 6961                  ROL 1,S         Shift into result.
0032 0641 69E4                  ROL ,S          Shift result.
0033 0643 5A                    DECB            Loop till
0034 0644 26F8                  BNE C@          result shifted.
0035 0646 20DE                  BRA A@          Loop till non-hex digit.
0036 0648 EEE1          D@      LDU ,S++        U=Starting address.
0037 064A 308D0471              LEAX M2,PCR     Point to message.
0038 064E 1703F5                LBSR DISM       Display message.
0039 0651 AD9FA000      E@      JSR [$A000]     Wait till
0040 0655 27FA                  BEQ  E@         key pressed.
0041 0657 8159                  CMPA #'Y        Check for Y.
0042 0659 2709                  BEQ F@          Jump if it's a Y.
0043 065B 814E                  CMPA #'N        Check for N.
0044 065D 26F2                  BNE E@          Loop if it's not a N.
0045 065F BDA928                JSR $A928       Clear the screen.
0046 0662 2061                  BRA L@          Jump.
0047 0664 6C8D0466      F@      INC CRT,PCR     Flag printer.
0048 0668 86FE                  LDA #-2         A=Printer device code.
0049 066A 976F                  STA <$006F      Save device code.
0050 066C 17009A                LBSR N@         Do 3 carriage returns.
0051 066F 2054                  BRA L@          Jump.
0052 0671 A68D08FD      LOOP    LDA NL,PCR      Get # lines.
0053 0675 4C                    INCA            Bump # lines.
0054 0676 A78D08F8              STA NL,PCR      Save # lines.
0055 067A 6D8D0450              TST CRT,PCR     Check for printer.
0056 067E 2621                  BNE I@          Jump if printer.
0057 0680 8110                  CMPA #16        Check for 16 lines.
0058 0682 2638                  BNE K@          Jump if not 16 lines.
0059 0684 6F8D08EA              CLR NL,PCR      Zero # lines.
0060 0688 AD9FA000      G@      JSR [$A000]     Wait till
0061 068C 27FA                  BEQ G@          key pressed.
0062 068E 8103                  CMPA #3         Check for BREAK.
0063 0690 2705                  BEQ H@          Jump if BREAK pressed.
0064 0692 BDA928                JSR $A928       Clear the screen.
0065 0695 202E                  BRA L@          Jump.
```

Listing continued

See List of Advertisers on page 131

Listing continued

```
0066 0697 10EE8D0434  H@    LDS STACK,PCR   Get stack.
0067 069C 0F6F              CLR <$006F      Video=Output device.
0068 069E 16FF5F            LBRA ST         Start over.
0069 06A1 813C        I@    CMPA #60        Check for 60 lines.
0070 06A3 261A              BNE K@          Jump if not 60 lines.
0071 06A5 6F8D08C9          CLR NL,PCR      Zero # lines.
0072 06A9 8D5E              BSR N@          Do 3 carriage returns.
0073 06AB 860D              LDA #13         A=Carriage return.
0074 06AD AD9FA002          JSR [$A002]     Print it.
0075 06B1 AD9FA000    J@    JSR [$A000]     Wait till
0076 06B5 27FA              BEQ J@          key pressed.
0077 06B7 8103              CMPA #3         Check for BREAK.
0078 06B9 27DC              BEQ H@          Jump if BREAK pressed.
0079 06BB 8D4C              BSR N@          Do 3 carriage returns.
0080 06BD 2006              BRA L@          Jump.
0081 06BF 860D        K@    LDA #13         A=Carriage return.
0082 06C1 AD9FA002          JSR [$A002]     Display it.
0083 06C5 17031C      L@    LBSR DISW       Display address.
0084 06C8 6F8D0403          CLR SPACE,PCR   Zero spaces.
0085 06CC 6F8D089B          CLR FLG16,PCR   Flag no 16-bit.
0086 06D0 170327            LBSR D4         Display hex value.
0087 06D3 8110              CMPA #$10       Check for 16-bit.
0088 06D5 2714              BEQ M@          Jump if 16-bit opcode.
0089 06D7 8111              CMPA #$11       Check for 16-bit.
0090 06D9 2710              BEQ M@          Jump if 16-bit opcode.
0091 06DB 8D38              BSR TABJMP      Disassemble opcode.
0092 06DD 308D064D          LEAX O2,PCR     Point to message.
0093 06E1 170349            LBSR DIS1       Display message.
0094 06E4 A65F              LDA -1,U        A=FCB value.
0095 06E6 17032A            LBSR D1         Display hex value.
0096 06E9 2086              BRA LOOP
0097 06EB 800F        M@    SUBA #$F        Mask prebyte.
0098 06ED A78D087A          STA FLG16,PCR   Save prebyte.
0099 06F1 170306            LBSR D4         Display hex value.
0100 06F4 8D1F              BSR TABJMP      Disassemble opcode.
0101 06F6 308D0664    WO    LEAX O7,PCR     Point to message.
0102 06FA 170330            LBSR DIS1       Display message.
0103 06FD 3440              PSHS U          Save memory pointer.
0104 06FF EE5E              LDU -2,U        U=FDB value.
0105 0701 1702D8            LBSR DIS2       Display hex value.
0106 0704 3540              PULS U          Get memory pointer.
0107 0706 16FF68            LBRA LOOP
0108 0709 860D        N@    LDA #13         A=Carriage return.
0109 070B C603              LDB #3          Number of times.
0110 070D AD9FA002    O@    JSR [$A002]     Display CR.
0111 0711 5A                DECB            Loop till
0112 0712 26F9              BNE  O@         done.
0113 0714 39                RTS

0114 0715 3402        TABJMP PSHS A         Save opcode.
0115 0717 6FE2               CLR ,-S        Zero the offset.
0116 0719 6FE2               CLR ,-S
0117 071B 308D03B5           LEAX EXGTAB,PCR Start of table.
0118 071F 6D8D0848    A@     TST FLG16,PCR  Check 16-bit.
0119 0723 2628               BNE E@         Jump if 16-bit opcode.
0120 0725 EC81        B@     LDD ,X++       Get opcode.
0121 0727 1083FFFF           CMPD #$FFFF    Check table end.
0122 072B 2716               BEQ D@         Jump if table end.
0123 072D 8101               CMPA #1        Check 16-bit opcode.
0124 072F 270A               BEQ C@         Jump if 16-bit opcode.
0125 0731 8102               CMPA #2        Check 16-bit opcode.
0126 0733 2706               BEQ C@         Jump if 16-bit opcode.
0127 0735 A162               CMPA 2,S       Check for match.
0128 0737 26EC               BNE B@         Loop if not a match.
0129 0739 2034               BRA G@         Jump if it's a match.
0130 073B EC81        C@     LDD ,X++       Get opcode.
0131 073D 1083FFFF           CMPD #$FFFF    Check table end.
0132 0741 26F8               BNE C@         Loop till end of table.
0133 0743 EC81        D@     LDD ,X++       Get the offset.
0134 0745 EDE4               STD ,S         Save the offset.
0135 0747 26D6               BNE A@         Loop till done.
0136 0749 3262               LEAS 2,S       Clean up the stack.
0137 074B 3582               PULS A,PC      Get opcode & return.
0138 074D EC81        E@     LDD ,X++       Get opcode.
0139 074F 1083FFFF           CMPD #$FFFF    Check table end.
0140 0753 27EE               BEQ D@         Jump if table end.
0141 0755 A18D0812           CMPA FLG16,PCR Check 16-bit.
0142 0759 26F2               BNE E@         Jump if no match.
0143 075B EC81        F@     LDD ,X++       Get opcode.
0144 075D 1083FFFF           CMPD #$FFFF    Check table end.
0145 0761 27E0               BEQ D@         Jump if table end.
0146 0763 8101               CMPA #1        Check for 16-bit.
0147 0765 27E6               BEQ E@         Jump if 16-bit opcode.
0148 0767 8102               CMPA #2        Check for 16-bit.
0149 0769 27E2               BEQ E@         Jump if 16-bit opcode.
0150 076B A162               CMPA 2,S       Check for a match.
0151 076D 26EC               BNE F@         Loop if not a match.
0152 076F 8604        G@     LDA #4         A=Size of messages.
0153 0771 3D                 MUL            D=Message offset.
0154 0772 308D05B4           LEAX O1,PCR    X=Start of messages
0155 0776 308B               LEAX D,X       X=Start of message.
0156 0778 318D0006           LEAY EXGJMP,PCR Y=Routing add.
0157 077C 3506               PULS D         Get jump offset.
0158 077E 3263               LEAS 3,S       Clean up the stack.
0159 0780 6EAB               JMP D,Y        Jump to proper routine.

0160 0782 170271      EXGJMP LBSR D5        Display hex val.
0161 0785 1702A5             LBSR DIS1      Display message.
0162 0788 A6C4               LDA ,U         Get register value.
0163 078A 44                 LSRA           Shift it.
0164 078B 44                 LSRA
0165 078C 44                 LSRA
0166 078D 44                 LSRA
0167 078E 8D0D               BSR A@         Display register.
0168 0790 862C               LDA #',        Display comma.
0169 0792 AD9FA002           JSR [$A002]
0170 0796 A6C0               LDA ,U+        Get register value.
0171 0798 8D03               BSR A@         Display register.
0172 079A 16FED4             LBRA LOOP
0173 079D 840F        A@     ANDA #$0F      Mask register.
0174 079F 308D079F           LEAX REGTAB,PCR Start of table.
0175 07A3 A180        B@     CMPA ,X+       Check for a match.
0176 07A5 1027029D           LBEQ DISM      Display if match.
0177 07A9 3002               LEAX 2,X       Bump table pointer.
0178 07AB 20F6               BRA B@         Loop till match.
0179 07AD 170246      BYTJMP LBSR D5        Display hex.
0180 07B0 17027A             LBSR DIS1      Display message.
0181 07B3 8623               LDA #'#        Display #.
0182 07B5 AD9FA002           JSR [$A002]
0183 07B9 17023E             LBSR D4        Display hex value.
0184 07BC 16FEB2             LBRA LOOP
0185 07BF ECC1        EXTJMP LDD ,U++       Get hex value.
0186 07C1 17020F             LBSR BIT16     Display hex value.
0187 07C4 170266             LBSR DIS1      Display message.
0188 07C7 EC5E               LDD -2,U       Get hex value.
0189 07C9 170207             LBSR BIT16     Display hex value.
0190 07CC 16FEA2             LBRA LOOP

0191 07CF AF8D079D    INDJMP STX I3,PCR     Save message.
0192 07D3 6F8D0795           CLR PS,PCR     Zero + flag.
```

Listing continued

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```
0193 07D7 6F8D0792          CLR MS,PCR      Zero - flag.
0194 07DB 17021C            LBSR D4         Display hex value.
0195 07DE A78D078C          STA I1,PCR      Save value.
0196 07E2 1F89              TFR A,B         Put it in B.
0197 07E4 C460              ANDB #$60       Mask register value.
0198 07E6 E78D0785          STB I2,PCR      Save register value.
0199 07EA 318D0786          LEAY MESS1,PCR  Point to buffer.
0200 07EE 4D                TSTA            Check bit 7.
0201 07EF 2B11              BMI B@          JMP if no offset from R.
0202 07F1 841F              ANDA #$1F       Mask offset.
0203 07F3 8510              BITA #$10       Check for positive.
0204 07F5 2705              BEQ A@          Jump if positive.
0205 07F7 8AF0              ORA #$F0        Make it negative.
0206 07F9 170202            LBSR D3         Make it positive.
0207 07FC 170209      A@    LBSR D2         Save hex value.
0208 07FF 1600A9            LBRA S@
0209 0802 8510        B@    BITA #$10       Check for direct.
0210 0804 2704              BEQ C@          Jump if direct.
0211 0806 C65B              LDB #'[         Save indirect char.
0212 0808 E7A0              STB ,Y+
0213 080A 840F        C@    ANDA #$F        Mask address byte.
0214 080C 3402              PSHS A          Save it.
0215 080E 308D00E6          LEAX INDJTB,PCR Start of table.
0216 0812 48                ASLA            Shift address byte.
0217 0813 3086              LEAX A,X        Point to offset.
0218 0815 EC84              LDD ,X          D=Offset.
0219 0817 308DFEDB          LEAX WO,PCR     Point to start.
0220 081B 308B              LEAX D,X        Point to routine.
0221 081D 3502              PULS A          Get address byte.
0222 081F 6E84              JMP ,X          Jump to proper routine.
0223 0821 1701D2      D@    LBSR D5         Display hex value.
0224 0824 1701CB            LBSR D6         Display hex value.
0225 0827 ECC1              LDD ,U++        Get address.
0226 0829 1701D8            LBSR STS2       Save address.
0227 082C 1600A8            LBRA X@
0228 082F 1701C4      E@    LBSR D5         Display hex value.
0229 0832 A6C0              LDA ,U+         Get offset.
0230 0834 2A03              BPL F@          Jump if positive.
0231 0836 1701C5            LBSR D3         Make it positive.
0232 0839 1701CC      F@    LBSR D2         Save hex value.
0233 083C 16006C            LBRA S@
0234 083F 1701B4      G@    LBSR D5         Display hex value.
0235 0842 1701AD            LBSR D6         Display hex value.
0236 0845 ECC1              LDD ,U++        Get offset.
0237 0847 2A0D              BPL H@          Jump if positive.
0238 0849 3404              PSHS B          Save LSB.
0239 084B C62D              LDB #'-         Save a -.
0240 084D E7A0              STB ,Y+
0241 084F 3504              PULS B          Get LSB.
0242 0851 43                COMA            Make it positive.
0243 0852 53                COMB
0244 0853 C30001            ADDD #1
0245 0856 1701AB      H@    LBSR STS2       Save hex value.
0246 0859 2050              BRA S@
0247 085B 8641        I@    LDA #'A         Register value.
0248 085D A7A0              STA ,Y+         Save register value.
0249 085F 204A              BRA S@
0250 0861 8642        J@    LDA #'B         Register value.
0251 0863 A7A0              STA ,Y+         Save register value.
0252 0865 2044              BRA S@
0253 0867 8644        K@    LDA #'D         Register value.
0254 0869 A7A0              STA ,Y+         Save register value.
0255 086B 203E              BRA S@
0256 086D 6C8D06FB    L@    INC PS,PCR      Bump + flag.
0257 0871 6C8D06F7    M@    INC PS,PCR      Bump + flag.
0258 0875 2034              BRA S@
0259 0877 6C8D06F2    N@    INC MS,PCR      Bump - flag.
0260 087B 6C8D06EE    O@    INC MS,PCR      Bump - flag.
0261 087F 202A              BRA S@
0262 0881 170172      P@    LBSR D5         Display hex value.
0263 0884 E6C0              LDB ,U+         Get offset.
0264 0886 1D                SEX             D=Offset.
0265 0887 3440        Q@    PSHS U          Save memory pointer.
0266 0889 E3E1              ADDD ,S++       Add memory pointer.
0267 088B 170176            LBSR STS2       Save hex value.
0268 088E 862C              LDA #',         Save a comma.
0269 0890 A7A0              STA ,Y+
0270 0892 8650              LDA #'P         Save PCR message.
0271 0894 A7A0              STA ,Y+
0272 0896 8643              LDA #'C
0273 0898 A7A0              STA ,Y+
0274 089A 8652              LDA #'R
0275 089C A7A0              STA ,Y+
0276 089E 160036            LBRA X@
0277 08A1 170152      R@    LBSR D5         Display hex value.
0278 08A4 17014B            LBSR D6         Display hex value.
0279 08A7 ECC1              LDD ,U++        D=Offset.
0280 08A9 20DC              BRA Q@
0281 08AB 862C        S@    LDA #',         Save a comma.
0282 08AD A7A0              STA ,Y+
0283 08AF 862D              LDA #'-
0284 08B1 6A8D06B8    T@    DEC MS,PCR      Check - flag.
0285 08B5 2B04              BMI U@          Jump if no -.
0286 08B7 A7A0              STA ,Y+         Save a -.
0287 08B9 20F6              BRA T@          Loop till done.
0288 08BB A68D06B0    U@    LDA I2,PCR      Get register val.
0289 08BF 308D0055          LEAX INDTB1,PCR Start of table.
0290 08C3 A181        V@    CMPA ,X++       Check for match.
0291 08C5 26FC              BNE V@          Loop if no match.
0292 08C7 A61F              LDA -1,X        Get register.
0293 08C9 A7A0              STA ,Y+         Save it.
0294 08CB 862B              LDA #'+
0295 08CD 6A8D069B    W@    DEC PS,PCR      Check + flag.
0296 08D1 2B04              BMI X@          Jump if no +.
0297 08D3 A7A0              STA ,Y+         Save a +.
0298 08D5 20F6              BRA W@          Loop till done.
0299 08D7 A68D0693    X@    LDA I1,PCR      Get address value.
0300 08DB 2A08              BPL Y@          Jump if direct.
0301 08DD 8510              BITA #$10
0302 08DF 2704              BEQ Y@
0303 08E1 865D              LDA #']         Save indirect char.
0304 08E3 A7A0              STA ,Y+
0305 08E5 6FA0        Y@    CLR ,Y+         Flag end of message.
0306 08E7 AE8D0685          LDX I3,PCR      Get message.
0307 08EB 17013F            LBSR DIS1       Display message.
0308 08EE 308D0682          LEAX MESS1,PCR  Start of buffer.
0309 08F2 170151            LBSR DISM       Display buffer.
0310 08F5 16FD79            LBRA LOOP
0311 08F8 017B0177    INDJTB FDB M@-WO,L@-WO
0312 08FC 01850181           FDB O@-WO,N@-WO
0313 0900 01B5016B           FDB S@-WO,J@-WO
0314 0904 0165000001         FDB I@-WO,0,E@-WO
0315 090A 0149000001         FDB G@-WO,0,K@-WO
0316 0910 018B01AB           FDB P@-WO,R@-WO
0317 0914 0000012B           FDB 0,D@-WO
0318 0918 005B2059    INDTB1 FCB 0,'X,$20,'Y
0319 091C 40556053           FCB $40,'U,$60,'S
0320 0920 1700D3      DIRJMP LBSR D5         Display hex.
0321 0923 170107             LBSR DIS1       Display message.
0322 0926 863C               LDA #'<         Display <.
```

Listing continued.

Listing continued

```
0323 092B AD9FA002          JSR [$A002]
0324 092C 1FB8              TFR DP,A        Get DP value.
0325 092E 1700E2            LBSR D1         Display hex value.
0326 0931 1700C6            LBSR D4         Display hex value.
0327 0934 16FD3A            LBRA LOOP
0328 0937 ECC1      IMMJMP  LDD ,U++        Get address.
0329 0939 3440              PSHS U          Save memory pointer.
0330 093B 1F03              TFR D,U         U=Address.
0331 093D 17009C            LBSR DIS2       Display hex value.
0332 0940 3540              PULS U          Get memory pointer.
0333 0942 1700E8            LBSR DIS1       Display message.
0334 0945 EC5E              LDD -2,U        Get address.
0335 0947 17007F            LBSR BIT16I     Display hex value.
0336 094A 16FD24            LBRA LOOP
0337 094D 1700DD    INHJMP  LBSR DIS1       Display mess.
0338 0950 16FD1E            LBRA LOOP

0339 0953 1700A4    BRAJMP  LBSR D4         Display hex.
0340 0956 1700D4            LBSR DIS1       Display message.
0341 0959 E65F              LDB -1,U        Get offset.
0342 095B 1D                SEX             D=Offset.
0343 095C 2010              BRA A@
0344 095E ECC1      LBRJMP  LDD ,U++        Get offset.
0345 0960 3440              PSHS U          Save memory pointer.
0346 0962 1F03              TFR D,U         U=Offset.
0347 0964 170075            LBSR DIS2       Display hex value.
0348 0967 3540              PULS U          Get memory pointer.
0349 0969 1700C1            LBSR DIS1       Display message.
0350 096C EC5E              LDD -2,U        Get offset.
0351 096E 3440      A@      PSHS U          Save memory pointer.
0352 0970 E3E1              ADDD ,S++       Add memory pointer.
0353 0972 17005E            LBSR BIT16      Display hex value.
0354 0975 16FCF9            LBRA LOOP

0355 0978 17007F    PSHJMP  LBSR D4         Display hex.
0356 097B 1700AF            LBSR DIS1       Display message.
0357 097E EC5E              LDD -2,U        Get opcode.
0358 0980 318D05DC          LEAY PSHTB,PCR  Start of table.
0359 0984 308D05EC          LEAX MESS1,PCR  Start of buffer.
0360 0988 8134              CMPA #$34       Check for PSHS.
0361 098A 2708              BEQ A@          Jump IF PSHS.
0362 098C 8135              CMPA #$35       Check for PULS.
0363 098E 2704              BEQ A@          Jump if PULS.
0364 0990 86D3              LDA #'S+$80     Register character.
0365 0992 2002              BRA B@
0366 0994 86D5      A@      LDA #'U+$80     Register char.
0367 0996 A728      B@      STA 8,Y         Save register char.
0368 0998 8601              LDA #1          Bit value.
0369 099A 2005              BRA D@
0370 099C 3502      C@      PULS A          Get bit value.
0371 099E 48                ASLA            Shift it.
0372 099F 251C              BCS G@          Jump if done.
0373 09A1 3402      D@      PSHS A          Save bit value.
0374 09A3 A6A0      E@      LDA ,Y+         Get character.
0375 09A5 2B08              BMI F@          Jump if character.
0376 09A7 E5E4              BITB ,S         Check for match.
0377 09A9 27F8              BEQ E@          Jump if no match.
0378 09AB A780              STA ,X+         Save character.
0379 09AD 20F4              BRA E@          Loop till register done.
0380 09AF B47F      F@      ANDA #$7F       Mask character.
0381 09B1 E5E4              BITB ,S         Check for match.
0382 09B3 27E7              BEQ C@          Loop if no match.
0383 09B5 A780              STA ,X+         Save character.
0384 09B7 862C              LDA #',         Save a comma.
0385 09B9 A780              STA ,X+
0386 09BB 20DF              BRA C@          Loop till done.
0387 09BD 6F82      G@      CLR ,-X         Flag end of message.
0388 09BF 308D05B1          LEAX MESS1,PCR  Start of buffer.
0389 09C3 170080            LBSR DISM       Display buffer.
0390 09C6 16FCA8            LBRA LOOP
0391 09C9 3402      BIT16I  PSHS A          Save MSB.
0392 09CB 8623              LDA #'#         Display a #.
0393 09CD AD9FA002          JSR [$A002]
0394 09D1 3502              PULS A          Get MSB.
0395 09D3 3440      BIT16   PSHS U          Save U.
0396 09D5 1F03              TFR D,U         Binary value to U.
0397 09D7 8D03              BSR DIS2        Display hex value.
0398 09D9 3540              PULS U          Get U.
0399 09DB 39                RTS
0400 09DC 1F30      DIS2    TFR U,D         Binary value to D.
0401 09DE 8D33              BSR D1          Display MSB.
0402 09E0 1F98              TFR B,A         Get LSB.
0403 09E2 202F              BRA D1          Display LSB.
0404 09E4 8DF6      DISW    BSR DIS2        Display 16-bit.
0405 09E6 863A              LDA #':         Display a :.
0406 09E8 AD9FA002          JSR [$A002]
0407 09EC 8620      SPA     LDA #32         Display a space.
0408 09EE 6E9FA002          JMP [$A002]
0409 09F2 A641      D6      LDA 1,U         Get binary value.
0410 09F4 201D              BRA D1          Display hex value.
0411 09F6 A6C4      D5      LDA ,U          Get binary value.
0412 09F8 2019              BRA D1          Display hex value.
0413 09FA A6C0      D4      LDA ,U+         Get binary value.
0414 09FC 2015              BRA D1          Display hex value.
0415 09FE C62D      D3      LDB #'-         Save a -.
0416 0A00 E7A0              STB ,Y+
0417 0A02 40                NEGA            Make it positive.
0418 0A03 39                RTS
0419 0A04 8D02      STS2    BSR D2          Save hex value.
0420 0A06 1F98              TFR B,A         Get LSB.
0421 0A08 8D4F      D2      BSR HEX         Convert to hex.
0422 0A0A A6E0              LDA ,S+         Get hex digit.
0423 0A0C A7A0              STA ,Y+         Save hex digit.
0424 0A0E A6E0              LDA ,S+         Get hex digit.
0425 0A10 A7A0              STA ,Y+         Save hex digit.
0426 0A12 39                RTS
0427 0A13 6C8D00B8  D1      INC SPACE,PCR   Bump # spaces.
0428 0A17 6C8D00B4          INC SPACE,PCR   Bump # spaces.
0429 0A1B 3402              PSHS A          Save binary value.
0430 0A1D 8D3A              BSR HEX         Convert to hex.
0431 0A1F A6E0              LDA ,S+         Get hex digit.
0432 0A21 AD9FA002          JSR [$A002]     Display it.
0433 0A25 A6E0              LDA ,S+         Get hex digit.
0434 0A27 AD9FA002          JSR [$A002]     Display it.
0435 0A2B 3582              PULS A,PC       Get A & return.

0436 0A2D E68D009E  DIS1    LDB SPACE,PCR   Get # spaces.
0437 0A31 50                NEGB            Make it negative.
0438 0A32 CB0B              ADDB #11        Figure # spaces.
0439 0A34 8DB6      A@      BSR SPA         Display a space.
0440 0A36 5A                DECB            Loop till
0441 0A37 26FB              BNE A@          spaces displayed.
0442 0A39 C604              LDB #4          number of characters.
0443 0A3B A680      B@      LDA ,X+         Get a character.
0444 0A3D AD9FA002          JSR [$A002]     Display it.
0445 0A41 5A                DECB            Loop till all
0446 0A42 26F7              BNE B@          characters displayed.
0447 0A44 20A6              BRA SPA         Display a space.
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Listing continued

Listing continued

```
0448 0A46 A680          DISM    LDA ,X+         Get a character.
0449 0A48 2708                  BEQ A@          Jump if done.
0450 0A4A 2B07                  BMI B@          Jump if last character.
0451 0A4C AD9FA002              JSR [$A002]     Display character.
0452 0A50 20F4                  BRA DISM        Loop till done.
0453 0A52 39            A@      RTS
0454 0A53 847F          B@      ANDA #$7F       Mask character.
0455 0A55 6E9FA002              JMP [$A002]     Display character.

0456 0A59 3416          HEX     PSHS D,X        Save D & X.
0457 0A5B EC64                  LDD 4,S         Get return address.
0458 0A5D ED62                  STD 2,S         Save it.
0459 0A5F 3506                  PULS D          Get hex value.
0460 0A61 6F62                  CLR 2,S         Clear a space.
0461 0A63 6F63                  CLR 3,S         Clear a space.
0462 0A65 3402                  PSHS A          Save value to convert.
0463 0A67 44                    LSRA            Shift it.
0464 0A68 44                    LSRA
0465 0A69 44                    LSRA
0466 0A6A 44                    LSRA
0467 0A6B 8D0B                  BSR A@          Convert to ASCII.
0468 0A6D A763                  STA 3,S         Save hex digit.
0469 0A6F 3502                  PULS A          Get value to convert.
0470 0A71 840F                  ANDA #$F        Mask it.
0471 0A73 8D03                  BSR A@          Convert to ASCII.
0472 0A75 A763                  STA 3,S         Save hex digit.
0473 0A77 39                    RTS
0474 0A78 8109          A@      CMPA #9         Check for <= 9.
0475 0A7A 2302                  BLS B@          Jump if it's <= 9.
0476 0A7C 8B07                  ADDA #7         Adjust for A - F.
0477 0A7E 8B30          B@      ADDA #$30       Make it ASCII.
0478 0A80 39                    RTS
0479 0A81 3638303920    M1      FCC "6809 DISASM V1.0
0480 0A91 0D                    FCB 13
0481 0A92 4259204D41            FCC "BY MARK D. GOODWIN
0482 0AA4 0D0D                  FCB 13,13
0483 0AA6 454E544552            FCC "ENTER STARTING ADDRE
0484 0ABA 53533A20              FCC "SS: "
0485 0ABE 00                    FCB 0
0486 0ABF 5052494E54    M2      FCC "PRINTER (Y/N)?
0487 0ACD 00                    FCB 0
0488 0ACE 00            CRT     FCB 0
0489 0ACF 00            SPACE   FCB 0
0490 0AD0 0000          STACK   FDB 0
0491 0AD2 0000          POS     FDB 0
0492 0AD4 1E2E1F2F      EXGTAB  FDB $1E2E,$1F2F
0493 0AD8 FFFF01F6              FDB $FFFF,PSHJMP-EXGJMP
0494 0ADC 3444354536    PSHTAB  FDB $3444,$3545,$3646
0495 0AE2 3747                  FDB $3747
0496 0AE4 FFFF01D1              FDB $FFFF,BRAJMP-EXGJMP
0497 0AE8 2030213122    BRATAB  FDB $2030,$2131,$2232
0498 0AEE 2333243425            FDB $2333,$2434,$2535
0499 0AF4 2636273728            FDB $2636,$2737,$2838
0500 0AFA 29392A3A2B            FDB $2939,$2A3A,$2B3B
0501 0B00 2C3C2D3D2E            FDB $2C3C,$2D3D,$2E3E
0502 0B06 2F3F8D70              FDB $2F3F,$8D70
0503 0B0A FFFF002B              FDB $FFFF,BYTJMP-EXGJMP
0504 0B0E 1A2C1C853C    BYTTAB  FDB $1A2C,$1C85,$3C4B
0505 0B14 8064816582            FDB $8064,$8165,$8266
0506 0B1A 8468856986            FDB $8468,$8569,$866A
0507 0B20 886B896C8A            FDB $886B,$896C,$8A6D
0508 0B26 8B6EC075C1            FDB $8B6E,$C075,$C176
0509 0B2C C277C479C5            FDB $C277,$C479,$C57A
0510 0B32 C67BC87DC9            FDB $C67B,$C87D,$C97E
0511 0B38 CA7FCB80              FDB $CA7F,$CB80
0512 0B3C FFFF003D              FDB $FFFF,EXTJMP-EXGJMP
0513 0B40 7000730274    EXTTAB  FDB $7000,$7302,$7403
0514 0B46 7604770578            FDB $7604,$7705,$7806
0515 0B4C 79077A087C            FDB $7907,$7A08,$7C09
0516 0B52 7D0A7E0B7F            FDB $7D0A,$7E0B,$7F0C
0517 0B58 B064B165B2            FDB $B064,$B165,$B266
0518 0B5E B367B468B5            FDB $B367,$B468,$B569
0519 0B64 B66AB772B8            FDB $B66A,$B772,$B86B
0520 0B6A B96CBA6DBB            FDB $B96C,$BA6D,$BB6E
0521 0B70 BC6FBD73BE            FDB $BC6F,$BD73,$BE71
0522 0B76 BF74F075F1            FDB $BF74,$F075,$F176
0523 0B7C F277F378F4            FDB $F277,$F378,$F479
0524 0B82 F57AF67BF7            FDB $F57A,$F67B,$F77C
0525 0B88 F87DF97EFA            FDB $F87D,$F97E,$FA7F
0526 0B8E FB80FC81FD            FDB $FB80,$FC81,$FD82
0527 0B94 FE83FF8401            FDB $FE83,$FF84,$0100
0528 0B9A B31EBC1FBE            FDB $B31E,$BC1F,$BE20
0529 0BA0 BF21FE22FF            FDB $BF21,$FE22,$FF23
0530 0BA6 0200B325BC            FDB $0200,$B325,$BC26
0531 0BAC FFFF004D              FDB $FFFF,INDJMP-EXGJMP
0532 0BB0 3040314132    INDTAB  FDB $3040,$3141,$3242
0533 0BB6 3343600063            FDB $3343,$6000,$6302
0534 0BBC 6403660467            FDB $6403,$6604,$6705
0535 0BC2 680669076A            FDB $6806,$6907,$6A08
0536 0BC8 6C096D0A6E            FDB $6C09,$6D0A,$6E0B
0537 0BCE 6F0CA064A1            FDB $6F0C,$A064,$A165
0538 0BD4 A266A367A4            FDB $A266,$A367,$A468
0539 0BDA A569A66AA7            FDB $A569,$A66A,$A772
0540 0BE0 AB6BA96CAA            FDB $AB6B,$A96C,$AA6D
0541 0BE6 AB6EAC6FAD            FDB $AB6E,$AC6F,$AD73
0542 0BEC AE71AF74E0            FDB $AE71,$AF74,$E075
0543 0BF2 E176E277E3            FDB $E176,$E277,$E378
0544 0BF8 E479E57AE6            FDB $E479,$E57A,$E67B
0545 0BFE E77CE87DE9            FDB $E77C,$E87D,$E97E
0546 0C04 EA7FEB80EC            FDB $EA7F,$EB80,$EC81
0547 0C0A ED82EE83EF            FDB $ED82,$EE83,$EF84
0548 0C10 0100A31EAC            FDB $0100,$A31E,$AC1F
0549 0C16 AE20AF21EE            FDB $AE20,$AF21,$EE22
0550 0C1C EF230200A3            FDB $EF23,$0200,$A325
0551 0C22 AC26                  FDB $AC26
0552 0C24 FFFF019E              FDB $FFFF,DIRJMP-EXGJMP
0553 0C28 0000030204    DIRTAB  FDB 0,$0302,$0403
0554 0C2E 0604070508            FDB $0604,$0705,$0806
0555 0C34 09070A080C            FDB $0907,$0A08,$0C09
0556 0C3A 0D0A0E0B0F            FDB $0D0A,$0E0B,$0F0C
0557 0C40 9064916592            FDB $9064,$9165,$9266
0558 0C46 9367946895            FDB $9367,$9468,$9569
0559 0C4C 966A977298            FDB $966A,$9772,$986B
0560 0C52 996C9A6D9B            FDB $996C,$9A6D,$9B6E
0561 0C58 9C6F9D739E            FDB $9C6F,$9D73,$9E71
0562 0C5E 9F74D075D1            FDB $9F74,$D075,$D176
0563 0C64 D277D378D4            FDB $D277,$D378,$D479
0564 0C6A D57AD67BD7            FDB $D57A,$D67B,$D77C
0565 0C70 D87DD97EDA            FDB $D87D,$D97E,$DA7F
0566 0C76 DB80DC81DD            FDB $DB80,$DC81,$DD82
0567 0C7C DE83DF8401            FDB $DE83,$DF84,$0100
0568 0C82 931E9C1F9E            FDB $931E,$9C1F,$9E20
0569 0C88 9F21DE22DF            FDB $9F21,$DE22,$DF23
0570 0C8E 0200932 59C           FDB $0200,$9325,$9C26
0571 0C94 FFFF01B5              FDB $FFFF,IMMJMP-EXGJMP
0572 0C98 83678C6F8E    IMMTAB  FDB $8367,$8C6F,$8E71
0573 0C9E C378CC81CE            FDB $C378,$CC81,$CE83
0574 0CA4 0100831E8C            FDB $0100,$831E,$8C1F
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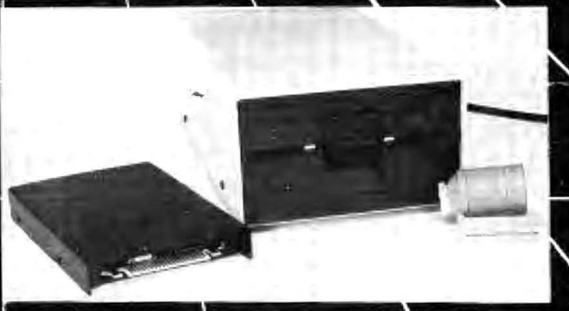

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0575 0CAA 8E20CE2202          FDB $8E20,$CE22,$0200
0576 0CB0 83258C26            FDB $8325,$8C26
0577 0CB4 FFFF01CB            FDB $FFFF,INHJMP-EXGJMP
0578 0CB8 1227132819 INHTAB   FDB $1227,$1328,$192B
0579 0CBE 1D2D39483A          FDB $1D2D,$3948,$3A49
0580 0CC4 3B4A3D4C3F          FDB $3B4A,$3D4C,$3F4D
0581 0CCA 404E434F44          FDB $404E,$434F,$4450
0582 0CD0 4651475248          FDB $4651,$4752,$4853
0583 0CD6 49544A554C          FDB $4954,$4A55,$4C56
0584 0CDC 4D574F5850          FDB $4D57,$4F58,$5059
0585 0CE2 535A545B56          FDB $535A,$545B,$565C
0586 0CE8 575D585E59          FDB $575D,$585E,$595F
0587 0CEE 5A605C615D          FDB $5A60,$5C61,$5D62
0588 0CF4 5F6301003F          FDB $5F63,$0100,$3F1D
0589 0CFA 02003F24            FDB $0200,$3F24
0590 0CFE FFFF01DC            FDB $FFFF,LBRJMP-EXGJMP
0591 0D02 1629172A01 LBRTAB   FDB $1629,$172A,$0100
0592 0D08 210E220F23          FDB $210E,$220F,$2310
0593 0D0E 2411251226          FDB $2411,$2512,$2613
0594 0D14 2714281529          FDB $2714,$2815,$2916
0595 0D1A 2A172B182C          FDB $2A17,$2B18,$2C19
0596 0D20 2D1A2E1B2F          FDB $2D1A,$2E1B,$2F1C
0597 0D26 FFFF0000            FDB $FFFF,0
0598 0D2A 4E454720    01      FCC "NEG "
0599 0D2E 46434220    02      FCC "FCB "
0600 0D32 434F4D20            FCC "COM "
0601 0D36 4C535220            FCC "LSR "
0602 0D3A 524F5220            FCC "ROR "
0603 0D3E 41535220            FCC "ASR "
0604 0D42 41534C20            FCC "ASL "
0605 0D46 524F4C20            FCC "ROL "
0606 0D4A 44454320            FCC "DEC "
0607 0D4E 494E4320            FCC "INC "
0608 0D52 54535420            FCC "TST "
0609 0D56 4A4D5020            FCC "JMP "
0610 0D5A 434C5220            FCC "CLR "
0611 0D5E 46444220    07      FCC "FDB "
0612 0D62 4C42524E            FCC "LBRN
0613 0D66 4C424849            FCC "LBHI
0614 0D6A 4C424C53            FCC "LBLS
0615 0D6E 4C424853            FCC "LBHS
0616 0D72 4C424C4F            FCC "LBLO
0617 0D76 4C424E45            FCC "LBNE
0618 0D7A 4C424551            FCC "LBEQ
0619 0D7E 4C425643            FCC "LBVC
0620 0D82 4C425653            FCC "LBVS
0621 0D86 4C42504C            FCC "LBPL
0622 0D8A 4C424D49            FCC "LBMI
0623 0D8E 4C424745            FCC "LBGE
0624 0D92 4C424C54            FCC "LBLT
0625 0D96 4C424754            FCC "LBGT
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0627 0D9E 53574932            FCC "SWI2
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0630 0DAA 4C445920            FCC "LDY "
0631 0DAE 53545920            FCC "STY "
0632 0DB2 4C445320            FCC "LDS "
0633 0DB6 53545320            FCC "STS "
0634 0DBA 53574933            FCC "SWI3
0635 0DBE 434D5055            FCC "CMPU
0636 0DC2 434D5053            FCC "CMPS
0637 0DC6 4E4F5020            FCC "NOP "
0638 0DCA 53594E43            FCC "SYNC
0639 0DCE 4C425241            FCC "LBRA
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0645 0DE6 54465220            FCC "TFR "
0646 0DEA 42524120            FCC "BRA "
0647 0DEE 42524E20            FCC "BRN "
0648 0DF2 42484920            FCC "BHI "
0649 0DF6 424C5320            FCC "BLS "
0650 0DFA 42485320            FCC "BHS "
0651 0DFE 424C4F20            FCC "BLO "
0652 0E02 424E4520            FCC "BNE "
0653 0E06 42455120            FCC "BEQ "
0654 0E0A 42564320            FCC "BVC "
0655 0E0E 42565320            FCC "BVS "
0656 0E12 42504C20            FCC "BPL "
0657 0E16 424D4920            FCC "BMI "
0658 0E1A 42474520            FCC "BGE "
0659 0E1E 424C5420            FCC "BLT "
0660 0E22 42475420            FCC "BGT "
0661 0E26 424C4520            FCC "BLE "
0662 0E2A 4C454158            FCC "LEAX
0663 0E2E 4C454159            FCC "LEAY
0664 0E32 4C454153            FCC "LEAS
0665 0E36 4C454155            FCC "LEAU
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0667 0E3E 50554C53            FCC "PULS
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0677 0E66 434F4D41            FCC "COMA
0678 0E6A 4C535241            FCC "LSRA
0679 0E6E 524F5241            FCC "RORA
0680 0E72 41535241            FCC "ASRA
0681 0E76 41534C41            FCC "ASLA
0682 0E7A 524F4C41            FCC "ROLA
0683 0E7E 44454341            FCC "DECA
0684 0E82 494E4341            FCC "INCA
0685 0E86 54535441            FCC "TSTA
0686 0E8A 434C5241            FCC "CLRA
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0728 0F32 53544420            FCC "STD "
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0730 0F3A 53545520            FCC "STU "
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0734 0F48 025900              FCB 2,'Y,0
0735 0F4B 035500              FCB 3,'U,0
0736 0F4E 045300              FCB 4,'S,0
0737 0F51 0550C3              FCB 5,'P,'C+$80
0738 0F54 084100              FCB 8,'A,0
0739 0F57 094200              FCB 9,'B,0
0740 0F5A 0A43C3              FCB 10,'C,'C+$80
0741 0F5D 0B44D0              FCB 11,'D,'P+$80
0742 0F60 43C3C1      PSHTB   FCB 'C,'C+$80,'A+$80
0743 0F63 C244D0              FCB 'B+$80,'D,'P+$80
0744 0F66 D8D9D3              FCB 'X+$80,'Y+$80,'S+$80
0745 0F69 50C3                FCB 'P,'C+$80
0746 0F6B 00          FLG16   FCB 0
0747 0F6C 00          PS      FCB 0
0748 0F6D 00          MS      FCB 0
0749 0F6E 00          I1      FCB 0
0750 0F6F 00          I2      FCB 0
0751 0F70 0000        I3      FDB 0
0752 0F72 00          NL      FCB 0
0753 0F73 00                  FCB 0
0754 0F74 0000000000  MESS1   BSZ 32
0755 0F94                     END ST
```

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BIT16  09D3  BIT16I 09C9  BRAJMP 0953  BRATAB 0AE8
BYTJMP 07AD  BYTTAB 0B0E  CRT    0ACE  D1     0A13
D2     0A08  D3     09FE  D4     09FA  D5     09F6
D6     09F2  DIRJMP 0920  DIRTAB 0C28  DIS1   0A2D
DIS2   09DC  DISM   0A46  DISW   09E4  EXGJMP 0782
EXGTAB 0AD4  EXTJMP 07BF  EXTTAB 0B40  FLG16  0F6B
HEX    0A59  I1     0F6E  I2     0F6F  I3     0F70
IMMJMP 0937  IMMTAB 0C98  INDJMP 07CF  INDJTB 08F8
INDTAB 0BB0  INDTB1 0918  INHJMP 094D  INHTAB 0CB8
LBRJMP 095E  LBRTAB 0D02  LOOP   0671  M1     0A81
M2     0ABF  MESS1  0F74  MS     0F6D  NL     0F72
O1     0D2A  O2     0D2E  O7     0D5E  POS    0AD2
PS     0F6C  PSHJMP 0978  PSHTAB 0ADC  PSHTB  0F60
REGTAB 0F42  SPA    09EC  SPACE  0ACF  ST     0600
STACK  0AD0  STS2   0A04  TABJMP 0715  WO     06F6
```

END

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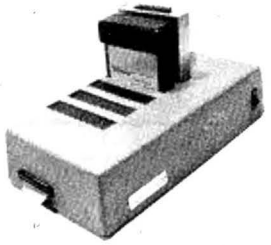

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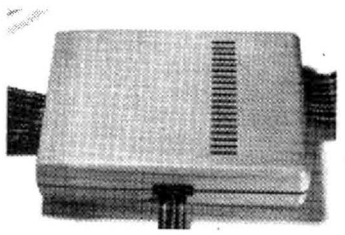

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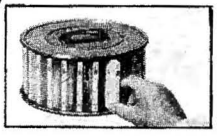

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Instant CoCo

by Amee Eisenberg

Last month you probably noticed the small symbol [CoCo] that appeared on the table of contents. This is our way of marking programs I've included on Instant CoCo, the cassette dump of *HOT CoCo*. We're making the best and the longest programs we publish instantly available to you on a monthly cassette, so you don't have to type them in.

Instant CoCo comes with a caveat; before you try to run our programs, you must read the article and the System Requirements box. If you've got a 16K RAM CoCo, and the program needs 32K RAM, it won't run on your computer.

Errata

Last month, I made a mistake in the Instant CoCo Index that appeared with this column. The program that adds a full character set to your CoCo video display, CHROUT, was incorrectly listed as requiring 32K Basic. In fact, it requires Extended Basic. Also, the command to load this program (as noted in the article) is CLEAR200, 31918: CLOADM:EXEC.

Dismayed CoCo Can't Cope With Unknown Commands

The CoCo does a funny thing when a Disk Basic program is loaded into Extended Basic, or an Extended Basic program into Basic. When listed, the program has lots of exclamation marks. "Oh my gosh!" the computer seems to say, "What does this mean?"

The exclamation points appear as default characters when a command the computer doesn't recognize is called. Because the computer can't translate it into a known Basic command it defaults to something it can print, an exclamation point. Don't confuse this with the PRINT USING ! command available in Extended Basic. So, if you see a listing with lots of exclamation points, check the System Requirements box. You've probably loaded it into the wrong Basic.

Problems?

Most emphatically, we are committed to supporting Instant CoCo. If you have any difficulties with the programs or the cassette, call or write to me at Pine St., Peterborough, NH 03458. ■

SIDE A

ARTICLE NAME/AUTHOR	FILE	PAGE #	SYSTEM
Copyright Statement	TITLE	----	A11
Computing Your Future/Christensen	RETIRE	52	16K Ext
Stock Transactions Tracker	STT	58	16K Ext
Active Negotiations/Levinski	ACTNEG EDITACNG	66	32K Ext
CoCo Payroll/Charlton	PAYROLL	74	16K Disk
Show As You Go/Tapanila	GRAPH	80	16K Ext
CoCo Mailing List/Sprouse	MAILDK1 MAILDK2	88	16K Disk Disk

SIDE B

Journey to the Center of the ROM/Goodwin (m)	DISASM	114	4K
Elmer's Arcade/Ramella	DANG	17	4K Ext

Instant CoCo Directory—January

Coming Next Month

Though you might tell your friends that you use your CoCo for practical things such as word processing or data-base management, we know the *real* reason you own a computer—just for the sheer fun of it.

Next month we'll give you programs that all computer hobbyists will enjoy. (You can tell your friends that these programs have serious uses too, but we know better.)

Want to know how you'll feel for that big date next week? Wallace Smock's Biorythm Calendar will tell you your physical, intellectual, and sensitivity highs and lows for any day. Robert Yeater has a Morse-code tutor program, but if you have no need to learn Morse code, you can use this program to improve your memory skills.

What do you get when you cross a CoCo with your stereo system? Pick up the February *HOT CoCo* and find out. Is your computer room overrun with cassettes of useful and not-so-useful programs? Helen LaBonville's Indxcard will help you make sense out of that mess.

Hardware buffs will like Mark Wilson's Circuit Drawer program. Design those circuits on the screen and avoid mistakes on the real thing, or use this program to experiment with different component configurations.

No issue devoted to the fun of computing would be complete without games. Peter Holden has written a challenging CoCo version of the old Chinese game Go. It is similar to Othello, and you can play the computer as an opponent.

February's *HOT CoCo* will keep any true computer hobbyist busy for weeks, at least until the March issue arrives. March will be just as interesting. You see, it's the issue with..., well, let's wait until next month for that. ■

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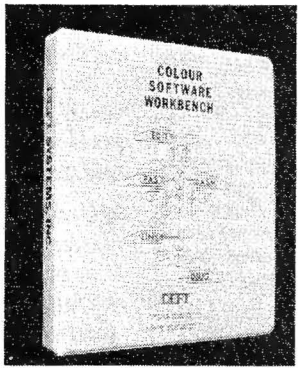

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- Finding Strings
- Changing Multiple String Occurrences
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- Reading, Writing and Merging Files From Tape and Disk

PASCAL COMPILER
- Specifying:
  - Source from Tape, Disk or Keyboard
  - Object and Listing to Tape, Disk, Screen or Printer
- Optional Symbol Table in the Object File for use by the Symbolic Debugger
- Explanation of Source Listing Format

MACRO ASSEMBLER
- Specifying:
  - Source from Tape or Disk
  - Object and Listing to Tape, Disk, Screen or Printer
- Explanation of Source Listing Format

OBJECT LINKER
- Specifying:
  - The Machine Language ORIGIN
  - Listing to Tape, Disk, Screen or Printer
  - Binary File on Disk
  - Whether to use Pascal Runtime Library
  - Whether to use Symbolic Debugger

SYMBOLIC DEBUGGER
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- Displaying and Modifying Memory
- Using Pascal Symbols
- Tracing Pascal Procedure Activations
- Viewing the User's (Graphic) Screen
- Using Symbols, Registers & Constants in Expressions

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Part TWO of the CSW User's Guide provides you with the background information needed to write programs using the Colour Software Workbench.

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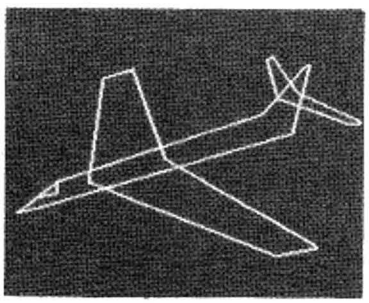
- Complete Pascal and Assembler Language Source
- Uses All Parts Of the Workbench
- Resulting Program is a Text Processor

PASCAL
- Describes Standard Language Elements Supported
- Constants Include Decimal and Hexadecimal Integers, ASCII characters and strings
- Types Include:
  - Integer, Char, Boolean, Enumerated, Subrange
  - Multi-Dimensioned Arrays
  - Records and Variant Records
  - Sets of Up to 256 Elements
  - Files
- PROCEDUREs and FUNCTIONs with FORWARD
- Variables and LABELs
- Arithmetic, Boolean, and Set Expressions
- Statements: IF, WHILE, REPEAT, CASE, GOTO, EXIT, FOR, BEGIN, assignment (:=)
- Input/Output: RESET, REWRITE, READLN, EOF, WRITE, WRITELN, CLOSE, PAGE
- Built-in Functions and Procedures: ABS, CHR, CURSOR, ODD, ORD, PRED, SUCC

ADVANCED PASCAL
- Strings Support: Assignment, Comparing, Concatenation
- String Procedures and Functions: STRINGCOPY, STRINGDELETE, STRINGINSERT, STRINGPOS, HEX, ENCODE, DECODE
- Type Extensions for Structured Type Breaking
- Absolute Memory Access via Built-in WORD and BYTE Arrays
- ROM Routine Access via CALL Built-in Function
- Static and Public Variable Allocation
- Separate Compilation and Assembler Interface via INTERFACE, EXTERNAL, and PUBLIC
- Listing and Multiple Source File Directives
- Explanation of Error Messages

6809 MACRO ASSEMBLER
- Motorola Compatible Source Conventions
- Macro Facility With up to 9 Macro Parameters
- Separate Compilation and Pascal Interface via PUBLIC and EXT Directives
- Listing Control Directives
- Explanation of Error Messages

TECHNICAL NOTES
- CoCo ROM Compatibility
- Pascal Runtime Library Assembler Interface
- CSW Object File Format



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⌐ See List of Advertisers on page 131

The Educated Guest

EDUCATIONAL SOFTWARE BUYER—BEWARE!

by Charles H. Santee

This month I want to explore ways of classifying educational software. If you ask why, consider the bewildered parent who spends several hundred (or thousand) dollars to buy a computer so that Johnny will have an educational advantage. This parent, having already taken one step in the wrong direction, looks for the best software so Johnny can do something besides playing games.

He enters the local computer store with high expectations of fascinating learning material tailored to Johnny's needs and asks, "Do you have anything for education?" The answer is usually, "Oh, we have a great selection." The salesman then takes an interminable amount of time searching through every shelf in the store to find five programs that seem to relate to education.

"And what do these programs do?" asks the parent. The salesman, reading from the label, replies, "Well, this program requires 16K RAM, is written in Basic and requires a duo-constabulary adapter." The parent, not understanding a single word, asks to see it. The salesman pauses, mumbles under his breath, looks after five other customers, goes to ask the boss if he can open the software, and with help from everyone in the store manages to get a program started.

Finally, after 73 minutes in the store, the parent sees a program in operation. It whirs, it gurgles, it captivates, and then he buys it on the spot. The parent has just made another mistake.

Now, anyone in the computing field will tell you that the first thing to do when buying a computer is to look for software that will meet your needs. In my opinion, the computer with the best and most in educational software is (oh no)...the Apple. However, the computer with the most potential for education is our own Color Computer. The Color Computer is also a good buy if you are willing to spend some time either looking for educational software or writing your own programs.

Assuming you have already made a preliminary decision and have a computer, you want to purchase or write educational programs. I suggest you write a specification sheet, outlining exactly what you want the program to perform. Figure 1 is a form you might use to do this. There are many ways to classify a program, so if you have ideas for improvement, let me know.

Said a parent, "I want education"
And didn't make specification
Without further thought
A program was bought
But the only thing learned was frustration.

First is the hardware required for the program. Make sure the program you buy works on the equipment you have. Next is the age for which the program is appropriate. While this seems straightforward, it can be misleading. Age can refer to the reading level of the text, interest level, instructional level of the content, or the age range of a group that field tested the program.

You need a second criterion that I will call the age reference. Determine how the age reference was obtained. An age reference is usually obtained by testing the program with different age groups, by selecting material from a graded source, or by computer analysis of content. The most common method used is to rely on the experience or intuition of the author.

The next criterion is to define the specific content of the program in goals and objectives (learner oriented outcomes). For example:

- Goal: The user will demonstrate mastery of material covering the Civil War period of history.
- Objective: When presented with questions about the Civil War, the user will select a correct answer from four alternatives presented on the video screen, with 90-percent accuracy.

Or, you can provide a brief paragraph defining the content. For example:

This program presents information about 200 spelling words selected at random from a list of "Santee's Commonly Misspelled Words," 1984. Four words are presented on the screen at one time. One word is misspelled. The user zaps the word with the speller ray. The program presents the words at random and repeats the presentation of words until the user demonstrates 90-percent accuracy in zapping 20 of the misspelled words.

You can then assign the program to a content category such as business/finance, foreign language, mathematics, computer science, reading, or home economics.

You can also categorize according to instructional technique using drill and practice (skill practice), tutorial (skill instruction), games (motivational exercises), simulation (computer representation), problem solving (student analysis), or inquiry (supplementary information source). For an explanation of these techniques consult the *Education Software Sourcebook* from Radio Shack (Cat. No. 26-2756), or read the *CAI Sourcebook* by Robert L. Blake (Prentice-Hall Inc., 1982).

```
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
*                  EDUCATION SOFTWARE SPECIFICATION SHEET                  *
*                  ------------------------------------                    *
*                                                                          *
*   HARDWARE REQUIRED: .....                                               *
*                      (computer - memory - peripherals - extra software)  *
*                                                                          *
*   AGE: .....        AGE REFERENCE:  .....                                *
*   (grade or level)                  (how was the grade or level        *
*                                      of the program determined)          *
*                                                                          *
*   CONTENT CATEGORY .....                                                 *
*                    (examples:  Reading, Social Studies, Math Etc.)       *
*                                                                          *
*   GOAL: (What is the general purpose of the program):  .....             *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   OBJECTIVE (What should be achieved by using this program, be specific):*
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   INSTRUCTIONAL TECHNIQUE (Check each item that applies):                *
*                                                                          *
*      .....  Drill and Practice (Skill Practice)                          *
*      .....  Tutorial (Skill Instruction)                                 *
*      .....  Games (Motivational Exercises)                               *
*      .....  Simulation (Computer Representation)                         *
*      .....  Problem Solving (Student analysis of a problem)              *
*      .....  Inquiry (Supplemental Information Source)                    *
*      .....  Record Keeping or Analysis                                   *
*      .....  OTHER (please specify) .....                                 *
*                                                                          *
*   FIELD TEST (Where has the program been used before and what evidence   *
*               exists that the program is successful?):                   *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   REVIEW (What sources can be checked for evaluation of the software?):  *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   UNIQUE FEATURES (What features make this program different or better   *
*                    than other software of a similar type?):              *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*   .....                                                                  *
*                                                                          *
*    PERSON COMPLETING THIS FROM:  .....                                   *
*                                                                          *
*    TITLE AND BACKGROUND:  .....                                          *
*                                                                          *
*    .....                                                                 *
*          (use the back of this form for additional information)          *
* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
```

Fig. 1. Educational Software Specification Sheet.

Try to determine the following about field testing: Who has used the programs? What evidence is there that the program successfully teaches the content? How was the success of the program measured? Has the software been reviewed or used by an independent source?

You should also know what features are unique to that program. What provisions are made for scoring the user's progress? Does the program keep a record of the correct and incorrect responses? Does it provide a summary of progress? Does the method of scoring provide motivation for improvement?

Finally, find out who has completed the specifications you have requested. What is the person's background and what bias might you expect?

Here is how to use the specification sheet. First, determine your own needs: What kind of program will really help Johnny? If you are a parent, you might want to ask the teacher. Find out the content area that needs improvement, his present level in that area, and the best way to learn that material.

If Johnny needs practice on skills, then the drill-and-practice type of program is for you. If you want new skills, you need a tutorial program that tests your knowledge and presents new material.

Maybe Johnny is a whiz who only learns what interests him. Then you need a motivational activity or a game that makes learning fun.

Perhaps you want to try out your skills in a new area like the stock mar-

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ket but are afraid to take the risk or spend the money. A simulation can provide the experience you want on a nonthreatening level.

Maybe Johnny can recite the books ad nauseam but can't apply facts to a problem. Then the problem-solving program might help. On the other hand, if you need just a good source of easily accessible information, the supplemental information source or data base is your answer.

Write down the type of program you want and make out a specification sheet to take with you to your local computer or software store. If you are buying by mail, send the specification sheet, with several blank forms and a return envelope, to the vendor with a request for him to complete a sheet for programs similar to your specifications.

If your vendor cooperates, check out any references provided in the specifications. Look up the review of the product or call a school that has used the product. Finally, if you find a store that has a demonstration copy, take a look at the program and try it with the person it is for.

One of the instructional techniques on the specification sheet is the tutorial program, commonly used in computer-assisted instruction. This type of program often uses a method called branching where the program begins with information presented one screen at a time. These are called teaching frames or presentation frames. I prefer the word screen for the information presented on one video screen.

After several instruction screens, the user gets a criterion screen that requires some type of response from the user. Depending on the response, the program branches or goes to different parts of the program. For example, the criterion screen might ask a question to see if the user understands the material. If he answers correctly, the program goes on to new material. Incorrect or partially correct responses branch to repetition or review of the material.

Good branching programs are difficult to write. Once a program is written, it is often difficult to adapt for alternative uses. The criterion for branching is often a single question. Therefore, in certain instances, the decision on mastery is based on a single response. How would you like to be hired or rejected for a job based on how you answered a single question?

You can overcome this by using series of related questions and other more complicated techniques, but the decision on where to branch still often depends on a single question.

Now for Santee's branching method. In this method you develop a pool of questions related to a topic. Divide these questions into levels of difficulty or into content groups. The program first presents questions and perhaps instruction at the first level. When the user demonstrates a certain level of mastery, say 90 percent, the program branches to the next level.

(Next month Charles Santee continues with a program that shows an application of this method.)■

Write Charles Santee c/o HOT CoCo, *Pine St., Peterborough, NH 03458.*

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Doctor ASCII

by Richard E. Esposito

Got a problem with your computer? Ask Doctor ASCII to solve it. Write to Doctor ASCII, HOT CoCo, *Pine St., Peterborough, NH 03458.*

Q. I am interested in obtaining new languages for my 64K CoCo with disk drive. I'd like Pascal, Cobol, and Fortran. What would my best bet be: Radio Shack's new OS-9 or FLEX?

Mark Charney
Denville, NJ

A. Microware (the authors of OS-9) offers OS-9 versions of CIS Cobol for $895 and Pascal for $400. Technical Systems Consultants (the authors of FLEX) offer FLEX versions of Pascal for $200 and FORTRAN77 for $375. These are all contained in the Frank Hogg Labs (The Regency Tower, Suite 215, 770 James St., Syracuse, NY 13203) catalog. It is desirable, and in some cases mandatory, that you have a second drive for this software. Good software does not come cheap.

Currently, most CoCo FLEXes use a high-resolution 51-by-24 display whereas OS-9 uses the standard 32 by 16. Since FLEX has been around longer, there is more software available for it. FLEX software has been priced lower than OS-9 in the past, but Radio Shack currently is offering Basic-09 for $99 (half the usual $200 Microware catalog price). If the Shack eventually carries the entire OS-9 line at the same discount, the price differential could swing the other way.

Q. I have a CoCo with a D board to which I recently added disk drives. My machine hangs up when I POKE 65495,0 for high speed with the disk plugged in. Is there a fix? Is there a simpler way to copy files from one drive to another without doing all that typing? BACKUP is fine but you cannot combine files from two disks.

Marie Melodia
Brooklyn, NY

A. I had the same problem with my machine. I solved it by removing capacitor C85.

I use Program Listing 1 for myself. It is patterned after the PCOPY command in FLEX. To use it, load and run Listing 1, then put the source disk in drive 0 and the destination disk in drive 1. If the destination disk is a new one, it must be formatted first. The program is self-prompting. It will copy one file (ONE), files with a particular extension (EXT), or files with any extension (ALL). If you choose EXT or ALL, it will ask whether you want to copy all of them. If you say no, it will list the file names one at a time and ask whether you want each of them copied.

```
10 CLEAR1000
20 DIMF$(2)
30 INPUT"[EXT, ALL, OR ONE]";A$
40 IF LEFT$(A$,1)="E" THEN GOTO6
0 ELSEIF LEFT$(A$,1)="A" THEN GO
TO 70 ELSE INPUT"FILENAME";B$
50 COPYB$+":0" TO B$+":1":END
60 INPUT"EXTENTION";E$: E=1
70 INPUT"COPY ALL OF THEM";R$: I
F LEFT$(R$,1)="Y" THEN Y=1
80 FORI=1TO9
90 DSKI$0,17,2+I,F$(1),F$(2)
100 FORF=1TO2
110 FORJ=1TO97STEP32
120 IF MID$(F$(F),J,1)=CHR$(255)
 THEN END ELSE IF MID$(F$(F),J,1
)=CHR$(32) THEN GOTO200
130 Q$=MID$(F$(F),J+8,3)
140 IF Q$<>E$ AND E=1 THEN 200
150 C$=MID$(F$(F),J,8)+"/"+Q$
160 PRINTC$;
170 IF Y<>1 THEN INPUT" COPY ";H
$: IF LEFT$(H$,1)<>"Y" THEN 200
180 COPY C$+":0" TO C$+":1"
190 PRINT" COPIED"
200 NEXTJ
210 NEXTF
220 NEXTI
230 END
```

Program Listing 1. File-Copying Utility

Q. I recently purchased a CoCo for word processing. I now have the problem of deciding which printer to purchase. Much of my typing involves cutting stencils for mimeograph on behalf of many volunteer organizations.

My problem is that I am afraid to use a dot-matrix printer to cut a mimeograph stencil because of possible damage to the pins. A daisy wheel would serve the purpose, but they are expensive. The cost of Xeroxing 25–200 copies is prohibitive and retyping the computer output onto a stencil seems awkward.

Shelly Ennis
Clio, MI

A. I have had good success with a Radio Shack LP VIII printing on Spirit duplicator stencils. Of course, you will need access to a Spirit duplicator. Assuming you can surmount that hurdle, look for a printer that has friction feed and test it to see that its impression is hard enough to come through the stencil. You should be able to find a printer that meets your needs for less than $400.

Q. I own a CoCo on which I create many hi-res graphics that I like to send to my printer. I have a hi-res screen-print program of my own, which is very long to type in for each screen print. Is there a way to merge two Basic programs simply?

Bill McCrea
Jacksonville, FL

A. I assume that you have a tape setup. With a disk system there is a MERGE command. For cassette users, a program called "Bmerge" by Dick Robinson appeared in *Color Computer News*, June 1983, p. 84, that will do the trick.

Q. I have an IDS Micro Prism 480 and a 32K CoCo. Can you please tell me how to do a graphics dump to the printer? Is there a way to change the baud rate in Scripsit?

Marc Korner
Metairie, LA

A. Unfortunately, I do not have access to an IDS printer. If one of our readers has a screen-print program for it, please send it in.

The Scripsit ROM pack stores the baud rate constant at address $CE11, which is in ROM and therefore unchangeable unless you have a 64K machine. If your 32K machine (Radio Shack original, not piggyback) has an F board, you really have 64K. If that is indeed the case, you can put a copy of Scripsit on tape or disk with the appropriate baud rate for your printer in it. Referring to the article "Disk Utilities," *HOT CoCo*, September 1983, p. 134, alter the Romfix program in the following manner: Add a line 355 POKE &H4E11,##, where ## is the desired baud rate constant (180 for 300 baud, 87 for 600 baud, 41 for 1,200 baud, 18 for 2,400 baud, and 1 for 9,600 baud). If you want your revised copy of Scripsit on tape, also change the SAVEM in line 380 to a CSAVEM. Aside from these changes to the Romfix program, follow the instructions in the article.

Q. After reading July's "64K Modification," I was wondering why you have to put in a program to get 64K when you have the right chips in it. I would like to know this since Radio Shack gives you 64K without having to put in a program.

Lance Wuckert
Winnipeg, Manitoba, Canada

A. An 8-bit microprocessor such as the CoCo's MC6809 has 16 address lines. Each of these address lines can be on or off giving a total of 65,536 combinations. The result is that a total of only 65,536 or 64K bytes of memory can be accessed at one time. When the CoCo is first turned on, no matter who installed the 64K RAM, you have access to only 32K of the RAM from address 0 to address 32767. The rest of the address space is occupied by Extended Basic in ROM from 32768 to 40959, Basic in ROM from 40960 to 49151, and Disk Basic in ROM from 49152 to 57343.

This configuration is known as memory map 0. What the program supplied in the article does is copy the code from the ROMs down into lower memory, remove the ROMs from the upper half of the 64K address space, replace this upper half with RAM, and finally copy the Extended Basic code, the Basic code, and the Disk Basic code into this upper RAM. This new configuration is known as memory map 1. 64K programs such as FLEX, OS-9, and Telewriter-64 have a program to switch memory maps built in. No matter which 64K CoCo you have, after powering up, typing ?MEM will yield 31015, 24871, or 22823 depending upon whether you have Basic, Extended Basic, or Disk Basic.

Q. I would like to transfer graphic games from my friend's Apple II+ to my 32K CoCo with Extended Basic. Your September column said that this could be done with a smart-terminal program running on each. What is a smart-terminal program and what equipment do I need?

Daniel Sounders
Glendale, AZ

A. If you are referring to machine-language games, you are out of luck. The two computers use different microprocessors, which have different instruction sets. The CoCo uses a 6809 and the Apple uses a 6502. If you are interested in transferring Basic programs, it is a relatively simple task. You need a smart-terminal program for your CoCo. What I mean by a smart-terminal program is one that has a buffer or a place in memory in which to store incoming text, which can subsequently be saved in ASCII to tape or disk.

This buffer can also be filled with an ASCII file for transmission to another device. The Apple would need a similar program. You would also need a modem and a cable to hook it to your RS-232 port on the back of your CoCo.

The transfer would take place as follows: Your friend with the Apple would telephone you or vice-versa. You would set one modem on originate and the other on receive. An Apple ASCII file would be loaded into the Apple's smart-terminal program's buffer. It would be transmitted to your CoCo's smart-terminal's buffer. You would save it to tape or disk for future editing with an ASCII-capable word processor such as Scripsit, Telewriter-64, or VIP Writer. Once edited to conform with the CoCo's Basic, you could load it in as a regular program.

Q. I recently paid Radio Shack $255 ($149.95 for the chip set, $45 to modify my D board to accept 32K, and $30 to install 32K) to upgrade my CoCo. For this price, I did receive the new Color Basic ROM 1.2. What additional modification and cost is required to run the new OS-9? Should I buy Radio Shack 35-track drives or 40-track drives from other vendors?

Carolyn J. Testa
Springfield, VA

A. Assuming the 64K mod is incomplete on your machine, you only need complete the steps starting with step 1 in the center column at the bottom of page 46 of the article "64K Modification," *HOT CoCo*, July 1983. Be aware that Fig. 2 on that page is in error. The pins should be numbered counterclockwise from the notch.

I personally prefer 40-track 5¼-inch disk drives as opposed to Radio Shack's 35-track drives. The advantage of

Doctor ASCII

the 35-track CoCo drives is that service is as close as your Radio Shack store.

Q. I would like to know if there is a way to use color graphics in the 256-by-192 mode and the price of the book *Assembly-Language Graphics for the Color Computer*.

Michael Cardillo
Largo, FL

A. Four-color graphics in 256 by 192 appeared in October's Doctor ASCII column in response to Matthew Edward's question. The book *Assembly-Language Graphics for the TRS-80 Color Computer*, by Don Inman, published by Reston, sells for $14.95.

Q. Could you please tell me how to "lock up" programs I have written? I would like to have my Basic programs unlistable and unbreakable.

Brian Rupert
Kittanning, PA

A. Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, markets the program Hidden Basic 1.0, which seems to do what you want. It sells for $19.95 and works with Basic or Extended Basic.

Q. In September's Doctor ASCII column, Bruce Esposito asked about scroll protection and you told him to use

POKE 359,0. It does not work for me but POKE 359,16 does.

In the same issue, I changed the Romfix program from the "Disk Utilities" article to save the programs to tape. I used EDTASM+ to relocate the programs so that they start in RAM at $0600, but they will not EXEC. Can this be done?

Timothy Ambrose
Dunedin, FL

A. The POKE 359,0 works with a disk system, your POKE 359,16 seems to work fine with tape. Sorry for the confusion.

The Romfix program was not designed so that the resulting machine-language programs could be offset loaded. Most ROM packs are not written in position-independent code, so this was not a consideration. If you have 64K and you load your tapes created by Romfix without an offset, they should work fine.

Q. I am interested in learning how the sort routine works in the Directory Sort program ("Disk Utilities," September 1983).

Douglas R. Cook
West Jordan, UT

A. The Directory Sort program used a bubble sort. I am providing Program Listings 2 and 3 to illustrate how it works. Listing 2 will do a bubble sort for you. Initially, you will be interested in Listing 3. It demonstrates the bubble-sorting algorithm on your TV screen.

To put information into ascending order, scan the data from the bottom up. Each time you encounter two adjacent points that are not in order relative to each other during a scan, interchange their relative positions.

The scans will get shorter as the sort progresses. The length of a scan decreases by one with each new cycle. The top of the list gets filled with values from down below as bubbles would head upward in a fish tank, hence the name. Continue scanning until one of two things occurs: you have completed N-1 scans or you have completed a scan without making an interchange. ■

```
30 INPUT N
40 DIM A$(N),G$
50 FOR I=1 TO N
60 INPUT A$(I)
70 NEXT I
80 REM ** START SORTING
90 FOR J=1 TO N-1
100 F=1
110 FOR I=N-1 TO J STEP -1
120 IF A$(I) <= A$(I+1) THEN 170
130 F=0
140 G$=A$(I+1)
150 A$(I+1)=A$(I)
160 A$(I)=G$
170 NEXT I
180 IF F=1 THEN 210
190 NEXT J
200 REM ** PRINT THE RESULTS **
210 FOR I=1 TO N
220 PRINT A$(I)
230 NEXT I
240 END
```

Program Listing 2. Bubble Sort

```
30 CLS
40 INPUT "HOW MANY";N
50 IFN>15THENPRINT"TOO BIG":SOUN
D1,10:GOTO40
60 DIM A$(N),G$
70 FOR I=1 TO N
80 PRINT"<";I;">";
90 INPUT A$(I)
100 IFLEN(A$(I))>15 THEN PRINT"T
OO LONG": GOTO80
110 NEXT I
120 GOSUB410
130 FOR J=1 TO N-1
140 F=1
150 FOR I=N-1 TO J STEP -1
160 PRINT@32*(I)+15,"_"
170 PRINT@32*(I-1)+15,"_"
180 SOUNDJ*14,40
190 PRINT@32*(I)+15," "
200 PRINT@32*(I-1)+15," "
210 IF A$(I) <= A$(I+1) THEN 350
220 F=0
230 G$=A$(I+1)
240 PRINT@32*(I),STRING$(15," ")
250 PRINT@32*(I)+16,A$(I+1)
260 PRINT@32*(I-1),STRING$(15,"
")
270 PRINT@32*(I-1)+16,A$(I)
280 SOUNDJ*14,40
290 A$(I+1)=A$(I)
300 PRINT@32*(I-1)+16,STRING$(15
," ")
310 PRINT@32*(I),A$(I+1)
320 A$(I)=G$
330 PRINT@32*(I)+16,STRING$(15,"
 ")
340 PRINT@32*(I-1),A$(I)
350 NEXT I
360 IF F=1 THEN 400
370 PRINT@32*(J-1)+16,"^"
380 SOUND200,2
390 NEXT J
400 PRINT@32*N,"all done":END
410 CLS
420 FOR I=1 TO N
430 PRINT@32*(I-1), A$(I)
440 NEXT I
450 PRINT@32*N,"sorting"
460 RETURN
```

Program Listing 3. Bubble Sort Demo

Re:FLEX

An Introduction, And a Couple Of "Other" Basics

by Scott Norman

Ed. note—This month, Scott Norman takes over this fourth in our bi-monthly series on the FLEX operating system.

No doubt about it; it seems funny to be welcoming readers to my column when the column itself has been around for a while and I'm the newcomer. In any event, I'm happy to be doing Re:FLEX, and I look forward to reporting my experiences with some interesting software.

If you are familiar with The Color Key, my former *80 Micro* column, you know that my principal interests are applications software, high-level languages, and utilities—more or less in that order. So, I envision Re:FLEX as a forum for discussing these topics as they apply to the advanced Color Computer operating systems. Note the plural.

Therefore, I'll direct this column primarily toward the present or prospective FLEX/OS-9 user who wants to know what's available and how it works. I'll try to communicate some sense of how various pieces of software "feel," and I'll discuss things that may not be obvious from the advertisements and manuals. I'll do some spreadsheeting, dig into a couple of FLEX word processors, and have a look at some of the business software available in CoCo FLEX formats.

And just to indulge myself, I have a copy of TSC's Pascal that's crying for some action. More on this at a later date.

I'm serious about covering OS-9, too, but where is it? At this writing (September), OS-9 isn't available yet. Frustrating, but I expect Basic-09 to be worth the wait.

Meanwhile, I expect to have Frank Hogg's O-Pak running as soon as he gets the file-translation routines finished. That will give me optional FLEX-like high-resolution text screens for OS-9, along with the ability to swap files among the various CoCo operating systems.

It's a good thing that O-Pak's high-res screens are optional, though. I understand that OS-9 will leave only 34K or so of RAM free when the screens are in use, and Basic-09 itself takes something like 22K! That extra 6K of screen RAM could come in very handy.

That kind of memory usage might mean that, even with low-res video, you'll see OS-9 software written in small modules, with the attendant need for many disk accesses in the course of normal operation.

I also have to believe that memory limitations will keep multitasking from being much of a factor for CoCos unless someone starts producing add-on RAM cards. Would it be possible to put a couple of boards with, say, 64K apiece into the expansion interface? That would let additional users do something meaningful.

And speaking of being useful, my contribution to the rumor (speculative forecasting) mill for this month is the unconfirmed story that the Shack is working on an inexpensive 80-by-24 video-display card for the Color Computer. If true, that certainly wouldn't hurt business applications. Could this be another candidate for the expansion box?

Random Basic for FLEX

Because of my own interest in high-level languages, I'm going to review some of the features of Random Basic (RBasic) (Computerware, Box 668, 4403 Manchester Ave., Suite 102, Encinitas, CA 92024) and Extended Basic (XBasic) (Technical Systems Consultants, 111 Providence Road, Chapel Hill, NC 27514). This might be old stuff to some of you; if so, let's agree to meet on the other side. I have to start somewhere.

These are by no means the only Basic dialects supported by FLEX. By themselves, neither of them would be enough to make many people run out and buy the operating system, either. Neither supports high-resolution graphics, and neither has a decent capability for editing source code; you're in the big leagues now, so you need some sort of text editor for preparing long program files.

Random Basic was so named in order to call attention to its ability to deal with random-access disk files in addition to sequential files. The former can be handled in a more flexible fashion than the latter, of course, though it's not a very economical use of disk capacity. (XBasic can use random files, too.)

RBasic has other advantages. It can manipulate numbers with absolute values that lie between 1.0E−99 and 9.99...E+99, as opposed to Color Basic's 1.0E+/−38. This can be vital for scientific computation in which you encounter very large and very small numbers all the time—especially as intermediate results in long calculations.

RBasic computations can carry along 11 digits. This feature alone merits serious consideration by programmers who deal with problems in the physical sciences.

The language is a little schizophrenic in its approach to notation. You can abbreviate commands to the minimum required for unique identifica-

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tion, while you can give variables names up to 126 characters long (although the interpreter only considers the first six).

This can be quite helpful in making sense out of someone else's code—or even your own old material.

RBasic has several "housekeeping" commands for the control of output format. It is fairly simple to specify print operations that will result in right-justified text, columns of figures aligned on their decimal points, and so on. All in all, it is much easier to set up a good-looking format for printed output in RBasic than in the Color Basics.

There are a full complement of arithmetic and relational operators and Basic functions for manipulating both numerical and string qualities. Novelties include IMOD(X,Y), which returns the integer remainder of dividing X by Y.

Besides being able to call machine-language subroutines, the RBasic user can define as many as 26 "personalized" functions for subsequent use within a program, much as in Fortran:

```
DEF FNA(X) = (Defining Expression)
```

There are a few restrictions. Function names must consist of FN plus a single letter, the defining expression must fit in one program statement of 128 characters or less, and there can be only one (nonsubscripted) independent variable. The variable actually in use when the function is called in a program replaces the dummy variable, X.

RBasic has an ON ERROR command for making programs crash-proof. Simply insert a statement like the following:

```
ON ERROR GOTO (line # of routine for
  continuation)
```

before any potentially critical step in a calculation. It is possible to take corrective action, depending on the nature of an error, using the ERLINE and ERCODE functions that return the line number in which an error occurred and a numerical code for the error itself.

RBasic has a few more commands and functions for dealing with random-access files than Color Disk Basic does. The two languages have to perform pretty much the same operations, but there are enough differences in syntax to make careful study of the manuals worthwhile.

For example, there is a useful RBasic function/command named RECNO. This informs you of the current position of the record pointer, and (in conjunction with the SET statement) allows you to move the pointer to any location within a file.

(See my review of RBasic (*80 Micro*, April 1983, p. 198) for a more detailed report.)

On to XBasic

RBasic's biggest drawback is its speed—or rather the lack thereof. It takes nearly three times longer than Extended Color Basic to perform a Sieve of Eratosthenes benchmark, which is primarily a test of a language's ability to execute loops.

> *"...XBasic zips through the same program at least 25 percent faster than the Color Basics..."*

On the other hand, XBasic zips through the same program at least 25 percent faster than the Color Basics, even when it is restricted to the use of floating-point variables. Simple loops in which the counting variable is defined as an integer (a nice feature of the TSC product) really wail. They execute about four times faster than with the Radio Shack Basics.

Does this mean that XBasic is the hands-down winner for operating speed? Not exactly—the speed of a high-level language depends on more than FOR...NEXT loops. To test many of the mathematical functions, I use another benchmark that calls for 100 computations of:

```
EXP(-X)*(SIN(X))^2
```

for values of X between 0–10.

When I tested Color Basic and the two FLEX Basics against this, the standings changed quite a bit:

Disk Color Basic: 13 sec.
XBasic: 19 sec.
RBasic: 55 sec.

The RBasic times are actually on the low side, because its exponentiation routine failed when SIN(X) became negative; therefore, I had to resort to multiplying two SIN functions together.

XBasic is clearly faster than RBasic, but I still think it's interesting to keep the very respectable performance of Microsoft's offspring in mind before making any extravagant claims.

XBasic is big: a 78-sector FLEX file accompanied by a separate two-sector file for its line-renumbering utility. RBasic is only 50 sectors long, leaving 35.8K of RAM available for source code, as opposed to XBasic's 26.5K. But both of these are a healthy increase over Disk Basic—especially when you remember that the two FLEX dialects still use a high-resolution screen for text.

Incidentally, XBasic has a numerical range of 76 orders of magnitude, just like the Radio Shack product. The difference is that XBasic carries a precision of 13–16 digits.

Here are a few of XBasic's unique features:

- You have the option of specifying a line number in the RESTORE command, so that you can reuse portions of a series of DATA statements.
- A SCALE command scales all floating-point numbers by 10↑(Scale factor) and rounds them to an integer before they're used within a program. The result is that roundoff errors become much less of a problem in long calculations; being integers, all of the numbers used in the computation have exact representations in the binary system. Results are reconverted to floating-point representation for output.
- SWAP interchanges the values of two variables. Technical Systems Consultants (TSC) claims that this specialized command can reduce the execution time of a sort (an obvious application) by 20–30 percent.
- PTR is a function that returns the address of the variable named as its argument. I have had to go through contortions with PEEK arithmetic to get the same information out of Extended Color Basic.
- DPOKE stores a double-byte argument in a specified location—just the thing for setting pointers. There is a corresponding DPEEK function,

along with a standard single-byte POKE and PEEK.

XBasic has error-handling and function-definition routines very much like those of RBasic. Functions can have two-letter names, which means that you are unlikely to run out of computing power in any practical application. You can call a function FN-- where -- is anything except a two-letter Basic word like ON or IF.

In the same vein, there are complete facilities for sequential and random disk file I/O. The TSC manual (85 pages with appendices) does a sober, straightforward job of telling you about the syntax required to get on the air with file manipulation. It also goes into some detail about the use of virtual arrays, which use random file I/O techniques to handle much larger data arrays than would actually fit into memory.

When you record an XBasic program on disk with the usual SAVE command, it produces a conventional ASCII file. Naturally, you can list and manipulate this file (which has a default extension of .BAS) with standard FLEX text editors. This is very desirable, in view of the language's lack of a built-in editor.

On the other hand, XBasic offers a COMPILE command that saves a program in binary form, including program and DATA statements together. The resulting disk file defaults to a .BAC extension, and is usually considerably smaller than the ASCII version. It loads faster, although it doesn't run any faster.

You can't edit or even list a COMPILEd file after it's loaded. You can't save or compile additional copies, either. This feature provides the commercial programmer with a measure of security against prying eyes.

TSC produces another piece of software, the Extended Basic Precompiler, which also accepts .BAS files and converts them to .BAC format. The Precompiler offers much more, however—like the opportunity to dispense with line numbers and GOTOs in favor of labels for modules of source code, *a la* Basic-09. But that's another story, for another column. ■

Send your comments on Re:FLEX to Scott Norman, c/o HOT CoCo, *Pine St., Peterborough, NH 03458.*

✓ See List of Advertisers on page 131

PRODUCT NEWS

edited by Cynthia Smith

The information used in the Product News section is supplied through manufacturers' press releases. *HOT CoCo* has not tested or reviewed these products and cannot guarantee any manufacturer's claim.

New CoCo Word Processor

Master Writer is a new word processor for the Color Computer that runs on 16K, 32K, or 64K machines; has disk or cassette capabilities; and does not require Extended Color Basic.

Master Writer's full screen-oriented editor allows you to move the cursor anywhere in your text using the up, down, right, and left arrows. Do this one character at a time, or by line or page. Insert, delete, or replace text at the cursor watching your changes as you make them. Delete or move blocks of text from one place to another. Merge in text from other files.

It features an automatic carriage return after the last complete word on each line, and it has automatic page feed so you don't have to worry about where a line or page ends.

An easy-to-understand manual has you using Master Writer in minutes. It is a menu-driven system with single-letter commands. Check any command without having to refer to the manual with the help screen. Its 10 programmable function keys allow easy insertion of frequently used words or phrases.

Master Writer works with any printer. Take full advantage of your printer's special functions such as variable character size and emphasized characters with easy embedding of printer control codes. The global-search function lets you quickly locate specific strings for replacement or deletion.

Other features include easy setting of left, right, top, and bottom margins, printer line width, and lines per page. Also auto repeat keys, auto line centering, auto page numbering, and choice of display color format make operating more efficient.

Master Writer sells for $14.95 for cassette and $19.95 for disk from Pyramid Distributors, 527 Hill St., Santa Monica, CA 90405. 213-399-2222.

Reader Service ✓ 572

Gold Plug-80

The Gold Plug-80 for the Color Computer solves problems of poor contact at the card edge connections of the disk controller module and the disk drive cable at the module and disk drives.

Included in the disk module kit are ground tab extensions that contact the ground clips on the CoCo's female connector. Gold Plug-80 extends this connection 1/2 inch, and ground tab extensions extend ground tabs 1/2 inch to contact ground clips, reducing RFI to the monitor. Extensions are required only on disk module or external module box.

The Gold Plug-80 for the CoCo disk module (both ends), including ground tab extensions is $16.95; for the external module box or the computer end of the disk module including ground tab extensions, $8.95. The disk drives or ROM modules are $7.95 each. A gold-plated drive cable is recommended and available from E.A.P. Co. for $29.95 (two drive) and $39.95 (four drive). A gold-plated female connector for the CoCo is available for $8.95. Contact E.A.P. Co., P.O. Box 14, Keller, TX 76248. 817-498-4242.

Reader Service ✓ 566

Display Noise Eliminator

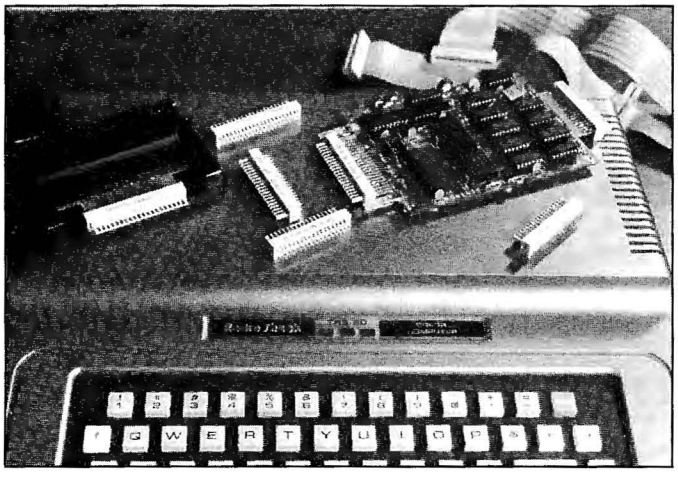
The Display Noise Eliminator will get rid of the annoying jitter and wavy lines that your Color Computer is putting on your TV screen.

Many users find that their CoCos have more of this kind of interference after converting to 64K, or adding disks. This is due to the additional interfering signals from the computer, disk controller, and disk drives. The Display Noise Eliminator is a special type of filter that traps this noise and prevents it from reaching the TV.

The Display Noise Eliminator is supplied as a kit that takes two minutes to install. Installation requires no special tools or soldering. The computer case is not opened, and the warranty is not affected.

It sells for $14 from Emerald Systems, 13052 Ferntrails Lane, Creve Coeur, MO 63141.

Reader Service ✓ 570



The Gold Plug-80

New from CoCoPro

The Dual Cassette Copy System for the CoCo lets you load from one cassette recorder and save to another with machine-language software. No longer do you have to change cassettes after loading or saving each program. DCCS starts copying with the first file encountered, or at a specified file name. It automatically adjusts up to 64K and displays remaining memory when loading. Select up to nine copies of each program.

DCCS is a menu-driven copy program. The default modes copy each file encountered on the first cassette one time onto the second cassette. Normally, files with errors are bypassed. As files are read and copied, a directory is generated on the screen showing the length of Basic programs and data files and the start, end, and transfer address of machine-language programs. A blank leader of eight seconds duration is automatically placed between all files recorded.

From the menu, you can change the number of copies to be made, select that the copying begin at a specified file name, and force copying of files with tape read errors. While the copying is underway you can enter a keyboard character that causes the operation to pause at the next possible step without aborting the ongoing procedure.

DCCS includes program on cassette, motor control adapter cable for the second cassette recorder, and complete instructions. It sells for $42 from CoCoPro, P.O. Box 37022, St. Louis, MO 63141.

Reader Service ✓ 571

MagiGraph

MagiGraph is a graphics development utility for the Radio Shack Color Computer, designed for experienced Basic and Assembly-lan-

guage programmers. The program simplifies the task of drawing highly detailed graphics characters, up to and including an entire high-resolution graphics screen.

MagiGraph has a full set of logical operation and pixel manipulation functions that simplify the development of a character in all possible color and position combinations.

The program offers nine animation buffers that allow positions of an animated character to be tested and revised so that animation blends together smoothly. You can list the pixel codes of a graphics character in hexadecimal numbers to a printer, and save the graphics screen on cassette tape or floppy disks to be used later by another program, or revised with MagiGraph.

MagiGraph is available on cassette for $34.95 (16K required); disk for $34.95 (32K Extended Color Basic required); Amdisk cartridge for $44.95. Documentation and sample programs are included in the package. Contact The Micro Works, P.O. Box 1110, Del Mar, CA 92014. 619-924-2400.

Reader Service ✓ 565

Business Sense From The Source

The Source, a communication and information service for personal computer owners, has recently announced these services.

- Bizdate is an electronic business magazine updated 55 times during the working day. The user signs onto The Source and types Bizdate to receive a menu of activities in all major financial markets, plus the latest financial and business news stories, analyses, and editorials.

Its first edition is available at 8:30 a.m. and in it you will find items such as the Board Room (reports from The Business Roundtable, The American Enterprise Institute, and other business leaders), U.S. News Washington Letter (details on investment opportunities, tax issues, and real-estate trends), and a Commodities Index (includes opening and closing charts, analyses and commentary on precious metals, treasury reports, grains, cotton, sugar, coffee, cocoa, lumber, and livestock).

- Stockcheck lets you monitor the stock market and retrieve information by typing in a symbol. At your access are current quotations, price/earning ratio, sales volume and net change. With Stockcheck you can create portfolio files for stocks or bonds and call up the latest quotes on them. Data originates from UPI, and N.Y. and American bond market reports. Single command services include information on gold prices, Dow indexes, NYSE indexes, currency reports and information, Standard & Poor's indexes, and metals market prices.

All services are accessible for personal computers or communicating word processors. It is a local telephone call in many major metropolitan areas. Registration for The Source is $100, and basic use is billed at $20.75 per hour weekdays, and $7.75 per hour evenings and weekends. Contact The Source, 1616 Anderson Road, McLean, VA 22102. 703-734-7500.

Reader Service ✓ 553

Hi-Resolution Screen Package

The Hi-Resolution Screen Package is designed to improve the standard 32-by-16 text-mode display of the Color Computer through the use of Cer Comp's Hi Resolution Graphics Display. The program is fully integrated into the existing Basic ROM software and can be used with standard Basic programs as well as others. The format of the display when the program is first executed defaults to 51 characters by 24 lines.

This display can be changed to 64, 42, 36, 32, or 28 characters per line from the keyboard, and the various screen sizes are displayed on the screen simultaneously.

The package also includes other control-code functions that allow various screen functions comparable to other video terminals. They include reverse screen, reverse character, underline character, and double-size characters. Other control codes allow erase-to-end-of-line, erase-to-end-of-screen, clear screen, home cursor, and bell tone. All these features are controlled through control codes sent via the Basic CHR$(n) statement, or through machine-language routines.

It sells for $19.95 plus $2.50 postage from Cer Comp, 5566 Ricochet Ave., Las Vegas, NV. 702-452-0632.

Reader Service ✓ 564

Battery Back-Up for CoCo Memory

Sav-A-Byte Battery Back-Up (BBU) now allows you to use your full complement of 32K/64K resident CoCo memory for word processing or program development applications without worrying about common power-line glitches. Frustrating and time-consuming intermediate SAVE routines are a thing of the past with BBU. Just complete your job and save only once.

Immunize your CoCo against memory loss by plugging the BBU cartridge into the ROM port and connecting its external rechargeable battery. The battery is constantly being charged by the CoCo power supply and stands ready to maintain all memory content for up to three hours during prolonged power loss. An on/off switch and LED indicator on the cartridge allow for control and monitoring of the BBU function.

You are still able to use the ROM-port bus because the BBU features a ribbon cable bus-extender that allows you to maintain interface with a disk controller or other standard ROM port interfaces.

The BBU is compatible with CoCos that use 64K RAM devices and is available now for $99 (including battery) from Sav-A-Byte, 2857 Emanuel Church Road, W. Columbia, SC 29169. 803-356-2398.

Reader Service ✓ 561

Disk Loader

Disk Loader for the TRS-80 Color Computer loads most 16K machine-language programs from tape to disk. This new program takes tape-based machine-language programs, stores them on disk, and allows them to run automatically.

Disk Loader is especially designed to load programs that interfere with normal disk operation. It saves multiple copies, allows renaming the program, and automatically gives program load and execute addresses. Supplied on tape with easy-to-operate instructions, Disk Loader works with any 32K or 64K Color Computer disk system. $13.95 ppd from Stuart Hawkinson, 6695 S.W. 203rd Court, Aloha, OR 97007. 503-642-9146.

Reader Service ✓ 559

Take Charge Of Your Money

Money Manager is a complete home money-management system with small-business applications, containing optional, automatic budgeting of specified accounts.

Menu driven, the program allows up to 26 accounts and up to 300 transactions before deleting the transactions, retaining the account balances. You can list all account balances and all transactions, or only those in a specified account, plus save and load data from tape or disk. Printer is optional.

Supplied on tape only, with complete documentation for a minimum 32K Color Computer, Money Manager sells for $24.95 from Reitz Electronics Inc., 3170 W. Central Ave., Toledo, OH 43606.

Reader Service ✓ 556

Math Invasion

First it was the Klingons, then the Body Snatchers, and now we are invaded by savage math problems. Crystal Software has released a new educational game for the TRS-80 Color Computer entitled Math Invasion.

This game combines arcade-style action with sound educational principles. A group of alien math problems is descending upon the planet and the only defense is to solve the equations. You use a laser cannon with the correct answer, and you can instruct CADS (Computer-Aided Defense System) to assist you in making the proper calculation.

Invaders come from one of four distant galaxies: Addition, Subtraction, Multiplication, or Division. Each galaxy has three classes of aliens that require a different level of mathematical expertise to defend against.

You use a menu to select the type and difficulty of the invading math problems. Math Invasion is recommended for ages 7 and older, requires 16K Extended Basic, and is available on cassette for $19.95 plus $1.50 shipping. Contact Crystal Software, 6591 Dawsey Road, Rock Creek, OH 44084. 216-474-7626.

Reader Service ✓ 562

A Pack Of Business Solutions

Bizpack is a business-planning and record-storing program for the FLEX-based Color Computer and other 6809 FLEX systems.

It features simplified spreadsheet entry, statistics, plotting, moving averages, forecasting, arithmetic operations between columns, automatic formatting, time-series analysis, automatic inflation adjustment, ability to rename commands, and array size limited only by the amount of disk storage.

The forecast function predicts the amount of money available for investment, the amount needed to

borrow, repayment schedule, the amount of cash on hand, and inventory, among other key items.

For special flexibility, Bizpak lets you perform any data manipulation possible in TSC XBasic, using an ancillary program format. Bizpack emphasizes an easy-to-use command structure that provides solutions to the challenges facing business people when they plan and control profitable operations, and a Bizpack license is $120.

For further information contact Ike Jeanes, The Virginia Company, 303 Park St., P.O. Box 2167, Christianburg, VA 24073. 703-382-4135.

Reader Service ✓ 555

Mark Data Shenanigans And Super Screen

For the game enthusiast and the serious computer user these two products for the Radio Shack Color Computer and TDP-100 are now available.

Shenanigans, a machine-language, hi-res adventure game, takes you from the heart of the city to remote wilderness in search of an elusive pot of gold at the end of the rainbow. For novice or experienced adventurer, Shenanigans is available on 32K cassette for $24.95 and 32K disk for $27.95.

Upgrade the performance and usefulness of your CoCo with Super Screen, a powerful machine-language program.

Replace your 32-character-by-16-line display with a 51-character-by-24-line display screen including a full upper- and lowercase character set. Super Screen fully supports the CLS and PRINT@ Basic commands making it easy to format business and personal programs.

Super Screen gives a full implementation of the ON ERROR GOTO statement including the ERL and ERR functions. Now you can trap errors and take corrective action to prevent crashed programs and lost data using the same syntax as many other computers. This addition to the Basic instruction set lets you write user-friendly programs.

Another important feature is the Key Press Auto-Repeat. Hold the space bar down and automatically step to the desired position in the line.

Super Screen is usable with, and automatically adjusts to 16K, 32K or 64K Extended or Disk Basic Color Computers and is available on cassette ($29.95) or disk ($32.95). Both Shenanigans and Super Screen are available from your favorite dealer, or direct from Mark Data Products, 24001 Alicia Parkway, #207, Mission Viejo, CA 92691. 714-768-1551.

Reader Service ✓ 554

RS-232 Checker

The Model 700 EIA RS-232 Interface Analyzer is a diagnostic tool designed for use at the standard EIA RS-232 or CCITT V.24 data interface of modems, multiplexers, terminals, and computers. It is inserted in series between the data terminal equipment and the data communications equipment (DCE) to provide access to and monitoring of all data, timing, and control signals.

The Model 700 uses state-of-the-art tristate LEDs to display polarity, activity, and validity of all key interface signals, simultaneously, in red, green, and red-green mixtures. Out-of-spec signals and open circuits are spotted instantly.

A complete table of EIA/CCITT standard interface signal description is provided in a reference chart. A compartment holds a folded EIA cable and mini-patchcords. The unit is compact, and battery powered for portability.

The Model 700 sells for $275. Contact Sales Dept., Electro Standards Laboratory Inc., P.O. Box 9144, Providence, RI 02940.

Reader Service ✓ 599

Hurricane Plotter/Predictor

New from The Software Connection, a Hurricane Plotter/Predictor Program distinguishes between a tropical storm and a hurricane, and determines whether the storm is a danger to the area.

If the storm presents a danger, the program gives an alert and calculates the time until the storm hits the area. The map is available at the press of a key, and once the storm has been plotted it shows its exact location in relation to the United States.

It has a relocatable city symbol, is designed for 16K tape or 32K disk systems, and requires Extended Basic. The Software Connection offers this program for $19.95. Contact them at 5460 N. State Road 7, Suite 108, Ft. Lauderdale, FL 33319. 305-484-7547.

Reader Service ✓ 552

New for the Dragon 32

Elkan Electronics announces three new products for the Dragon-32 home computer.

- Nanos Quick-Reference card for the Dragon-32 is a 20-page card containing some hitherto unpublished information about the Dragon-32. Intended as easier-to-handle and easier-to-use than the reference manuals, the card is pocket size, and costs £2.95.
- The Dragon Cruncher conversion program is the first cassette-based, menu-driven program that converts most Dragon-32 programs for use on the Tandy Color Computer, and most Tandy Color Computer programs for use on the Dragon-32. This program also enables program listings from magazines such as *HOT CoCo* to be easily converted, without programming, for use on the Dragon-32. Dragon cruncher sells for £7.95.
- Quick-Shot deluxe self-centering joystick controller has a positive-response fire button and contour grip, and helps you improve your scores on arcade type games that require quick reactions. It sells for £14.95 (£1 shipping), or £28.95 for 2 (£1.50 shipping).

All three products are available from Elkan Electronics, FREEPOST, 11 Bury New Road, Prestwich, Manchester M25 8JZ. Phone 061-798-7613.

Reader Service ✓ 551

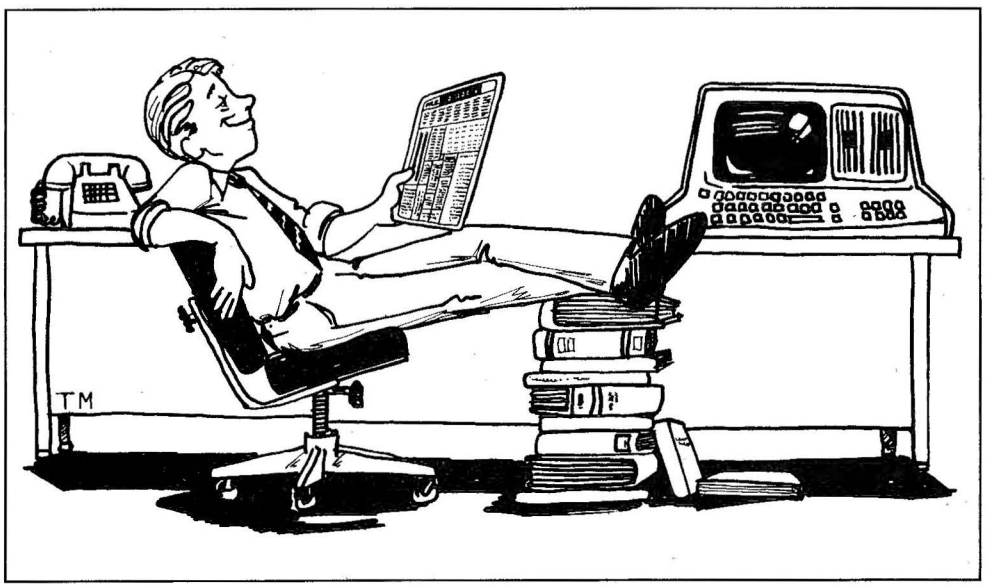
Morse Code Teacher

Cynwyn now offers TRS-80 Color Computer and TDP-100 owners Morse Code Teacher, a program aid for learning International Morse Code. The program is designed for the beginner to International Morse Code and features three different practice routines that promote familiarity with the code and can increase copying or auditory recognition speed up to five words per minute.

In the introductory routine, whenever any letter or number on the computer keyboard is pressed, the program responds with the equivalent character in Morse code. The second routine generates and sends characters one at a time from predetermined letter/number groups and displays them on the screen for checking. In the final routine, random characters are sent either three or five words per minute for copying sessions of one minute, and are then displayed on the screen at the end of the session.

Morse Code Teacher requires 16K RAM and Extended Color Basic, and is available on cassette for $15 postpaid from Cynwyn, 4791 Broadway, Suite 2F, New York, NY 10034. 212-567-8493.

Reader Service ✓ 550



Algorithms Chart for Quick Reference

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This disk based program for the color computer contains recipes for over 150 of your favorite bar drinks-both alcoholic and non-alcoholic. **MASTER MIXOLOGIST** is menu driven for ease of use. Requires 16K and one RS/DOS drive. Get this one today, it will be great for your next party $19.95

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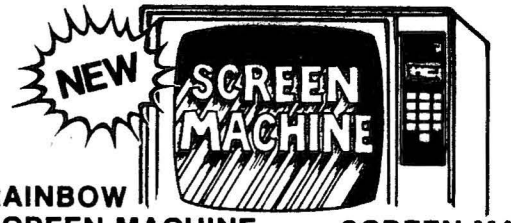

RAINBOW SCREEN MACHINE

The Rolls Royce of graphics/text screen enhancers — more features than all others combined!

- Add these features to your computer/program: ML extension of Basic loads on top of 16, 32, or 64K machines to enable easy mixture of hi-res graphics and text in your programs. Dense text or large lettering for children, visually impaired or VCR title screens with no programming!
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- Simple 2-letter abbreviated commands inside your program or control key entry from keyboard, even during program execution!
- Includes demo program, character generator program and manual. 16K Ext. Basic required - 32K recommended, $29.95 Tape, $32.95 Disk.

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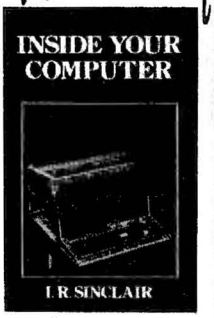
Rainbow Quest for the Color Computer

A computer fantasy for young Color Computer users. Rainbow Quest *is an adventure that combines fiction and programs. Readers must cross the planet Rainbow and master a series of challenges to succeed on the Quest. Each challenge is a program on cassette. Included are arcade games, puzzles, and mazes. Book and cassette sold together.* **$24.97 BK7391 128 pp.**

Computer Carnival

For the TRS-80 Models I and III. These sixty programs for beginners will entertain and educate. Children will find mazes, word games, graphics, puzzles, and quizzes. Card games, logic tests, word and number quizzes, and letter guesses make Computer Carnival *a learning experience. The* Carnival Companion *cassette of all sixty programs is also available.* **Computer Carnival and Carnival Companion** *$24.97 CC7389* **Computer Carnival** *$16.97 BK7389 218 pp.* **Carnival Companion** *$9.97 TP7389*



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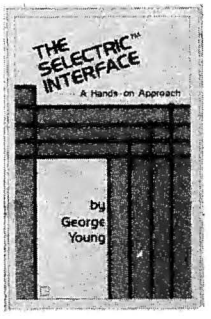

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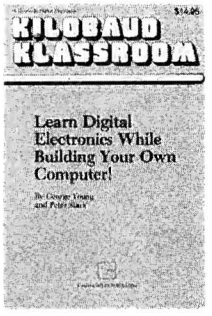

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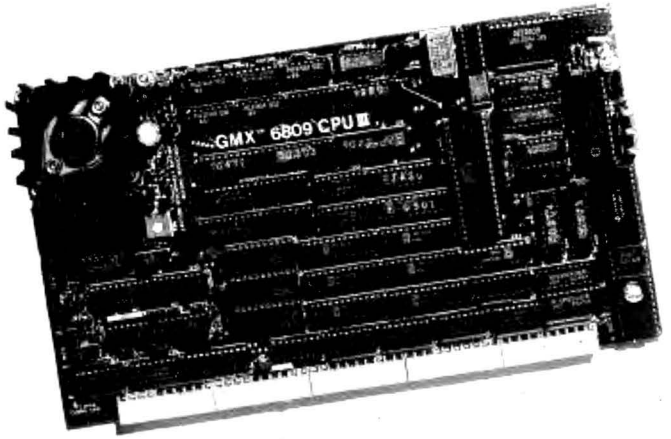

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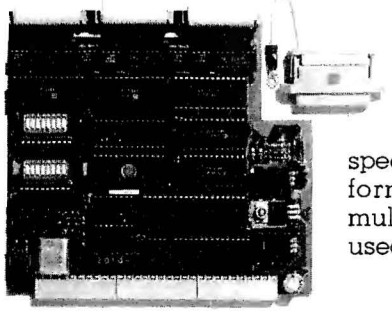

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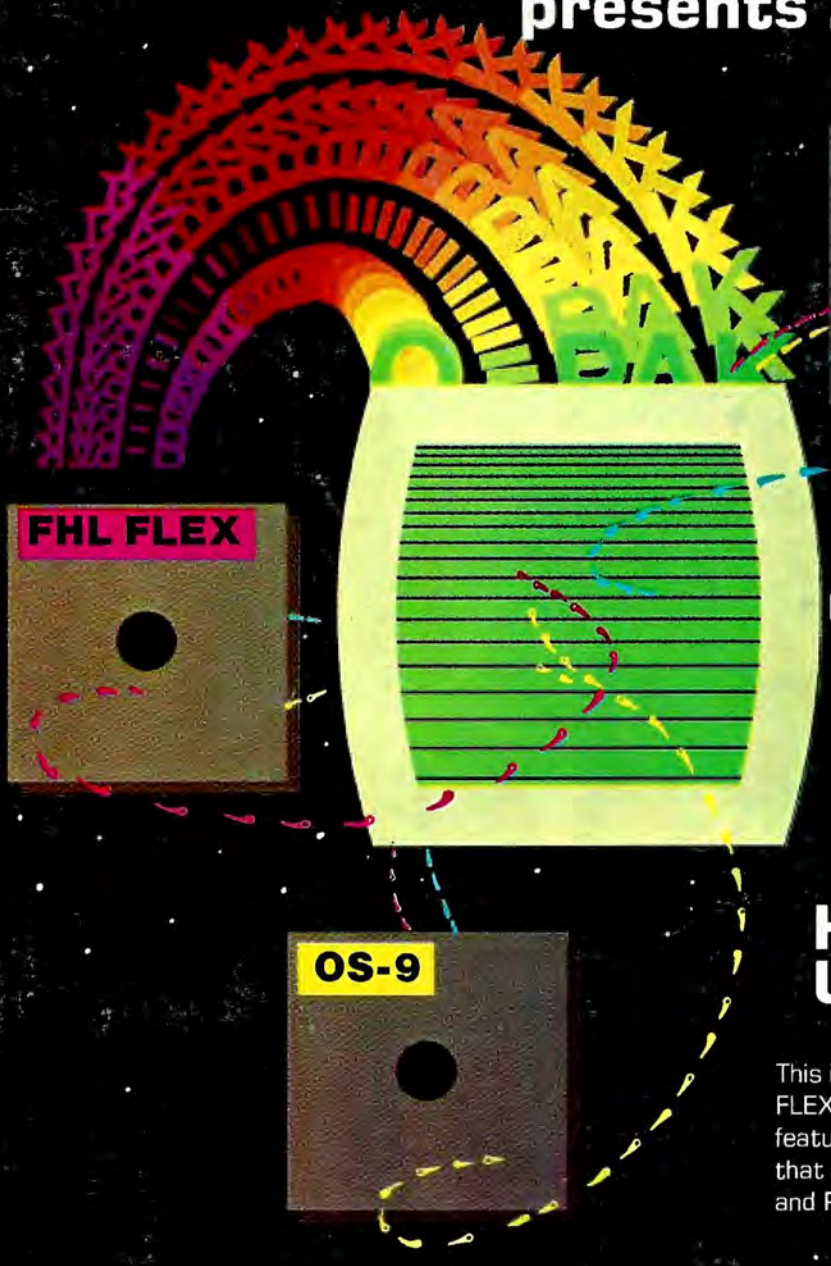

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