

HOT

CoCo

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A3#520

THE MAGAZINE FOR TRS-80 COLOR COMPUTER®, MC-10®, TDP-100™ AND DRAGON™ USERS. T.M.

Help GeoJogger Stop Dr. D'Estroi . . .

ROMBACK

G A M E S

START



START

W



S

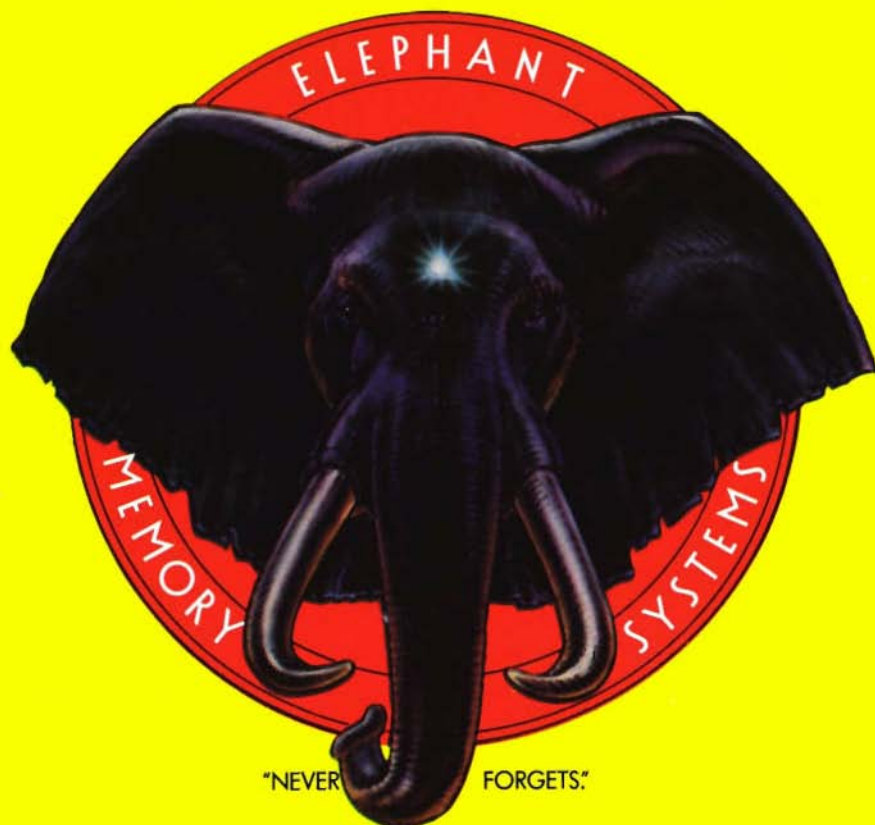
... Can You Find
The Clues on
This Cover?



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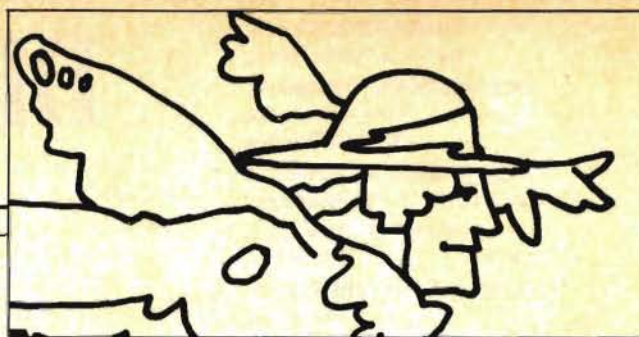


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Ordering Information: Specify model (Original or F-version). Payment by C.O.D., check, MasterCard or Visa. Credit card customers include complete card number and expiration date. Add \$2.00 for shipping. New York state residents add 7% sales tax. Dealer inquiries invited.

HOT CoCo



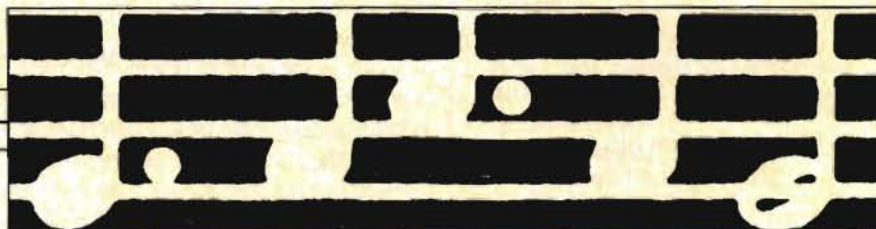
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DIGRESSIONS

DID SOMEONE SAY “GAMES ISSUE?”

This issue of *HOT CoCo* was a lot of fun to put together. We always enjoy the games our readers submit for publication, and we are happy to provide the best of them in our first-ever Games Issue.

Our cover this month sets the tone for the rest of the magazine: fun. We have a variety of games to suit a number of tastes. If you like adventures, you'll like our cover article, *GeoJogger*. *GeoJogger* must stop a sociopathic litterbug from ruining the North American countryside. The cover offers some clues to where this evil-doer might be. On the way you'll come across some characters from the other games in this issue.

(We'd like to thank the author of *GeoJogger*, Richard Ramella, for writing this program on such short notice. Good job, Richard.)

GeoJogger will ride on the submarine from William Bonnell's "Submarine Simulation," while facing down the featured creature in this month's Elmer's Arcade, "Guppy's Revenge." He'll do a quick quarter-mile in Charles Levinski's simulation, "Dragrace."

While in New Mexico, *GeoJogger* will find the Grand Canyon blocked off by multicolored bricks, which he'll do away with by playing Mark Goodwin's "Smashout." He won't be able to resist trying Gabriel Weaver's "Jackpot Slots" while visiting Atlantic City.

*"We hope you enjoy this issue
as much as we enjoyed producing it."*

In Canada, *GeoJogger* will find that everyone's favorite sport is hockey, as exemplified by Charles Boulanger's "Hockey One-on-One."

So, put on *GeoJogger's* shoes and take a run through this month's *HOT CoCo*. We hope you enjoy this issue as much as we enjoyed producing it.

Re: Re:FLEX

Unfortunately, due to other demands on his time, David Wasler will no longer be able to write our Re:FLEX column. However, starting in January that column will be taken over by Scott Norman.

Scott is well known to many CoCo users. He has reviewed numerous Color Computer products, and he is currently the author of *80 Micro's* monthly column, *The Color Key*. Scott will take a user approach to FLEX. He will discuss various software packages and ways of implementing them in serious applications. We are pleased to have Scott aboard as a columnist.

Re: Program Listing Formats

So far, response to the question on whether to publish program listings in

32- or 64-character format is running heavily in favor of the 32-character style. Most said it was their best tool for ensuring that they typed in listings correctly.

We must agree that anything that cuts down on the frustration of typing in listings is worthwhile. We will run all our Basic listings in the 32-character format from now on. You might see some 64-character listings from time to time, but they will be articles that had been readied for publication before this decision.

We are open to any suggestions from our readers that could make *HOT CoCo* easier to use. Also, if you find a particular aspect of our magazine troublesome, tell us about it. We'll try to fix it.

New CoCos

The second part of Digressions this month was written by our technical editor, Guy Wright. He has gathered information on the new 64K Color Computer and OS-9.

By the time you read this, some of you might actually own either the 64K or the CoCo 2, which is a smaller, compatible Color Computer with either 16K or 32K. Because of our publication lead times, we are preparing this column in early August, and no units were available. We expect to have a comprehensive review in December.—*M.N.*

THE NEW 64K CoCo: LOOKING GOOD!

At this writing, the new 64K Color Computer is being advertised in the newest Radio Shack catalog for \$399.95. The first difference you notice between the new CoCo and the old one is the off-white case, as opposed to the battleship-grey, but the changes go much deeper than that.

The next most obvious difference is the 64K of memory—64K usable with the new OS-9 disk operating system (DOS) and 32K usable with the built-in Extended Basic. The 64K CoCo's ability to support the OS-9 DOS, with the Basic-09 is perhaps the most interesting change.

The catalog describes OS-9 as a "comprehensive system that supports multi-tasking." How well the OS-9 multi-tasking system works with the CoCo remains to be seen, but many of you readers will put this to the test when the system is available. OS-9 also provides a full-featured editor/assembler with a reference manual for \$69.95. The Basic-09 costs \$99.95. Both come on disk.

Basic-09, which requires OS-9, has an interactive compiler, which will produce "compact programs that can be executed at high speed." It also has command, edit, execution, and debug modes, which give the impression that OS-9 with Basic-09 is much more of a full-featured DOS than the Disk Basic many of us are used to.

The new CoCo also has a "new electronic typewriter-quality keyboard." The keys are sculpted like a "real" keyboard, but early reports suggest that it is not a "full-travel" keyboard, similar to the old-style keyboard. The sculpted keys alone should be an improvement, though.

Apparently, some hardware ROM bugs have been fixed. DLOAD and PCLEAR functions have been cleaned up. Many owners of Color Computers never realized that these bugs existed, but it is nice to know that Radio Shack is correcting these problems.

The new 64K Color Computer should be a giant step in the direction of making the Color Computer a machine that can compete with the other low-cost microcomputers such as the Commodore-64 in price, sophistication, and memory size. This new CoCo should raise an eyebrow or two in the next few months.—*Guier S. Wright* ■

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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 wrap-around 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

... With a Twist

October's "Expansion With a Twist" inadvertently ran with an incorrect Systems Requirements Box. The program requires 32K.

Souped-Up Line Printer

Thanks for the fine article on the serial-to-parallel printer interface in the June 1983 issue.

The construction was easy, but on the unit I built, the C3 caused the printer to double print every character. So I simply removed the C3.

Now my line printer works faster than ever. It doesn't print any faster (still 30 cps), but it loads the buffer four times faster (2,400 baud). This reduces the total printing time, and if you're printing graphics, you'll love the difference.

Larry Barnes

CoCo in the Classroom

I'm very impressed with the first issues of your magazine and feel that you have produced a forum that will be a great help in the development of support for the Color Computer.

I'm wondering if any of your readers can help me. This fall I will supervise a pilot program that will introduce children in several schools in our local school district (Knox Co., TN) to computers. We will use the Color Computer, and I would like to hear from educators who have used, or who are using, this machine in schools, especially elementary schools.

I'm interested in their experiences with the CoCo, with children's reactions, and with various software. I would be happy to share the results of our pilot with any interested readers.

Chris Templar

*Johnson Bible College
Kimberlin Heights Station
Knoxville, TN 37920
615-573-4517*

Meet Me in Spartanburg

The Spartanburg County CoCo Club meets every Thursday evening at 7:30 p.m. in the old library, Wing C of Spartanburg Technical College, Spartanburg, SC.

For more information, call or write Dennis Shattuck, 473 Royal Oak Drive, Spartanburg, SC 29302, 803-583-3017.

Dennis L. Shattuck

Meet Me in Sarajevo

We have recently founded a Computer club here in Sarajevo. I have the only Color Computer in this area. (I think there are only three or four in Yugoslavia.)

There are, however, many Sinclair Spectrums and ZX-81s, three Apple IIs, one Video Genie (a clone of the TRS-80 Model I), and a TI 99/4A.

I am employed by PTT Sarajevo and spend my free time practicing Aikido and programming my Color Computer.

*Ragib Karamehmedovic
M. Trifunovica 47
71000 Sarajevo
Yugoslavia*

Wait a Minute, Captain Kirk!

Please make the following corrections to the listing of Galaxy Trek Adventure 2 (Sept. 1983, p. 72):

●Line 250: Correct the spelling of MAIN and change the checksum value to 6969.

●Line 510: Correct the spelling of AGAINST, delete one space before DEADLY, and change the checksum value to 12886.

●Line 1933: Delete the period after

TYCHO IV and change the checksum value to 5130.

●Line 1950: Correct the spelling of PLANET'S, delete one space after POPULATION, and change the checksum value to 13699.

●Line 2905: Change the checksum value to 2980.

●Line 2950: Insert a space before the first CAPTAIN and change the checksum value to 10028.

●Line 3900: At the end of the line add :GOTO 850 and change the checksum value to 5113.

●Line 4215: Insert a colon (:) before GOTO 850 and change the checksum value to 10576.

If you still have difficulty typing in the listing, even with the Checksum feature, I'll send you a tape of the program, ready to CLOAD and run for \$10. It requires 32K and Color Basic.

With this tape, you can stop in the middle of the adventure and then pick up later right where you left off—a feature not available in the magazine version. You store all appropriate variables (what you see, your location, and so on) on a separate tape and then reload them in response to prompts provided in the new tape version.

*Howard F. Batie
12002 Cheviot Drive
Herndon, VA 22070*

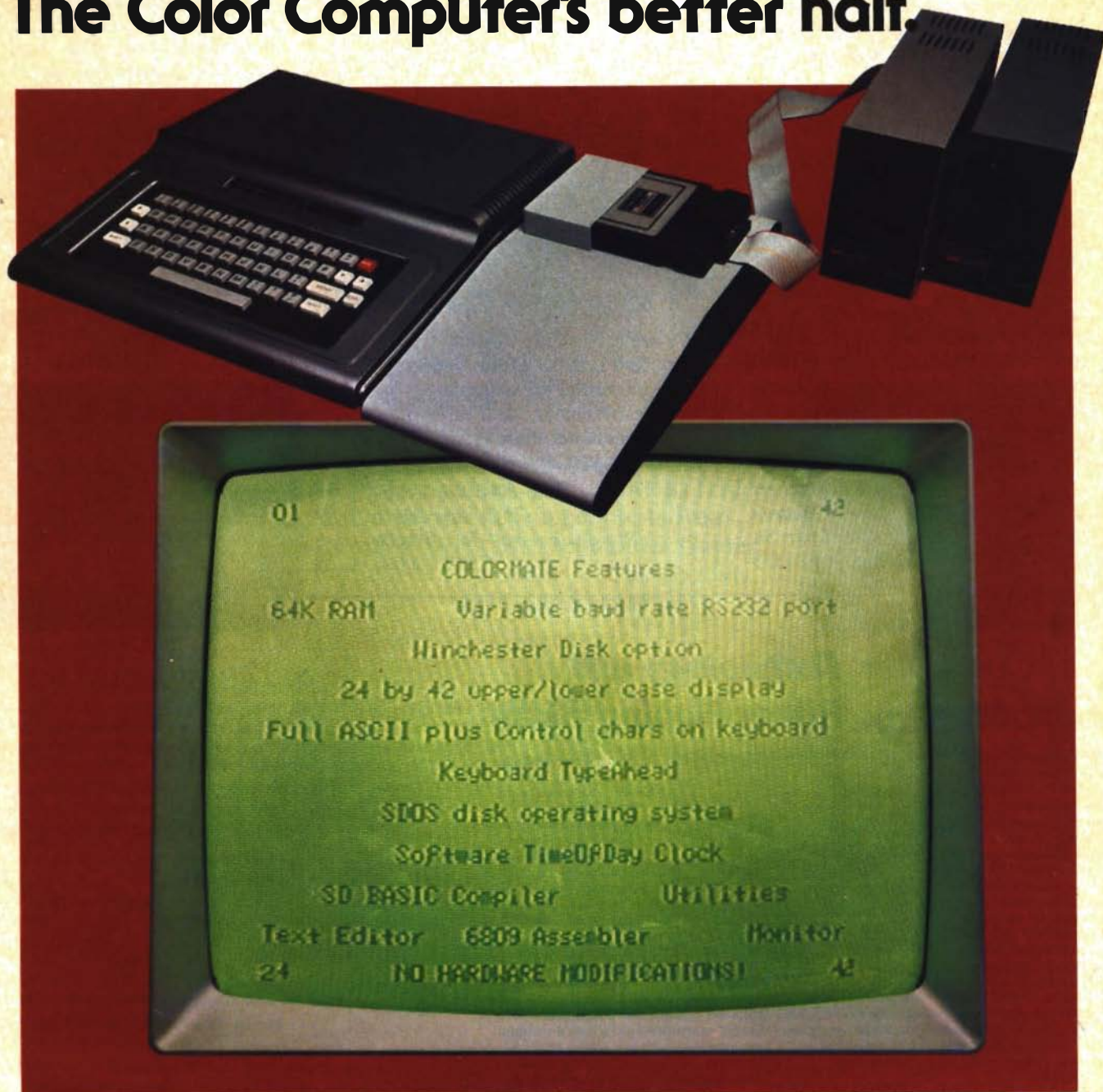
Bugs in Small Numbers

In the course of developing software for my new product, the Kaleidophone, I have discovered yet another bug in Microsoft Basic. If you have any software that involves the use of small numbers, watch out!

This is not the usual rounding error to which all floating point is subject, but a strange quirk in 1.1 Color Basic, with or without 1.0 Ex-

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Screen above is unretouched photograph of ColorMate display. Disk Extended BASIC is not required.

COLORMATE is \$495.00. Includes 400+ pages of documentation. Radio Shack floppy controller and floppy disk drive not included. Word processing, accounting, and Winchester disk drives are available. Write or call for details. Dealer inquiries invited.



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✓393

tended Color Basic. Try this:

PRINT 31 - 1.0E - 38

Now 10^{-38} is almost zero, so you should get 31, right? Wrong. The answer given is $1E - 38$.

There are many variations of this bug, and it's not just a problem with using E format for input. Try this:

```
10 X = 1.0
20 X = X/1.1
30 IF (31 - X) < 30 THEN PRINT X; 31 - X
40 GOTO 20
```

You'll find a whole range where the error occurs—roughly 3×10^{-39} to 9×10^{-38} . Note that these answers are wrong by a factor of nearly 10^{40} —not an insignificant amount.

I think all numerical software vendors should be aware of this.

*Fred K. Lenherr
New Salem Research
West Main St.
New Salem, MA 01355*

Meet Me in Pontiac

There is now a Color Computer club called Color C.H.I.P.S. in the Pontiac, MI, area. It meets on the fourth Wednesday of each month at 7 p.m. in the I.M.C. Building, 1325 Crescent Lake Road.

For more information, call 627-4358 or 627-2235.

*J. Hallock
586 Eastridge
Ortonville, MI 48462*

Meet Me in Rio

We are a Brazilian TRS-80 Color Computer user's group seeking anyone interested in exchanging programs, experiences, and information. We'll answer all letters.

*Francisco J.M.C. da Silva
TRS-80 Color Club
P.O. Box 2951
Rio de Janeiro—RJ, Brazil
CEP: 20000*

Anyone for High Scores?

Hot CoCo is a fine magazine, and I enjoy all your columns and articles.

I do have a suggestion, though. How about publishing the high scores for CoCo gamers out there? Not many Color Computer scores appear in *80 Micro*, but I bet the response would be terrific in *HOT CoCo*.

*Peter Stumpf
1508 Appaloosa Trail
McHenry, IL 60050*

What do you think, gamers? If enough of you send in your high scores, we'll publish them. Please respect the honor system that we here in NH value so highly.—Eds.

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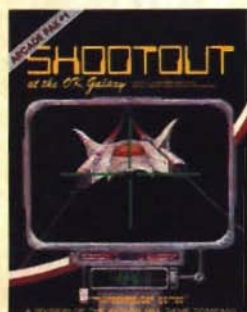
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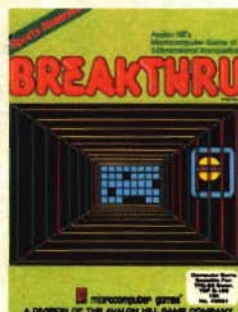
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SCIENCE FICTION



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Shootout Screen

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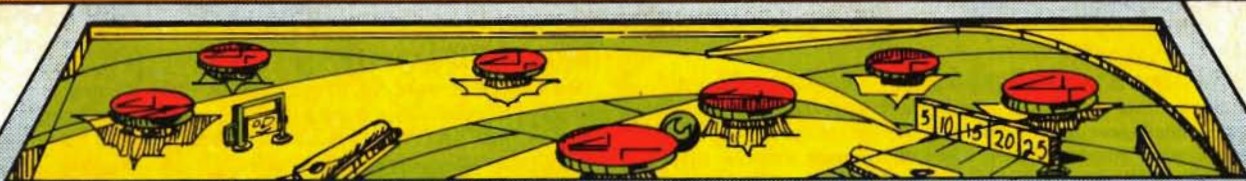
ELMER'S

ARCADE

GUPPY'S REVENGE



Robert Dukette



by Richard Ramella

A beautiful girl sat weeping loudly on the counter at Elmer's joint as I stopped by this past Saturday. "Who is this lovely creature and why is she so sad?" I asked. I could be so bold because the girl was about three years old.

"My niece Cynthia," Elmer said glumly. "I'm watching her while her mother shops. Bet you're surprised someone so cute could be in my family."

Not one to turn down a good straight line, I told him, "The greater surprise is that you're a member of the same phylum." I turned to Cynthia before he could think of a comeback. "What could I do to make you smile, sweetie?"

"W-A-A-A-H-H!" she answered, scrambling along the counter away

from me and toward Elmer.

"She just woke up," Elmer said. "She's cranky. Did you have a bad dream?" he asked her.

"Uh-huh," said Cynthia.

"What about?"

"Bunny rabbits chasing me."

"Aw!" said Elmer. "Why don't I tell you a nice monster story so you don't think about those mean old bunny rabbits?"

"Okey-doke," Cynthia said with a pale little smile.

"Elmer, you got it backwards," I said. "The normal way to tell a story about nice things like bunnies and fuzzy bears and fawns to chase away the monsters."

"My family doesn't do things the normal way," Elmer said. He took my quarter, gave me five nickels and dis-



missed me.

At first I didn't pay much attention to the story because I was rather heavily involved in a game Elmer recently installed. It was old, and if it ever had a name it was long ago worn off by players. It had two sets of...well, teeth would be a good way to describe them. I turned a knob that inclined the set of metal uppers and lowers from

System Requirements

16K RAM

Extended Color Basic

Elmer's Arcade

side to side so a ball bearing would score points each time it hit a side of the mouth. The kicker was that the teeth would snap together, two at a time, in a sweeping motion from side to side. If the steel ball was caught by the teeth, the game ended. I suspect it made some electrical connection.

But why am I boring you with all this when I can share the story Elmer told Cynthia? I won't attempt a verbatim retelling.

It seems there was a mean little kid who didn't always remember to feed her guppy. One night the Guppy Fairy Godmother appeared to the tiny fish and offered it one wish. The ill-tempered guppy requested that the forgetful little girl be made very small and thrown into the fishbowl. And, lo, it was so!

I tried to protest the story, but by then both Elmer and Cynthia were rubbing their hands and he-he-hee'ing in a world of their own. I'll spare you the subsequent result of this tale of revenge.

I turned back to my game, trying to shut out the tale of carnage. The game's teeth reminded me of nothing else but a guppy made leviathan by some dark magic, and I might have fainted on the spot had not a thunder-clap struck my fevered brain at that instant. In such creative moments, my mouth flaps open so the steam can escape.

Elmer saw and understood. "Uh-oh, he's got an idea! Stand back,

everyone!"

I headed for the door. "Bye."

"Come back here!" Elmer yelled. "You've stolen my story. You're going to take my story and make it into a computer game, and I won't get a

*"The guppy is huge
by comparison. It has
beady red eyes and
large blue teeth
that snap together
two at a time alternating
from left to right."*

dime out of it!"

Elmer spoke the truth. I'm a terrible thief and I feel so horrible and remorseful. Oh me, oh my! Now let's play Guppy's Revenge.

In this game you are an orange submarine the size of a single SET(X,Y,Z) graphic pixel. The guppy is huge by comparison. It appears on the screen in a head-on view. It has beady red eyes and large blue teeth that snap together two at a time alternating from left to right.

At the top left of the screen is the score, and at the top right is a timer. You score points by holding down the

left and right arrow keys so the submarine travels from side to side. The points you earn depend on how fast you maneuver the submarine to the other side of the screen. You keep playing until the submarine gets chomped by the teeth or you fail to reach the opposite side within the allotted time. Both these eventualities make the guppy quite happy.

Any time you take the submarine to the extreme left or right positions, the timer starts over at 150. However, you only score points when you make it to the opposite side of the screen, whichever side that may be. Also, the extreme right position is a safe position; the teeth can't get you and the timer hasn't started. So, if you're tired, you can take a rest here and return to a good game.

The guppy has gaps between its teeth which provide safe harbors as you make your way across the screen.

I think a score of 20,000 will be quite difficult.

If anyone has trouble keying in Guppy's Revenge, send a listing or at least a description of error messages and lines occurring, to me, Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. Include a self-addressed stamped envelope, and I'll answer quickly. From other countries, include a self-addressed envelope and coin equal to stamps on your outgoing letter. I can't help if you have changed the program in any way, so save enhancements until we get it running. ■

Program Listing. Guppy's Revenge

```
120 CLS(0)
130 G$=CHR$(128)
140 H$=CHR$(239)
150 K=.714285714
160 PRINT @ 160,STRING$(32,134);
170 PRINT @ 233,"GUPPY'S REVENGE
";
180 PRINT @ 288,STRING$(32,134);
190 FOR T=1 TO 1500
200 NEXT T
210 CLS(3)
220 FOR A=0 TO 64 STEP 32
230 PRINT @ A,STRING$(32,128);
240 NEXT
250 Y=6
260 FOR Z=13 TO 1 STEP -1
270 FOR X=0 TO Z
280 RESET(X,Y)
290 RESET(63-X,Y)
300 NEXT X
310 Y=Y+1
320 NEXT Z
330 Y=31
340 FOR Z=3 TO 1 STEP -1
350 FOR X=0 TO Z
360 RESET(X,Y)
370 RESET(63-X,Y)
380 NEXT X
390 Y=Y-1
400 NEXT Z
410 FOR Y=13 TO 15
420 FOR X=9 TO 21
430 RESET(X,Y)
440 RESET(X+32,Y)
```

Listing continued

Elmer's Arcade

Listing continued

```
450 NEXT X
460 NEXT Y
470 A$=CHR$(239)+CHR$(128)
480 FOR A=1 TO 16
490 A$(1)=A$(1)+A$
500 NEXT A
510 A$(2)=STRING$(32,128)
520 A$(3)=A$(2)
530 A$(4)=A$(1)
540 X=10
550 Y=15
560 SET(X,Y,4)
570 SET(X+32,Y,4)
580 F=3
590 C=1
600 P=63
610 Q=23
620 GOSUB 920
630 PRINT @ 0,"SCORE:";L;
640 A=RND(5)*2
650 TIMER=0
660 B=RND(2)
670 PRINT @ 23,"TIME";150-(INT(TIMER/10));
680 IF B=1 THEN FOR C=F TO F+A STEP 2 ELSE FOR C=F TO F-A STEP -2
690 MID$(A$(2),C,1)=H$
```

```
700 A$(3)=A$(2)
710 MID$(A$(1),C,1)=G$
720 A$(4)=A$(1)
730 GOSUB 920
740 GOSUB 1180
750 MID$(A$(1),C,1)=H$
760 A$(4)=A$(1)
770 MID$(A$(2),C,1)=G$
780 A$(3)=A$(2)
790 RESET(X,Y)
800 RESET(X+32,Y)
810 IF B=1 THEN X=X+K ELSE X=X-K
820 IF X<10 THEN X=10 ELSE IF X>20 THEN X=20
830 SET(X,Y,4)
840 SET(X+32,Y,4)
850 GOSUB 920
860 GOSUB 1180
870 IF C=1 THEN C=3: GOTO 890 ELSE IF C=31 THEN C=29: GOTO 890
880 NEXT
890 F=C
900 IF TIMER>1500 THEN PRINT @ 36,"TIME'S UP";: PRINT @ 28,"0";: GOTO 1030
910 GOTO 660
920 RESET(P,Q)
930 PRINT @ 320,"";
940 FOR H=1 TO 4
950 PRINT A$(H);
960 SET(P,Q,8)
970 NEXT H
980 U=INT(C/2.625): IF U<1 THEN U=1
990 PLAY "T50": PLAY STR$(U)
1000 IF POINT(P,Q+1)<>0 GOSUB 1030
1010 IF P=0 OR P=63 GOSUB 1130
1020 RETURN
1030 SET(P,Q+1,8)
1040 PRINT @ 46,"TRAPPED ";
1050 SOUND RND(13)*16,1
1060 SET(X,Y,RND(8))
1070 SET(X+32,Y,RND(8))
1080 IF C<17 THEN W=404 ELSE W=384
1090 PRINT @ W,"HAR HAR HAR!";
1100 GOTO 1050
1110 PRINT @ 0,STRING$(30,175);
1120 RETURN
1130 IF P=0 AND S/2=INT(S/2) THEN S=S+1: L=L+1500-TIMER
1140 IF P=63 AND S/2<>INT(S/2) THEN S=S+1: L=L+1500-TIMER
1150 PRINT @ 0,"SCORE:";L*10;
1160 TIMER=0
1170 RETURN
1180 IF P>0 AND (PEEK(343)AND8)=0 THEN P=P-1 ELSE IF P<63 AND (PEEK(344)AND8)=0 THEN P=P+1
1190 RETURN
1200 END
```

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Your job, as a Mesthopholan gunner, is to blast away at the Demon's force field in the sky. The higher the section in the power field, the more points you score. Hitting the demon will disorient him and score you extra points. Avoid the underground Neutralizer which will vaporize your gun station if you fire while one is underneath you.

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You have fifteen tries to decode the word on the screen. Each time you miss a letter a new section is added to the alien. There are two levels of play, hard and easy. Sometimes a code word will be repeated. See how many alien craft you can destroy before they are able to launch!

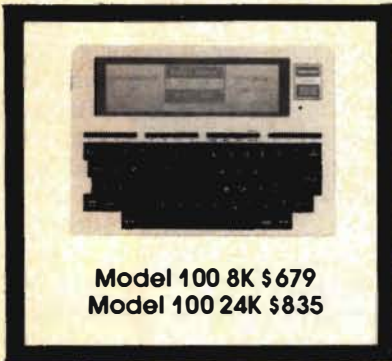
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REVIEWS

Color Outhouse
Computer Shack
1691 Eason
Pontiac, MI 48054
\$26.95, cassette
\$28.95, disk

by **Martin Goodman**

Is nothing sacred? Thieves are making off with your toilet-paper supply, stringing it out the door and across the field. As your ship hovers above, you must pick off the scoundrels, being careful not to fire into the fragile toilet paper. There's even trouble from above! The skies are filled with enemy ships, just waiting for a chance to wipe you out (pardon the pun!)."

So runs the ad for Color Outhouse by Computer Shack. When I first saw that, I thought they must be scraping the bottom of the idea barrel. However, after loading the game and playing it a few times, I was totally taken by its originality, its outstanding graphics, its delightful sound effects, and, most of all, by its brilliant playability.

You control a spaceship that guards the outhouse. Using either the joystick and fire button or the arrow keys and space bar (I preferred the joystick), you zap away at quite amusing thieves who will enter the outhouse, drag out the toilet paper, and proceed to string it across the screen unless you stop them.

You rack up some points by zapping these thieves and the enemy ships that drift toward you, but most of your score comes from preserving the roll of toilet paper. The number of feet left on the roll is multiplied by a bonus factor and added to your score.

As you proceed from level to level, the difficulty increases in various ways. Zappers appear in greater and greater numbers and fire at you. The game gradually speeds up. Squatters enter the outhouse, perform some unspeakable function, and then leave, but your toilet paper supply has decreased by a few feet. Different enemy ships appear and home in on the outhouse. Then Crushers and Spinners appear in the ninth level.

In addition to your zapper, you can

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edited by Mark E. Reynolds

fire one of your three smart bombs by pressing any number key. These bombs will clear the screen of all enemies, but the enemies regroup and reappear almost immediately. Extra rolls of toilet paper, extra smart bombs, and extra ships are awarded at various points in the game.

If you run out of toilet paper, if the enemy destroys all of your ships, or if any of the enemy ships manage to touch the outhouse, the game ends. In the disk version, all-time high scores are written to disk and displayed at the beginning of the next game. One or two people can play.

Strictly speaking, this is just another "zap the moving blips with your moving blot" game, but it is one of the finest of that genre I have seen for the CoCo (and I've seen and played nearly all the CoCo games).

All of Color Outhouse's excellent features combine to make it a truly superior and enjoyable game. You must constantly decide which enemy to destroy first (a mistake in this matter can end the game abruptly). The game appears to depend almost entirely on your skill; random events don't have much influence.

I have a few criticisms. The zapper can be aimed only in eight distinct positions separated by even 45-degree angles. Also, the game is so addicting that a pause button would have been handy.

A more serious criticism is that

there is no way of escaping to Basic. Once you've loaded this game, hitting reset will merely restart it. This feature is apparently a part of the copy-protection scheme, but is a grand pain to disk system owners. They must remove all disks from all drives before turning off the machine, or run the risk of crashing the disks. The risk of crashing this disk is heightened by the fact that it resides in the drive during the game and periodically will write to itself if it gets a high score. To its credit, however, Computer Shack does have a generous replacement policy for crashed disks.

In spite of these criticisms, I urge all CoCo arcade-game players to purchase this game. It really is one of the best I've seen. ■

Bloc Head
Computerware
Box 668
Encinitas, CA 92024
16K
\$26.95, cassette
\$29.95, disk

by **Peter Paplaskas**
HOT CoCo staff

Bloc Head is a high-resolution game based on the arcade game Q-Bert. The graphics are crisp and clear, similar to the arcade version.

You, as the character Bloc Head, begin play on a three-dimensional stack of 27 colored cubes. You must jump from cube to cube, changing the color of each to the color indicated in the upper-right corner of the screen. You score 25 points for each successful jump that changes the color of a cube. If you are near the edge and miss the cube, you fall to certain death.

If the game so far sounds unchallenging, let me warn you, it also features "nasties" and "friendlies" who will either help you or try to eliminate you, so beware.

The nasties are the Spring (worth 500 points), Black Egg, Red Egg, and the Face. The friendlies are the Blue Egg (worth 100 points), Bus Stop, and Oops (100 points).



Computer Shack's Color Outhouse

The Black Egg will immediately try to reach the bottom cubes in as few moves as possible. When it does it turns into the Spring, which is the only nasty that constantly hunts and hounds you. The Spring resembles its name and is quite hard to distinguish on the cubes as it blends in with the background. It can, however, be tricked into jumping off the cubes to certain death by making your Bloc Head jump onto one of the two Bus Stops, which will carry you safely back to the top of the screen. But he will return to the top of the screen as the Black Egg until it reaches the bottom and once again becomes the Spring.

After you have completed the first wave, a new wave of cubes appears and you continue to change the colors to the color indicated in the upper-right corner.

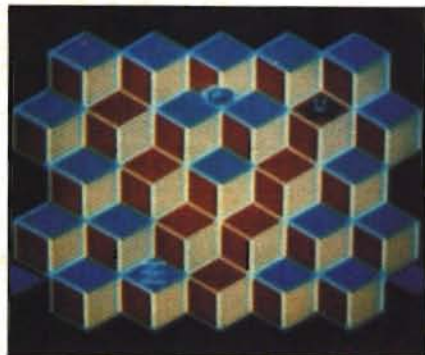
The third wave is very strange: You must have total recall of the board's setup, because the cubes are now invisible. They only appear after you

jump on them. One good point about the third wave is that you can see the Spring more clearly.

As you complete each new wave you are awarded bonus points and you also get an extra Bloc Head at every 10,000 points. There are two levels of difficulty, easy or tough. If you select the tough level, a new character appears after every wave, cluttering the board with both nasties and friendlies.

The first wave in the tough level is similar to the easy level. In the second wave the face appears; it ignores you, but is still a nuisance. The third wave is where all the fun starts. The Oops makes a grand appearance amidst all the numerous characters now on the board.

I have played many games in both levels and have yet to get past the fifth wave. Bloc Head does not become any less challenging after one or 10 games. The documentation is detailed and gives you a good idea on the objectives to accomplish. Bloc Head is definitely a must for your software collection. ■



Bloc Head, by Computerware

Whirly Bird Run
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by Edward Hemrick

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HOT CoCo[™]

ter in search of an enemy base hidden in the Tunnel of Doom. Equipped with a cannon and an unlimited supply of bombs, you battle rockets, saucers, and gas clouds on four screens. This high-resolution game is quite fun to play.

In the first screen, you fly the chopper over a landscape of mountains and ridges studded with rockets, enemy bases, and fuel tanks. Running into any of these destroys you, but if you bomb or shoot any of them you receive points. If you hit the fuel tanks you get one unit of fuel for your chopper. The fuel level drops gradually as you fly, and when you run out of fuel you crash.

The rockets in the first screen are not fired accurately, so they're quite easy to destroy as are the fuel tanks and enemy bases. Pressing the fire button and holding it in gives you bursts of four cannon shells and two bombs with a slight space between the shots.

The second screen has an added feature: small pink saucers that bob and weave across the screen.

These saucers can slip into the spaces between the bomb bursts and kill you. The rockets in screen two are fired much more accurately, and you have to dodge and shoot at them as well as the bouncing saucers.

Screen three also has enemy bases and the fuel tanks, but a large number of red arrowheads have been added. The arrowheads move across the screen in varying patterns. They are indestructible; you either dodge them or you're killed. They absorb any bomb or shot that hits them. This wastes valuable shots that could be aimed at the fuel tanks.

In screen four you enter the Tunnel of Doom, a black corridor with blue above and below it. Good control of your chopper is critical as the floor and ceiling often leave little room for maneuvering. You must also bomb and strafe at the same time you are going through the tunnel to increase your score and replenish your failing fuel supply.

As for screen five, I'll let you discover that one for yourself. (Actually, I haven't managed to get through screen four yet.)

My only wish is that the game had a practice round in which you have more than four lives.

However, even with only four lives it is a challenging and entertaining game for all ages. ■

Moon Hopper
Computerware
Box 668
Encinitas, CA 92024
32K, joysticks required
\$24.95, cassette
\$29.95, disk

Lunar Rover Patrol
Spectral Associates
3418 South 90th St.
Tacoma, WA 98409
32K, joysticks required
\$24.95, cassette

by Janet Fiderio
HOT CoCo staff

Moon Hopper and Lunar Rover Patrol share the same scenario. Both are inspired by Moon Patrol, the video-arcade game where you are the pilot of an experimental moon vehicle. Your mission: to successfully maneuver the craggy moon landscape and return safely to your compatriots. Don't be fooled, though. These games may share the same story line, but they are both unique.

The games use similar commands. You move the joystick to the right to accelerate, to the left to slow down, and up to jump. In both games the fire button can be held down continuously for rapid fire.

Moon Hopper

The feature I like most about Moon Hopper is its graphics. The black horizon, blue mountains, and multi-colored moon mobile, complete with revolving treads, are striking. The game has five levels of difficulty.

With typical arcade-documentation hype, Moon Patrol pits you against all sorts of strange and dangerous creatures with odd names like Traglons. The Traglons, in Space-Invader fashion, appear from the side of the screen, six tiers deep. They drop bombs and missiles on you, but it is fairly easy to blast them with your phasors or to avoid their fire.

As you dodge Traglonian missiles, you must watch the landscape for oncoming boulders or craters. You jump the craters (which can be difficult), but you can jump or blast the boulders.

The Moon Hopper screen displays a distance scanner above the horizon so you can judge your progress. It also tells you how many moon buggies you have left and how many points you have scored. You get an extra buggy when you reach home base. The screen then repeats itself and you begin another cross-country trek.

I found the first four levels of Moon Hopper fairly easy. I could never, however, get through the fifth level. I would inevitably fall into a crater or be blasted by an alien—sometimes both.

Moon Hopper's documentation consists of one colored sheet of paper. It is not of high quality, but it adequately covers the story line and necessary operating instructions. I would have liked to have seen a breakdown of the points received for shooting the different sized Traglons. It is not obvious how the game awards points.

Lunar Rover Patrol

Lunar Rover Patrol features a horizon that changes as the game gets more difficult. It does not feature separate levels of play. Where Moon Hopper's landscape is dark, concise, and clear, Lunar Rover Patrol's landscape is bright and cheerful—cartoonlike. A nice graphic touch in this game is watching the wheels of your all-terrain vehicle bounce off in different directions when you crash.

The landscape is marked with alphabetic milestones so you can gauge your progress. The screen also features a distance scanner, and displays your remaining moon vehicles, your points, and elapsed time at the top of the screen.

This game's interesting twist appears when you reach points E, J, O, T, and Z. At these points a new screen appears that shows how long it took you to get to that point, what the average arrival time is, what the record arrival time is, and what your bonus points are, if any.

This is what makes the game interesting. Not only are you dodging invaders, but you are racing your past speeds and trying to beat past time records.

Lunar Rover Patrol also takes a different track from Moon Hopper when it comes to aliens. Instead of tiers of attacking ships, your opponents are saucers that appear on the screen in groups of two or three at the most.

REVIEWS

As you move past the milestones, you are faced with additional obstacles. From points E through J you must only fight airborne aliens, craters, and boulders. When you reach points J through O land mines are added to your woes; from points O through T you must blast and jump mysterious balls. Once past point T, you battle tanks that fire back at you.

The Lunar Rover Patrol documentation is similar to Moon Hopper's—one colored sheet of paper with the needed information for play. The point values for the different ships are given, which is helpful.

Conclusion

Moon Hopper's strongest point is its graphics. And if you like Space Invaders, its alien-attack style will appeal to you. Jumping craters is more difficult with this game as there is less room for error. High scores are easily attainable, until you reach the fifth level.

Lunar Rover Patrol's race-the-clock approach, on the other hand, appealed to me. Even though it

doesn't offer separate levels of play, I found it more challenging. I liked being pitted against the clock as well as against the other obstacles. ■

Grabber
Tom Mix Software
3424 College N.E.
Grand Rapids, MI 49505
32K, joysticks required
\$27.95, cassette
\$30.95, disk

Trapfall
Ken Kalish
Tom Mix Software
16K, joysticks required
\$27.95, cassette
\$30.95, disk

by **Michael E. Nadeau**
HOT CoCo staff

Grabber and Trapfall are two of the more recent game offerings from the prolific Tom Mix Software. The two games differ greatly—one is a mutated form of Pac-Man, and the

other is a Co-Co version of the arcade game Pitfall.

Grabber

Of the two, Grabber rates highest in the sheer-fun category. You, as the Grabber, run around a maze collecting treasures and placing them in the center boxes. You must avoid monsters and Googlies, who can take your treasures and relocate them elsewhere in the maze.

You actually have two mazes on the screen. You switch to the other screen by pressing the fire button—a handy maneuver in tight situations. You have two X's on each maze. These X's change your color. If you are a different color than the monsters or Googlies, you can kill them.

What makes this game so much fun to play is its sound routines. I'm one of those game players who usually finds video muzak and the various vreeps, whoops, and snorts an annoyance. The author of Grabber, however, has managed to incorporate a catchy tune that meshes incredibly well with the game. It's almost like the old silent

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

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— Color Computer News, Jan. 1982

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

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

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

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

FEATURES & SPECIFICATIONS:

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

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

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

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

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

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

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

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— The RAINBOW, Jan. 1982

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REVIEWS

movies where someone played a piano for background music that was fitting for the mood. If you ever intend to write commercial game software with music, pick up a copy of Grabber and see how it's done.

The game itself is challenging. You must use strategy and be aware of what's happening on both boards at all times. The graphics are superb, and Grabber's features include a pause command and a scoreboard for scores over 15,000 points.

The documentation with Grabber and Trapfall is just a small piece of paper with the briefest instructions. It is adequate, but it isn't up to the standards of some other companies. This scanty documentation would not be worth mentioning if it were not for the prices of both games. Several other companies sell game software at similar prices, but they also provide slick packaging and handsome documentation.

If you have a 32K machine and are willing to pay the price, you should consider adding Grabber to your game collection.



Trapfall

As mentioned earlier, Trapfall is a completely different game from Grabber. You are a treasure seeker who runs, jumps, and dodges alligators, logs, snakes, scorpions, and campfires. You have 20 minutes to complete the game and collect all the green lumps that are the treasures.

The graphics are good, though not the best I've seen. The sound is only average. The game is challenging and usually a matter of timing your jumps. Good joysticks will aid your game as the Radio Shack sticks seem to be particularly unforgiving with Trapfall.

It's too bad Tom Mix wasn't more imaginative with the documentation. Trapfall lends itself well to an interesting story line.

Trapfall became monotonous to me after about a half-hour of play. But if you are the type of person who has seen *Raiders of the Lost Ark* seven times and can't wait for it to come around again, then Trapfall will probably appeal to you. ■

Guardian
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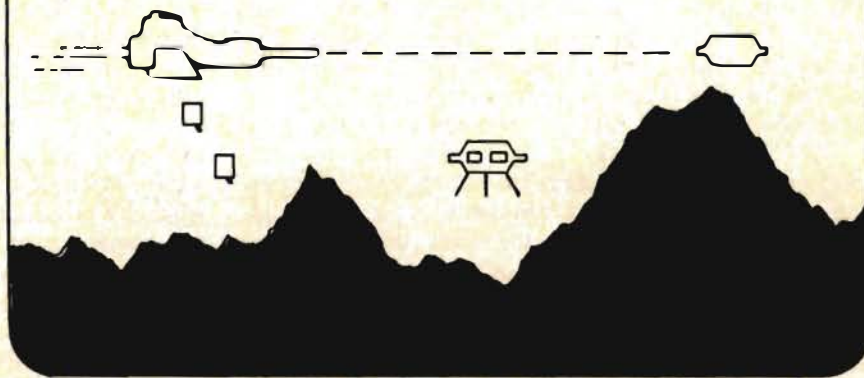
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REVIEWS

by Peter Paplaskas
HOT CoCo staff

Of all the Defender clones, Guardian has them all beat. The sound effects are of superb quality—sometimes I'd swear that I was at an arcade playing Defender. The graphics are just as impressive, and the explosion of being annihilated shows detailed fragments of your ship flying into many directions.

I have played two other Defender clones that received good reviews, but they cannot come close to Guardian's standards.

The object of Guardian is to save the 10 energy pods on your planet from being carried off to space by the Landers. All you have is your three Guardian spaceships equipped with plasma bolts and three smart bombs for the first wave of attack. You are awarded an additional spaceship for every 400 points.

The aliens are Landers (10 points), which try to steal your energy pods; Mutants (20 points), which follow you and shoot missiles; Swarms (40 points), which are pods that have been shot; Baiters (35 points), which come after you after a time limit; Pulsers (25 points), which can only be destroyed when they blink on; and Munchies (30 points), which are just a nuisance.

You control your ship with the right joystick and fire button. The fire button controls your plasma bolts, one shot at a time. You can achieve rapid fire only by firing at short range. This mode of firing is not as effective as the single shot because only the most recent shot is deadly.

The space bar activates your three smart bombs. This is a drawback because you must remove one of your hands from the joystick controls to hit the space bar. This could prove to be disastrous in a tight situation. The smart bombs will destroy everything on the screen except for your ship. You acquire an additional smart bomb after every completed wave.

At the top of the screen is your long-range scanner. It shows all current enemy positions and your own, so you can anticipate what will be attacking you. It also gives information on how many ships and smart bombs you have remaining in the game.

When the attack begins the Landers will try to steal your energy pods. If successful they will appear at the top

of the screen as Mutants, which are now at a higher energy level and are fast and hard to destroy. But if you destroy a Lander while in the process of stealing one of your energy pods, the pod will fall back towards the planet and you must catch it before it does. You are then awarded 75 points.

If all your energy pods are stolen, the planet explodes and you are left in space to fight the aliens, which now operate at twice their normal speed. A new planet will appear after every fifth wave is completed.

The best strategy is to drop your energy pods in one area for easy protection after saving them from the Landers. Mutants, when first appearing on the screen, seem to hesitate for a second or two to decide in which direction to move; this is the best time to attack.

The documentation is an eight-page booklet that gives you in-depth instructions on playing procedures. Guardian is a very challenging game, full of fast action and fun—probably one of the better shoot 'em-up space games you will encounter. ■

Colorkit
Prickly-Pear Software
9822 E. Stella Road
Tucson, AZ 85730
\$34.95, cassette
\$39.95, disk

by D. Dean Rector

Microsoft gave the CoCo language, Arizin Inc. gave it style with Colorkit. This 5K machine-language utility (2.5K for the Microkit) ties into Basic by modifying the jump table in low memory. Essentially, it adds 20 separate commands and functions to the Basic command mode. Any of these functions, or the entire kit, can be enabled or disabled at will.

Colorkit is a boon to the eyes and mind of anyone who spends much time in front of the screen programming. This utility is compatible with all versions of the Color Computer having at least 16K, and is available on cassette and disk. I run the kit on a 64K cassette system.

At first glance, the kit's size, 5K, seems to be its biggest drawback. However, if you load it into the top of a 64K system you retain a full 32K of Basic RAM. If you have a 32K system,

with the increased efficiency the utility provides, you will seldom notice a loss of space. For those running with less RAM, the smaller Microkit (only 2.5K) might be more to your liking, although you lose some of the functions.

The kit provides many utilities. For those of you who have not made the reverse-screen modification, you may invoke a function that provides a dark screen with light letters. In addition, you can choose either the standard green or the optional orange-text screen. By using these options on a color TV and adjusting the tint, you can produce a satisfactory amber screen. For anyone using a black-and-white TV or a monochrome monitor, the orange screen gives much better contrast.

A keyclick tone can be enabled through the TV speaker. Until you have used this feature you cannot appreciate it. The kit also features a fine full-screen editor that complements the Basic line editor. This editor uses a four-way, arrow-controlled cursor to move about the screen. You can over-type characters, and open and close space in the text.

When you open and close space, the full screen beneath the cursor scrolls, wrapping around on each line successively. Any characters scrolling to the cursor from the right, or past the right bottom edge of the screen from the left, are deleted.

Cursor motion and opening and closing actions are fast and smooth. They continue for as long as you press the keys. You can speed up or slow down these functions by a simple set of POKES.

You can see what is happening to the line as it exists at any moment when using the screen editor. With the Basic line editor you cannot. In addition, you can quickly renumber a line that needs to be elsewhere, alter and renumber long repetitive lines, merge two or more lines, and create multiple lines from single lines. In addition, without retyping, you can alter and recover lines that give a line-too-long error when entered. The kit editor accepts up to 249 characters per program line.

If you are interested in the contents of memory, the memory-examine/modify function displays the contents of any memory location as a line containing the hex and decimal address, and the hex/ASCII/decimal and



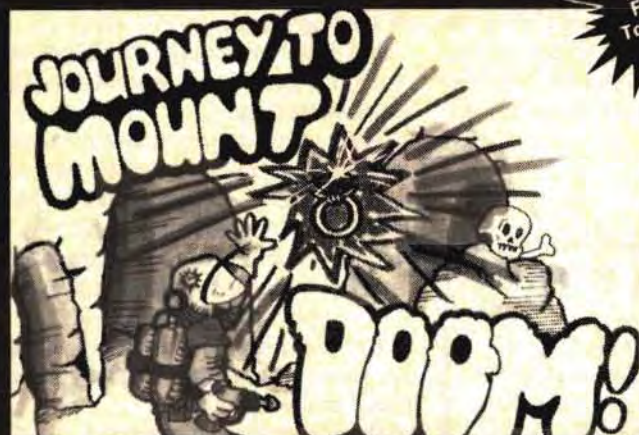
Air Traffic Controller is a computer model of an air traffic control situation in which Remotely Piloted Vehicles (RPV's) are operated by the controller in landing on and taking off from designated runways.

32K Extended Basic
TAPE 28.95 DISK 31.95



By Ken Kalish
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16K Machine Language
TAPE 27.95 DISK 30.95



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ARCADE ACTION GAMES



16-bit decimal contents. A cursor at the end of the active line allows the location to be filled with any hex or ASCII value.

The up- and down-arrow keys scroll this display through memory, and the left arrow requests a new display address. You can type addresses in hex or decimal; a decimal address is denoted by a leading decimal point. This same format applies to all numeric inputs requested by the kit.

If you prefer to simply look at a region of memory, you can dump any section to the screen or the printer in hex or ASCII. Touching any key pauses the dump, and any key again toggles the dump back on.

You will appreciate the print-delay option when trying to read program listings or disk directories. As this delay slows all screen output, it can also be used to slow program execution. You can choose 10 print-to-screen speeds that vary from the normal basic speed to the speed of a leisurely snail.

In addition, you can specify that

printing to the screen only occurs while a key is pressed. These options are very handy when searching through a long listing. Pressing any key defaults to the fastest print speed as long as the key is depressed. These choices permit stop and go, fast and slow scrolling with a single key press. When you are loading a program, if the print delay is too great for the file name to be printed to the screen before the file is encountered, an I/O error occurs.

A similar run-delay option is also available. Note that Basic runs somewhat faster with the kit than without. The actual speed increase depends on the nature of the code being run.

Another gem hidden in the kit is a global-search feature. Up to 11 characters, including wildcard spaces, can be specified by a search command. Until the search string is redefined, each time a "." "enter" sequence is pressed, the next program line containing that string is listed. Search strings can be tokenized to include or exclude Basic words. Global search is very useful for locating lines when you

forget line numbers, finding all occurrences of a set of characters that you wish to change, and checking on the prior use of variable names. By defining the search string as the wildcard only, you can list a program one line at a time.

Using another command, variables used in a program just run can be listed, along with current string-space allocation and the addresses of free memory.

Programmable function keys are also provided. When the screen editor is on, you can define 10 function strings of up to 249 characters each. These strings will be printed at the current cursor position in response to pressing numeral keys 0-9 following a control key. You can save functions with the kit for later use and redefine them at any time. You must allocate the maximum anticipated function space with a CLEAR statement prior to loading the kit.

For \$29.95 you might think that this is a good deal, but it gets better. The kit also lets you:

- Delete extra spaces in your program and all remarks if you like. You are told which lines were deleted and how much space you saved.
- Echo all screen output to the printer. This is useful for printing program output and TRON listings.
- Double-space your program listings for easier reading and to give yourself space to make notes.
- Block-move or block-copy regions of memory.
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while keyboard input remains active.

All Colorkit functions are quickly accessed or initiated in the command mode by a three- or four-letter mnemonic prefaced by a period. You can alter these mnemonics if desired. The documentation suggests various changes that you can make in the program to customize it to your taste, including changes in the cursor appearance and speed, enabling auto-key repeat, and various cosmetic variations. If you make a change in the kit by either POKEing control locations or by invoking certain options, the alteration can be made permanent by saving the program in that state.

The documentation supplied is concise and clear, although until you have used the kit some of its subtle points will slip by as there is a good deal to assimilate. A page of helpful comments on some of the quirks of the program is useful, but these would be better included in the function descriptions.

Few of these quirks are of consequence. Most are simply minor changes from standard operation. I found the greatest irritant to be having to turn off the screen editor before loading an ASCII program. Also, a few of the function menus are cryptic at first glance.

The Colorkit is compatible with most utilities. The only problem I have had was with a screen-format utility that also modified the Basic jump table.

This program is well supported. When a recent revision upgraded the kit to version 1.2, the patch listings were sent out to all owners of the 1.1 edition.

Not only is this an excellent addition to the CoCo's operating system, but it is of fine quality and well priced. I recommend it. ■

Shark Treasure
Computerware
Box 668
Encinitas, CA 92024
16K
\$21.95, cassette
\$26.95, disk

by **Bob Liddil**

Just when you thought it was safe to go into the waters of your Color

Computer, along comes Shark Treasure. This machine-code offering from Computerware is an original interpretation of a popular arcade game called Lunar Rescue. Plainly packaged and modestly priced, it gives value to the consumer.

In Lunar Rescue, the spaceship travels through cross-directional asteroids to land on plateaus to rescue stranded astronauts. It then must blast its way up through alien ships and laser fire to dock with mother ship.

Shark Treasure takes this premise and applies it to an aquatic setting. The mother ship becomes a scuba barge. The Lunar Rescue module becomes a diver. The cross-directional asteroids become cruising giant sharks, and the stranded astronauts become gold coins on the ocean floor.

The author's sense of humor prevents this game from being another arcade clone. In the early stage of the game the sharks cruise by, one or two at a time and the diver has no difficulty getting around them. The diver is realistic with his arms and legs waving

around all over the place. Suddenly, the diver is swallowed by a shark and is gone.

The diver is not without protection. He has flash grenades, which cause the sharks to reverse their direction. He has the ability to swim faster vertically than the sharks swim horizontally. But there is the inevitable Gulp and the diver disappears.

The sharks consume only portions of the diver leaving the remains to drift on the tides while another diver takes his place. The sharks don't snap at the leftover diver. They just move over him and erase his remains.

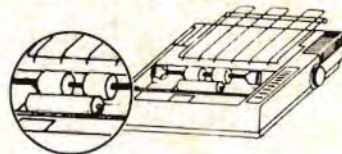
The graphics presentation in this program is terrific. Detailed high-resolution blue sharks with white bellies swim in a green sea snacking on lifelike little hi-res divers. The game has impressive graphics, and what it lacks in plot it more than makes up for in belly laughs.

Shark Treasure holds its dollar-to-program-value ratio well. It should provide many hours of fun for the whole family. It is not so difficult that

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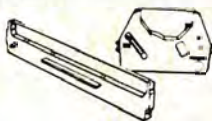
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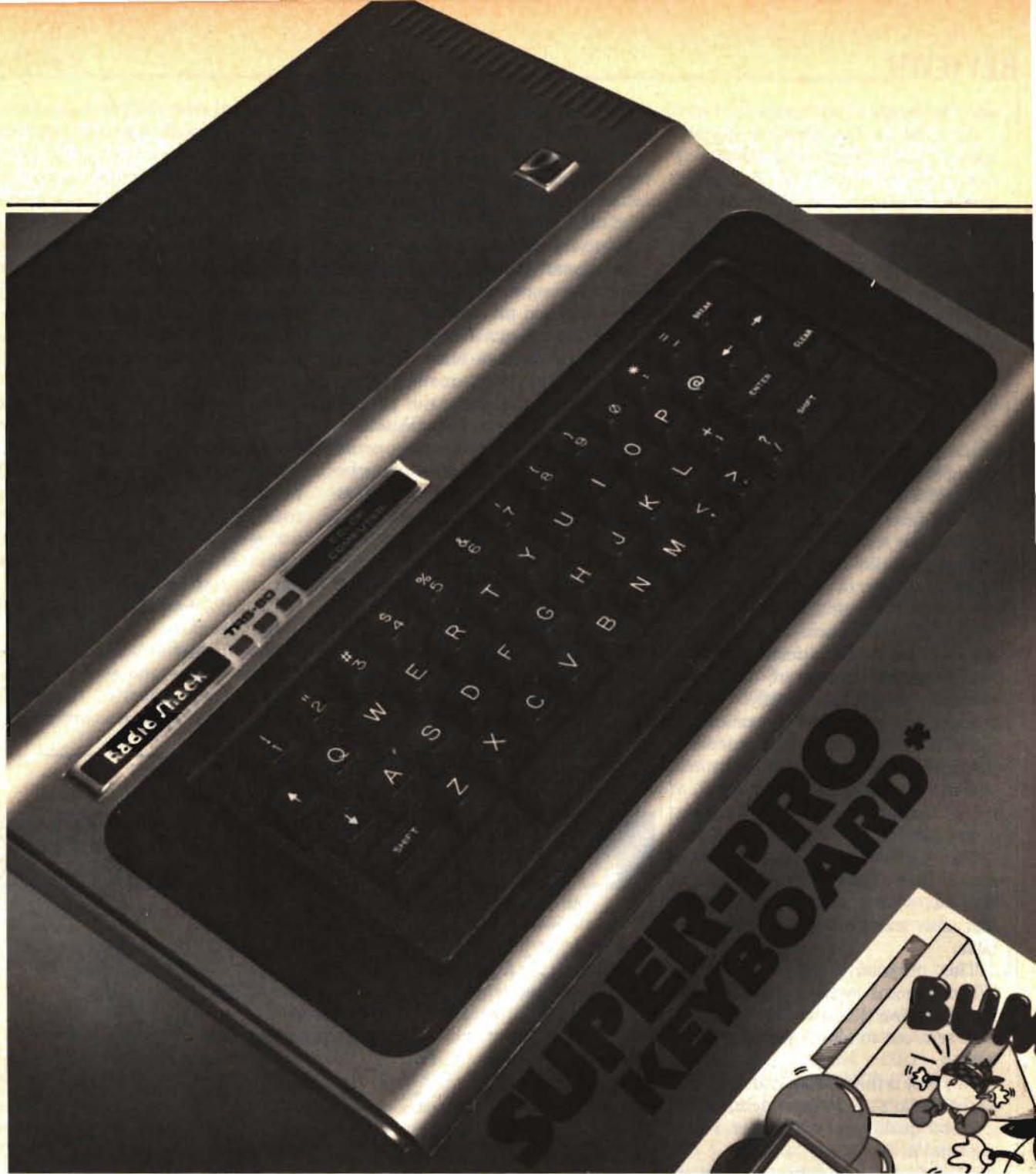


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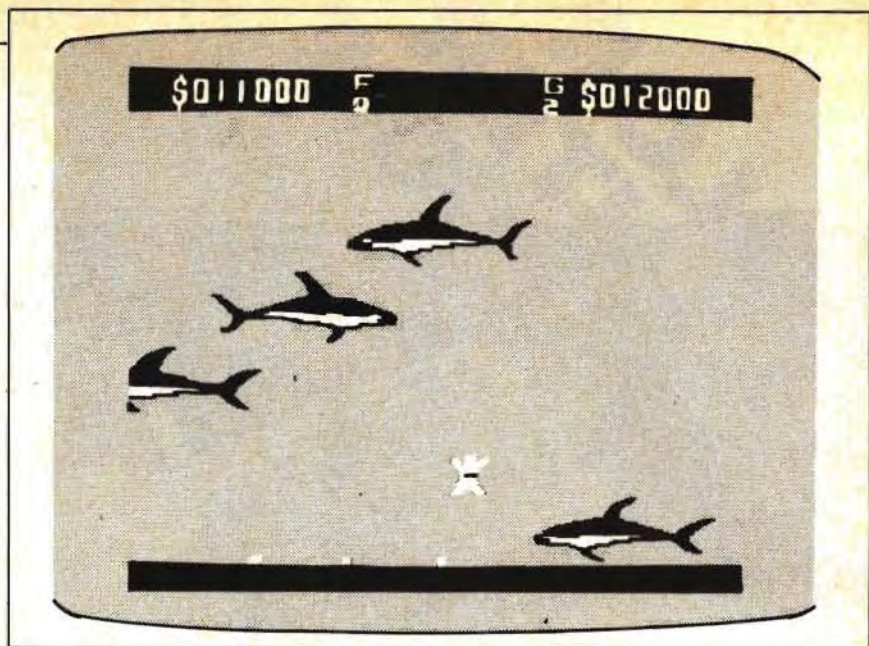
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Shark Treasure

it overwhelms children, yet is not slow paced and boring to the arcade sophisticate. Shark Treasure occupies that pleasant middle ground where even a critic could like it. ■

chine has been modified for 64K, PLUS32 will switch it to the all-RAM mode and copy your Basic ROMs into RAM, with addresses unchanged. First, though, it performs a simple test on the upper half of RAM to minimize the chances of a system crash when Basic is relocated.

This utility is probably of greatest interest to the Assembly-language programmer. It will not give the Basic enthusiast access to any additional memory.

PLUS32 does, however, let you place machine-language routines in normally inaccessible reaches of memory. For example, if you have a disk system, you can use the region between \$E000 and \$FEFF for such routines.

If you do not use disks, you can copy any Radio Shack ROM-pack program onto tape and then use it in its proper location after running PLUS32. This is a useful way to save wear on the cartridge connector inside the computer.

In making RAM copies of all the Microsoft Color Basics accessible, PLUS32 actually performs one of the functions of FLEX. That's as far as the MTP product goes, though. It leaves the computer firmly in the grasp of Basic, and therefore should not be thought of as a cheap way to open the machine up to alternative operating systems.

PLUS32

\$15 cassette, \$19 disk

ROMKIL

\$15 cassette, \$19 disk

ROML

\$25 cassette, \$29 disk

TAP2DSK

\$25 cassette, \$29 disk

Micro Technical Products Inc.

123 N. Surrine, Suite 106

Mesa, AZ 85201

by Scott L. Norman

Here are four useful utilities for the Color Computer; the first three perform memory-management functions, while the last expedites the transfer of machine-language programs from tape to disk.

Each program is available in both tape and disk formats.

The disk versions of these programs differ from the tape editions only in that they include an automatic start feature. The tape programs can be copied to disk.

PLUS32

PLUS32 is a straightforward 64K RAM enabler. Assuming your ma-

ROMKIL

With ROMKIL, you can selectively

disable the ROMs for Extended Color Basic or Disk Basic. Thus, disk-system owners can cause their computers to revert to Extended Color Basic, while folks saddled with the latter can delete it and get back to ordinary Color Basic.

This is all accomplished with software, and works in an unmodified 32K machine. The appropriate amount of RAM is released when a ROM is disabled.

Why would anyone be interested in having their computer regress to a less capable stage? One reason is the desire to run software that is incompatible with your hardware configuration. That's when ROMKIL comes in handy.

Operation is as simple as it can be. After loading and executing ROMKIL (the latter isn't necessary if you're using the disk version), you are given the choice of entering Color Basic or Extended Basic. Press the appropriate first letter and there you are. You can return your machine to its original configuration by cycling the power, or by entering POKE 113,0 and pressing the reset switch.

My applications always seem to require Extended Color Basic's graphics capabilities, so only Disk Basic gets disconnected. I would much rather do this with ROMKIL than by disconnecting the controller.

ROML and TAP2DSK

ROML and ROMKIL work as a team; some of their features overlap. ROML permits any machine-language program to be loaded from tape or disk—even programs that are normally incompatible with the controller because of conflicting requirements for low memory.

This utility goes further, though. If you have a 64K computer, it lets you load and run tape or disk copies of Radio Shack ROM-pack programs, including those that use nonrelocatable code. Making those disk copies is the province of TAP2DSK, though, so let's take a look at it first.

Assume that you have a tape copy of a ROM-pack program. When TAP2DSK reads a tape file, it displays the start, end, and transfer addresses. After you place the recipient disk into drive 0 and press any key, the file is automatically transferred with the same name as the tape version and a .BIN extension. You don't have to key in

the three addresses.

Now let's see how ROML works. When it begins execution, it requests the name of the program to be loaded, and a T or D for tape or disk sources. Do not specify the extension for disk copies; ROML knows all about .BIN.

The disk or cassette should be in position and ready to go before you press the T or D key, because operation is automatic from that point on. The computer next flashes a "Disk ROM Disabled" message and notification of the three major addresses of the file.

If your program resides in the lower 32K of RAM, pressing any key starts execution. If it resides in the upper 32K, you are prompted to disable the RAM write-protect circuitry before proceeding, although in some cases this is not necessary.

Once ROML positions your program, it tells you that the 64K RAM mode has been selected and directs you to reenable write-protection and press any key to begin execution. If the write-protection is irrelevant, just press any key to run the machine-language program.

Summary

Being uninterested in tinkering with Basic, I have been primarily concerned with ROMKIL, ROML, and TAP2DSK. I have also used TAP2DSK to make disk copies of the four utilities themselves, and have employed ROML to run a tape copy of my Radio Shack Graphic Pack. Maybe I'll get around to using TAP2DSK on that, too.

One issue has to be faced. It is undeniably true that ROML and TAP2DSK can be used to generate pirated copies of machine-language software. (TAP2DSK will not copy protected tapes.) Does this somehow make the two utilities evil?

I don't think so. It is legitimate to make back-up copies of personally owned software, and equally legitimate for disk owners to want everything on disk to avoid frequent removal of the controller cartridge. I hope that the MTP programs will be applied chiefly for these purposes.

So recognize the MTP utilities for what they are: solid, easy-to-use programs that can make life a little easier for anyone with a multimedia software collection. I would like to see them at lower prices, but they do work, and work well. ■

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The Basic Beat

Now that you are fairly proficient programmers, you will have fewer commands to learn each month. However, I'll cover those few in more depth. This will also reinforce your understanding of those commands you've already learned.

As you may remember, variables are letters that are given a number value (i.e., A = 7, AB = 2, X = 10, and so on). There are also string variables, such as A\$ = "HELLO" or B\$ = "COMPUTER".

Sometimes another method of expressing variables is more useful.

THE FIRST STEPS TO BASIC PROGRAMMING

by James W. Wood

Imagine using INPUT to have a program ask for checkbook deposits for 12 months. It might look like Program Listing 1. I almost included 12 INPUT statements, but decided that no one would have done that much needless work.

```
3 LIST
10 CLS
20 INPUT A,B,C,D,E,F,G,H,I,J,K,L
30 END
```

Program Listing 1.

```
10 A(1)=13:A(2)=34:A(3)=15
20 A(4)=54:A(5)=19:A(6)=42
30 PRINTA(1)+A(2)+A(3)+A(4)+A(5)
+A(6)
```

Program Listing 2.

```
10 A(1)=13:A(2)=34:A(3)=15
20 A(4)=54:A(5)=19:A(6)=42
30 FOR Z=1TO6
40 T=T+A(Z)
50 NEXTZ
60 PRINTT
```

Program Listing 3.

Listing 1 will work, but it is a little confusing to enter the deposits. It's almost impossible to program the computer to pick the largest value or to arrange values from largest to smallest.

An array is useful for storing several related variables and for arranging the information they store. Program Listing 2 uses an array to store the values of six variables and print the sum.

Using a FOR loop is another method to add the six variables. Change Listing 2 into Program Listing 3 by retyping the lines that are different.

It looks like a lot more work, and it is—for small arrays. But imagine typing line 30 of Listing 2 for an array with 100 elements. To add a 100-element array in Listing 3, however, you only need to change the 6 in line 30 to 100. In Listing 3, lines 30-50 add the total (T, which starts at zero) to A(1) to get the new total. Then they add this total to A(2) to get an updated total, and so on. T therefore becomes the sum of all six elements of the array.

Program Listing 4 has a BS (bad subscript) error in line 50. The computer will not allow the number in parentheses to be larger than 10, unless you use a special command to reserve more array storage space. Add line 15 DIM A(11) and run the program again. This enlarges the array dimension.

Type in Program Listing 5a. As you

System Requirements

4K RAM
Color Basic

The Basic Beat

```

10 CLS
20 A(0)=31
30 A(3)=24
40 A(10)=35
50 A(11)=19
60 PRINT A(0)+A(3)+A(10)+A(11)

```

Program Listing 4.

```

10 CLS:DIM D(12)
20 PRINT"12 MONTH'S DEPOSITS"
30 FOR A=1 TO 12
40 PRINT"MONTH";A;"DEPOSIT";:INP
UT D(A)
50 NEXT A

```

Program Listing 5a.

```

70 PRINT"AMOUNT","MONTH #"
80 FOR A=1 TO 12
90 IF D(A)>GR THEN GR=D(A):MO=A
100 NEXT A
110 PRINT GR,MO

```

Program Listing 5b.

```

70 DIM MO(12)
80 FOR A=1 TO 12:MO(A)=A:NEXTA
90 FOR B=1 TO 11:FOR A=1 TO 11
100 IF D(A+1)>D(A) THEN H=D(A):D
(A)=D(A+1):D(A+1)=H:M=MO(A):MO(A
)=MO(A+1):MO(A+1)=M
110 NEXT A,B
120 PRINT"AMOUNT","MONTH"
130 FOR A=1 TO 12
140 PRINTD(A),MO(A):NEXT

```

Program Listing 5c.

```

10 A=6:B=8
20 H=A:A=B:B=H
30 PRINTA;B

```

Program Listing 6.

```

10 CLS
20 PRINT"ANSWER EACH STATEMENT W
ITH A PRESIDENT'S LAST NAME."

```

Listing continued

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The Basic Beat

enter a series of monthly deposits, the display tells which month's deposit you're entering, so you won't lose your place. Now that you've stored these deposits in an array, you can program your CoCo to find the month with the greatest deposit.

Add Program Listing 5b to 5a. Lines 80-100 inspect each element of the array. If one of them is greater than GR (greatest) then GR becomes that value and MO (month) is set equal to the number of that entry.

Now try a deposit list by descending order. Delete lines 70-110 (DEL70-100). Enter Program Listing 5c. This gives you Listings 5a and 5c in memory.

Line 80 numbers the months. Line 90 uses a nested FOR loop. Table 1 is an example of what happens when you use this method to sort a smaller set of numbers. It takes the worst possible case—numbers in ascending order.

The program looks at the first two numbers. Eight is larger than seven, so it switches them. Next, compare the

second and third numbers. Ten is larger than seven, so the program switches them. The third and fourth numbers are seven and 24. They are exchanged, which completes the first pass or loop through the array. A nested loop executes the second and third passes (for four elements in an array).

This method of sorting numbers is crude, but effective for small sets of numbers. Line 100 does the switching in the program. The D variables exchange deposits, the variables with an M exchange the months. It is important to know that three variables are necessary to exchange the values of two variables.

Program Listing 6 is a short example for exchanging the values of two variables. H holds the value of A, A is set equal to B, and B is set equal to H. It works, but isn't there an easier way? If you change line 20 to A=B:B=A, you'll find that it results in both A and B equaling 8. Setting A equal to B erased the 6 from line 10, and it is gone forever. This easier way doesn't work.

Enough financial stuff. Now I'll show you an array to shuffle test questions. Most computer quizzes always ask the questions in the same order. Program Listing 7 is a three-question exam. Even though there are four questions listed, the program only asks three. It picks the questions in a random order, but it won't ask the same question twice in one test.

The questions are in the A\$ array, and the corresponding answers in the B\$ array. Line 80 chooses a random number. If the program sees that it has already used it, then it labels the number as used (Q(A)=1) and increases the count (C) by one.

Line 90 prints the corresponding question and expects an answer. Line 100 prints "Correct" and increases the number correct (NC) by one if you've typed a correct response. If the response is wrong, then the program prints the correct answer. Line 110 stops the program after three questions and prints the number correct.

Arrays can be fun also. Program

Listing continued

```

30 A$(1)="HE WAS OUR FIRST PRESI
DENT."
40 A$(2)="HE WAS ASSOCIATED WITH
PEANUTS. (THE CROP, NOT THE COM
IC STRIP)"
50 A$(3)="HE WAS SHOT AT A PLAY.
"
60 A$(4)="HE STARRED IN MOVIES."
70 B$(1)="WASHINGTON":B$(2)="CAR
TER":B$(3)="LINCOLN":B$(4)="REAG
ON"
80 A=RND(4):IF Q(A)=1 THEN 80 EL
SE Q(A)=1:C=C+1
90 PRINTA$(A):INPUT AN$
100 IF AN$=B$(A) THEN NC=NC+1:PR
INT"CORRECT":PRINTELSEPRINT"WRON
G, THE ANSWER IS ";B$(A):PRINT
110 IF C=3 THEN PRINT"TOTAL CORR
ECT=";NC:ELSE GOTO80
    
```

Program Listing 8.

```

10 CLS:DIM C(4,13),P(52)
20 PRINT"SHUFFLING"
30 FOR Z=1 TO 52
40 A=RND(4):B=RND(13)
50 IF C(A,B)=1 THEN 40
    
```

Listing continued

Listing continued

```

60 P(Z)=A*100+B:C(A,B)=1
70 IF P(Z)<200 THEN PRINT P(Z)-1
00;"OF HEARTS":GOTO110
80 IF P(Z)<300 THEN PRINT P(Z)-2
00;"OF CLUBS":GOTO110
90 IF P(Z)<400 THEN PRINT P(Z)-3
00;"OF DIAMONDS":GOTO110
100 PRINT P(Z)-400;"OF SPADES"
110 NEXT Z
    
```

```

10 CLS
20 PRINT"PRESS A NUMBERED KEY"
30 A$=INKEY$:IFA$=""THEN30
40 A=VAL(A$)
50 IF A=0 THEN 30
60 PRINTA,:FOR B=1 TO A:PRINT"*"
;:NEXT:PRINT
70 GOTO20
    
```

Program Listing 9.

```

31 PRINT"PRESS ANOTHER"
32 B$=INKEY$:IFB$=""THEN32
34 A$=A$+B$
    
```

Program Listing 9a.

KEYBOARD "BEEPER" CARTRIDGE

- ▷ ON BOARD SPEAKER
produces feedback, reducing entry errors
- ▷ "IN-LINE" TRANSPARENT
operation does not "use up" expansion capability
- ▷ NO MODIFICATIONS
(hardware or software) to install or use
- ▷ SWITCHED INTERRUPT LINE
allows power up into BASIC or game pack
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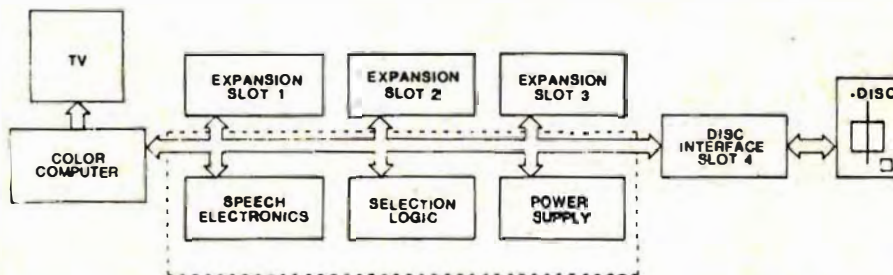
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The Basic Beat

Listing 8 shuffles a standard deck of 52 cards and prints their resulting order. The program could be a starting point for any card game, since most games require shuffling.

Line 40 picks a card's number and suit. Line 50 eliminates a card being picked twice.

Lines 60-100 change the two-dimension C array into a one-dimension array for printing. If A equals 1, then the program numbers a card somewhere between 101 and 113. These are hearts. The number 1 represents an ace, 10 a jack, 11 a queen, and 12 a king. With a little more work, you could give the proper name for these face cards (good homework problem).

VAL changes a string to a number. Remember INKEY\$? INKEY searches the keyboard for the key that you press and reads it as a string.

Many commands and math operations require numbers. The FOR loop in line 50 needs a numeric value for A. Line 40 changes the string value to a numeric one. The program prints a number of stars equal to the number you press. What if you want more than nine stars? Add the supplement to Program Listing 9.

I have worked with SGN to figure out why it is necessary. SGN(A) returns -1 if A is negative, zero when A equals 0, and +1 when A is positive. I couldn't think of any use for SGN that I couldn't get with IF, greater than and less than. Program Listing 10 demonstrates SGN.

Have you got your joysticks ready? Program Listing 11 is the starting program of a lesson in joystick programming. The command for the joystick is JOYSTK. Figure 1 shows there are four possible joystick readings: 0, 1, 2,

and 3. The computer must always read JOYSTK(0) before reading any other joystick number.

The right control is JOYSTK(0) for horizontal movement and JOYSTK(1) for vertical movement. The readings will vary from 0-63. This is perfect for SET positions horizontally, but you must divide vertical readings by two so that the screen matches the swing of the joystick. SET varies from 0-31 vertically.

After running Listing 11 and moving the joystick around, you will notice two problems. The Basic program is slow. A rapid joystick movement leaves a trail of dots. This is not

easy to solve. The second problem involves seeing the current position of your joystick.

As a remedy, change line 30 to read RESET(A,B):SET(A,B,C). Even with a large portion of the screen colored, the blinking area of your current SET position is easy to spot.

Can't the Color Computer make prettier displays? You can use the fire button to change screen colors. According to Fig. 1, if you press the right joystick fire button, then PEEK(65280) will equal 126 or 254.

Add the supplement to Listing 11. Line 32 reads the fire button, line 34 increases the color by one, and line 36 ensures you don't run out of the allowed colors. C=9 gives an FC error in line 30. Green follows orange. How's that for an easy way to sit back and draw pictures? Now if you only had a way to store it on tape. Maybe I'll get to that in another column. But next month, I'll show you some fearfully fast string graphics. ■

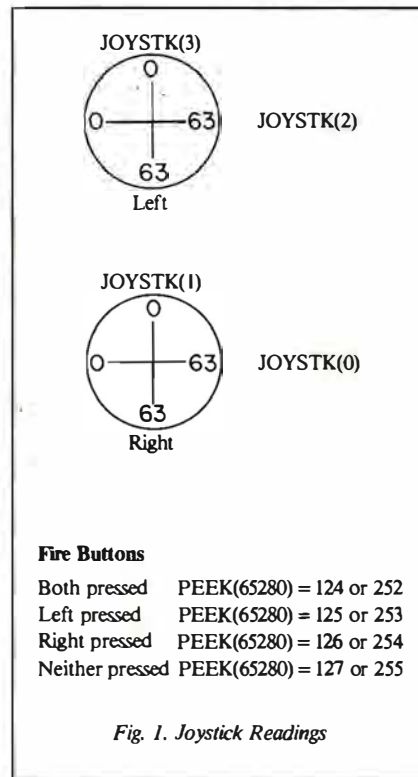


Fig. 1. Joystick Readings

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

Original order	7	8	10	24
	8	7	10	24
	8	10	7	24
First pass complete	8	10	24	7
	10	8	24	7
Second pass complete	10	24	8	7
Third pass complete	24	10	8	7

Table 1. Using a Nested FOR Loop to Sort Numbers

```

10 CLS
20 INPUT"ENTER A NUMBER";A
30 IF SGN(A)=-1 THEN PRINT A;"IS
   NEGATIVE"
40 IF SGN(A)=+1 THEN PRINT A;"IS
   POSITIVE"
50 IF SGN(A)=0 THEN PRINT"YOUR N
   UMBER IS ZERO"
60 PRINT:GOTO20
    
```

Program Listing 10.

```

10 CLS0:C=1
20 A=JOYSTK(0):B=JOYSTK(1)/2
30 SET(A,B,C)
40 GOTO20
    
```

Program Listing 11.

```

32 PE=PEEK(65280)
34 IF PE=126 OR PE=254 THEN C=C+
   1
36 IF C=9 THEN C=1
    
```

Program Listing 12.

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HIT THE JACKPOT

Jackpot Slots is a slot-machine game that uses some special graphics techniques to save memory. Originally, Program Listings 1 and 2 were combined, which prohibited the game from running on 16K Extended Color Basic. By using a separate program to generate the slot-machine graphics, however, I reduced the memory requirements of the game by about 4K.

The Display program, Listing 1, uses the first two graphics pages in memory, locations 1536-4607, to store the screen display. You can save graphics pages one and two as a machine-language program using this command:

```
CSAVEM "SLOT",1536,4607,1536
```

The main program, Jackpot, can

Experience the thrill of playing the slot machines without traveling all the way to Las Vegas.

load the machine-language Slot program by using CLOADM "SLOT". Jackpot, Listing 2, loads the Slot program, animates the graphics, plays music, generates sound effects, and keeps track of your winnings. I packed Jackpot's lines, removed unnecessary spaces, and used multiple statements per line to reduce memory requirements.

Listing 1 Description

I drew the slot-machine graphics on

a 128-by-96 graphics-screen worksheet (see Fig. 1), which let me visualize the graphics and determine the proper dimensions for graphics arrays and GET/PUT statements. The slot-machine symbols include: cherries, oranges, bells, diamonds, bars, dollar signs, and the letter A. These are located inside a square window. The symbols and windows are the same color because I found that the symbol is not consistently centered in the window when they are different colors.

The Color Computer has an inherent PCLEAR problem. When you turn on the machine, the computer automatically clears the first four graphic pages (PCLEAR 4-1.5K/page). If you run the following program after you turn on the machine, you will probably get an FC, Illegal Function Call, error in line 10.

```
10 PCLEAR 2: CLEAR 200
20 PMODE 1,1: PCLS3: SCREEN 1,0
30 GOTO 30
```

Typing RUN and enter will clear the FC error.

The following program will perform the same graphics functions as the above program, but the FC error caused by the PCLEAR 2 statement should not occur.

```
10 GOTO 40
20 CLEAR 200: PMODE 1,1:
   PCLS3: SCREEN 1,0
30 GOTO 30
40 PCLEAR 2: GOTO 20
```

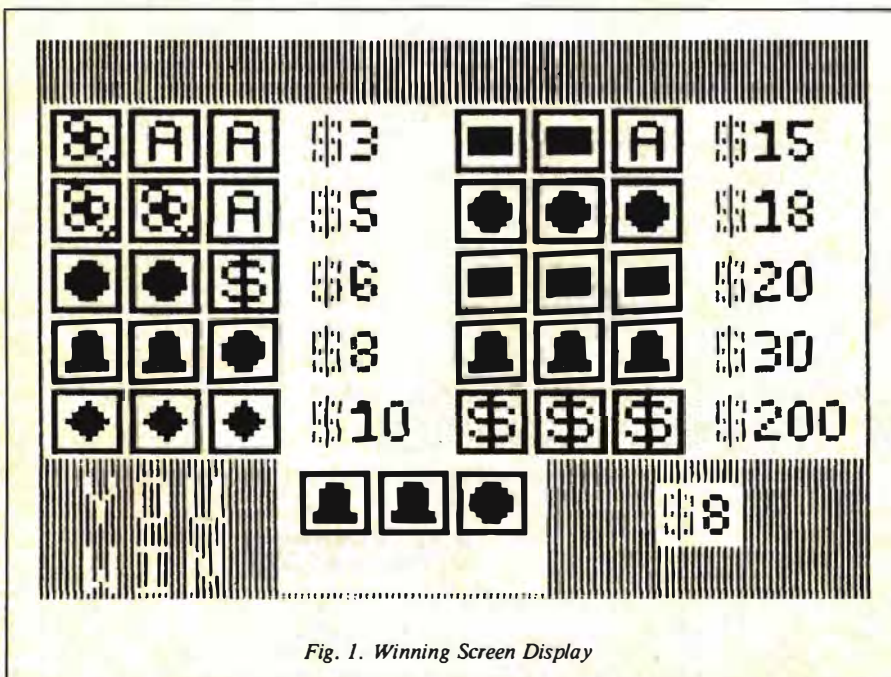


Fig. 1. Winning Screen Display

System Requirements

- 16K RAM cassette
- 32K RAM disk
- Extended Color Basic

Using a reverse GOTO statement reduces the possibility of a PCLEAR command causing an error in the initial program run.

Lines 10 and 890 correct power-up PCLEAR problems in the Display program.

Lines 20-40 set up the graphics mode and dimension the arrays. The graphics arrays in line 30 are C(6), A(6), O(6), D(6), B(6), E(6), F(6), and T(4). The program uses single-dimensioned arrays for two-dimensional graphics. This simple equation, described by Tomas Rokicki (September 1981, *TRS-80 Microcomputer News*), reduces a two-dimensional graphics array to a single-dimension array:

$$\begin{aligned} \text{Array Size} &= (\text{Horizontal Length} * \\ &\quad \text{Vertical Height}) - 1/N \\ \text{Horizontal Length} &= (X2 - X1) + 1 \\ \text{Vertical Height} &= (Y2 - Y1) + 1 \\ N &= 40 \text{ in PMODEs 3 and 4} \\ N &= 80 \text{ PMODEs 1 and 2} \\ N &= 160 \text{ in PMODE 0} \end{aligned}$$

Round down the array size to the nearest whole number. Use the G option with the GET statement. For examples, see Listing 1 lines 80, 130, 200, 280, and 350. In addition, you must use an action option (PSET, PRESET, AND, OR, NOT) with the PUT command. I used the PSET action option in lines 90 and 100 of the Display program.

According to the *Going Ahead with Extended Color Basic* manual, the following equations determine the size of a graphics array:

$$\begin{aligned} \text{Horizontal Length} &= X2 - X1 \\ \text{Vertical Height} &= Y2 - Y1 \end{aligned}$$

The array points described in line 80 are X1 = 4, X2 = 26, Y1 = 24, Y2 = 44. According to the manual, the C (cherry) array should be C(22,20). Using Rokicki's equation and rounding down, the cherry array is reduced to C(6). In this case, N equals 80 because the Display program uses PMODE 1.

$$\begin{aligned} \text{C array} &= (\text{Horizontal Length} * \\ &\quad \text{Vertical Height}) - 1/N \\ C &= ((26 - 4 + 1) * (44 - 24 + 1) - 1) / 80 \\ C &= ((23) * (21) - 1) / 80 \\ C &= 6.025 \\ C(6) \end{aligned}$$

Lines 50-870 create a slot-machine graphics display. The program draws each symbol inside a square window and then places it on the graphics screen in desired locations using GET/PUT statements. For example,

line 50 draws a box, and line 60 draws cherries inside the box. Lines 90 and 100 place the box and cherries in two additional locations on the graphics screen.

Line 40 (SCREEN 1,0) calls for color set 0, which uses green, yellow, blue, and red. I found that it is not necessary to switch colors 1-4 to 5-8 when switching from SCREEN 1,0 to SCREEN 1,1. The Color Computer automatically switches from green (1) to buff (5) when changing screens. For example:

- PMODE 1,1:PCLS:SCREEN 1,0:DRAW "C4BM10,10R10" draws a red line on a green background.

- PMODE 1,1:PCLS:SCREEN 1,1:DRAW "C4BM 10,10R10" draws an orange line on a buff background.

- In Listing 1, line 80 draws in red, not orange, and line 530 draws in blue, not magenta.

Listing 2 Description

Lines 1 and 149 prevent PCLEAR problems. Line 2 clears space for variable storage, sets up random-number generation, dimensions arrays, puts alphabet graphics strings into array A\$(22), and reads the data in line 7 into the R(2,19) array.

Line 3 loads the machine-language



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graphics-screen program, Slot. Lines 4-6 create the title page and allow you to select your bankroll (\$1 to \$100).

Line 7 contains the data that determines the actual slot display and your winnings. The data corresponds to the following: 1 = cherry, 2 = orange, 3 = dollar sign, 4 = bell, 5 = diamond, and 6 = bar. By changing the data in line 7, you can increase or decrease the percentage of payoffs. The Read statement in line 3 writes the data into array R(2,19). Data is broken up into groups of three. For example, the first data group is 2,4,1. The left number, in this case 2 (orange), determines the symbol for the left wheel on the slot machine. The middle number determines the middle symbol, and the right number selects the symbol for the right wheel.

Line 8 initiates the variable N, which the program uses to calculate your winnings. The variable QR is part of the loop that allows you to start a new game without reloading the program. Lines 145-148 are also part of the game-restart loop.

Lines 9-11 generate the game instructions. Pressing the spacebar is the same as pulling the slot-machine handle. Pushing any other key displays your bankroll. Selecting the clear or break keys is not advisable. The letter A on the slot machine represents any symbol. Line 12 initiates game play.

Line 13 displays a slot machine. The counting loops in line 13 randomly select locations in array R(2,19), placing a symbol on the appropriate wheel position of the slot display. Lines 56-79 work in conjunction with line 13 to animate the slot display. The program uses GET/PUT commands exclusively for slot-machine animation. The Play statement in line 13 pro-

duces the sound effect for the turning slot wheels.

Logical statements in lines 14-30 determine winnings. Lines 41-50 select the winnings to be displayed, and lines 80-89 flash the winnings on the slot display. In addition, lines 93-127 generate various encouraging statements.

Line 31 reinitializes the slot-machine graphics and calculates your current bankroll. If your bankroll is zero, the game ends. Lines 32-34 pull

“...the technique of saving graphics as a separate program, to be loaded by a main or menu program, can be very useful...”

the slot-machine handle or check your bankroll. Lines 35 and 36 return you to slot-machine play or end the game.

This game has three end routines: “You Lost,” “You Broke Even,” and “You Won.” Lines 37-40 generate these routines.

Lines 128-144 produce game music, which consists of 17 tunes. Lines 53-55 generate three siren sounds for jackpots of \$10 to \$30, while lines 90 and 91 produce the display and sounds for the \$200 jackpot. The PLAY statements in lines 80-89 generate the sound effect of coins dropping out of the slot machine. Each payoff has a separate coin sound effect.

Saving the Program

To save Jackpot Slots to tape, type in

Listing 2, but do not run the program. Instead, CSAVE “JACKPOT”, type NEW and press enter. Type in Listing 1 and run the program. Next, press break after the graphics are displayed, then type:

```
CSAVEM "SLOT",1536,4607,1536
```

Now CSAVE Display and rewind the tape.

To play Jackpot Slots, CLOAD Jackpot and press enter. When Jackpot is finished loading, run the program. The Jackpot program loads the Slot program, and the game starts.

To save the program to disk, type in Listing 2, changing the CLOADM and LOADM in line 3. SAVE “JACKPOT”, type NEW, and press enter. Type in Listing 1 and run the program. When the program displays the graphics press break and type:

```
SAVEM "SLOT",&HE00,&H1A00,&HE00
```

After you store the Slot program on disk, save the Display program. To play Jackpot Slots, run Jackpot and press enter.

It is also a good idea to save the Display program because there is a good chance you will have to correct typing errors.

Not only is Jackpot Slots fun to play, but the technique of saving graphics as a separate program, to be loaded by a main or menu program, can be very useful in developing games and educational software. ■

Address correspondence to Gabriel Weaver, 1309 W. Ave., J-2 Apt. #1, Lancaster, CA 93534.

Program Listing 1. Display

```
10 GOTO 890
20 CLEAR 500:CLS:Pmode 1,1:PCLS
30 DIM Z(3),R(3,20),C(6),A(6),O(
6),D(6),B(6),E(6),F(6),T(4),S(7)
,P(7),Q(7),H(7),G(10),I(10),J(10)
,K(10),L(10),W(12)
40 SCREEN 1,0
50 LINE (4,24)-(24,44),PSET,B
60 DRAW "BM14,30U2H2L2G2D2F2R4E2
R2F2D2G2L2H2L4G2D2F2R2E2U2"
70 DRAW "BM16,38F4E2"
80 GET (4,24)-(26,44),C,G
90 PUT (4,48)-(26,68),C,PSET
100 PUT (28,48)-(50,68),C,PSET
110 LINE (28,24)-(48,44),PSET,B
120 DRAW "BM34,40U10E2R4F2D4NL6D
6"
130 GET (28,24)-(50,44),A,G
140 PUT (52,24)-(74,44),A,PSET
150 PUT (52,48)-(74,68),A,PSET
160 PUT (176,24)-(198,44),A,PSET
170 LINE (4,72)-(24,92),PSET,B
180 DRAW "BM12,76R4F4D4G4L4H4U4E
2"
190 PAINT (12,82),8,8
200 GET (4,72)-(26,92),O,G
210 PUT (28,72)-(50,92),O,PSET
220 PUT (52,96)-(74,116),O,PSET
```

Listing continued

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- 230 PUT (128,48)-(150,68),O,PSET
- 240 PUT (152,48)-(174,68),O,PSET
- 250 PUT (176,48)-(198,68),O,PSET
- 260 LINE (52,72)-(72,92),PSET,B
- 270 DRAW "BM68,78H2L4NU2ND14L4G2D2F2R8F2D2G2L8H2"
- 280 GET (52,72)-(74,92),D,G
- 290 PUT (128,120)-(150,140),D,PS ET
- 300 PUT (152,120)-(174,140),D,PS ET
- 310 PUT (176,120)-(198,140),D,PS ET
- 320 LINE (4,96)-(24,116),PSET,B
- 330 DRAW "BM8,112R12U2H2U6H2L4G2D6G2"
- 340 PAINT (12,108),8,8
- 350 GET (4,96)-(26,116),B,G
- 360 PUT (28,96)-(50,116),B,PSET
- 370 PUT (128,96)-(150,116),B,PSET
- 380 PUT (152,96)-(174,116),B,PSET
- 390 PUT (176,96)-(198,116),B,PSET
- 400 LINE (128,24)-(148,44),PSET,B
- 410 LINE (132,30)-(144,38),PSET,BF
- 420 GET (128,24)-(150,44),E,G
- 430 PUT (152,24)-(174,44),E,PSET
- 440 PUT (128,72)-(150,92),E,PSET
- 450 PUT (152,72)-(174,92),E,PSET
- 460 PUT (176,72)-(198,92),E,PSET
- 470 LINE (4,120)-(24,140),PSET,B
- 480 DRAW "C8BM8,130F6E6H6G6"
- 490 PAINT (12,130),8,8
- 500 GET (4,120)-(26,140),F,G
- 510 PUT (28,120)-(50,140),F,PSET
- 520 PUT (52,120)-(74,140),F,PSET
- 530 DRAW "C7BM92,30U2L8D6R8D6L4NU13ND2L4U2"
- 540 GET (83,24)-(94,44),T,G
- 550 PUT (83,48)-(94,68),T,PSET
- 560 PUT (83,72)-(94,92),T,PSET
- 570 PUT (83,96)-(94,116),T,PSET
- 580 PUT (83,120)-(94,140),T,PSET
- 590 PUT (207,24)-(218,44),T,PSET
- 600 PUT (207,48)-(218,68),T,PSET
- 610 PUT (207,72)-(218,92),T,PSET
- 620 PUT (207,96)-(218,116),T,PSET
- 630 PUT (207,120)-(218,140),T,PS ET
- 640 LINE (0,0)-(256,20),PSET,BF
- 650 LINE (0,144)-(72,192),PSET,BF
- 660 LINE (156,144)-(252,192),PSET,BF
- 670 LINE (0,0)-(256,192),PSET,B
- 680 DRAW "C8BM96,28R4F2D2G2NL2F2D2G2L4"
- 690 DRAW "BM96,52NR6D4F2R2F2D2G2"

Listing continued

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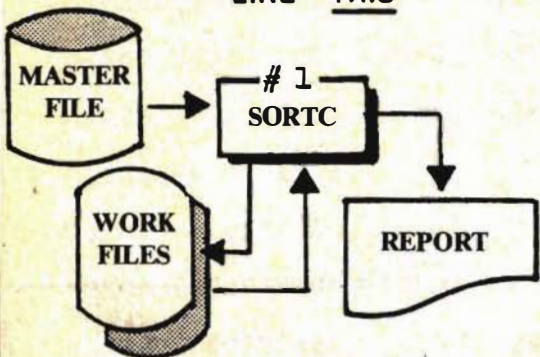
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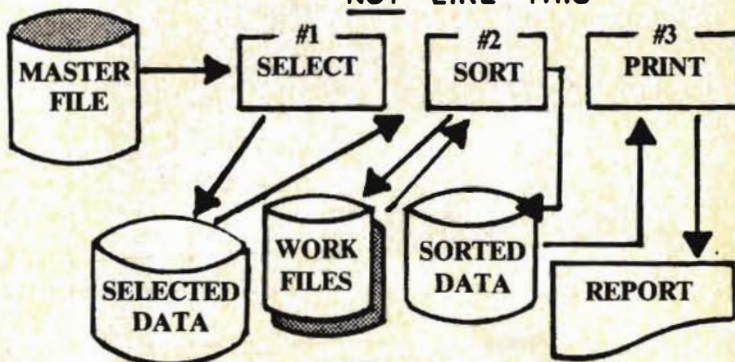
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Listing continued

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U2H2G2"
710 DRAW "BM98,100R2F2D2G2F2D2G2
L2H2U2E2H2U2"
720 DRAW "BM 98,124R2D2NL4D10NR2
L4"
730 DRAW "BM108,124R2F2D8G2L2H2U
8"
740 DRAW "BM222,28R2D2NL4D10NR2L
4"
750 DRAW "BM230,28NR6D4F2R2F2D2G
2L2H2"
760 DRAW "BM222,52R2D2NL4D10NR2L
4"
770 DRAW "BM232,52R2F2D2G2F2D2G2
L2H2U2E2H2U2"
780 DRAW "BM220,78E2R2F2D2G6D2R6
"
790 DRAW "BM232,76R2F2D8G2L2H2U8
"
800 DRAW "BM220,100R4F2D2G2NL2F2
D2G2L4"
810 DRAW "BM232,100R2F2D8G2L2H2U
8"
820 DRAW "BM220,126E2R2F2D2G6D2R
6"
830 DRAW "BM232,124R2F2D8G2L2H2U
8"
840 DRAW "BM242,124R2F2D8G2L2H2U
8"
850 PUT (80,148)-(102,168),D,PSE
T
860 PUT (104,148)-(126,168),D,PS
ET
870 PUT (128,148)-(150,168),D,PS
ET
880 GOTO 880
890 PCLEAR2:GOTO20

Program Listing 2. Jack.pot

```

1 GOTO149
2 CLEAR1050:CLS:X=RND(-TIMER):DI
M Z(3),R(2,19),C(6),A(6),O(6),D(
6),B(6),E(6),F(6),T(4),S(8),P(8)
,Q(8),H(8),G(11),I(11),J(11),K(1
1),L(11),W(13),A$(22):GOSUB117:F
ORK=0TO19:FORI=0TO2:READR(I,K):N
EXTI:NEXTK
3 IFQR=1THEN4ELSECLS8:PRINT"LOAD
ING MACHINE CODE";:SCREEN0,1:PMO
DEL,1:PCLS:CLOADM" SLOT"
4 PMODEL,1:GOSUB124:SCREEN1,0:DR
AW"BM40,16"+A$(9)+A$(0)+A$(2)+A$(
10)+A$(14)+A$(13)+A$(17):DRAW+A
$(22)+A$(16)+A$(11)+A$(13)+A$(17
)+A$(16):GOSUB144:FORX=1TO500:NE
XT:DRAW"BM24,172"+A$(1)+A$(21)
5 DRAW"BM180,162"+A$(6)+A$(0)+A$(
1)+A$(4):DRAW"BM166,184"+A$(20)
    
```

Listing continued

```

+A$(4)+A$(0)+A$(19)+A$(4)+A$(15)
:GOSUB131:FORX=1TO1000:NEXT:DRAW
"C3":LINE(0,0)-(256,191),PSET,B:
LINE(0,0)-(256,20),PSET,BF:LINE(
0,144)-(72,192),PSET,BF
6 LINE(156,144)-(252,191),PSET,B
F:CLS:PRINT@134,"SELECT YOUR BAN
KROLL":PRINT@200,"TYPE IN A NUMB
ER":PRINT@264,"BETWEEN 1 AND 100
":PRINT@328,"THEN PRESS <ENTER>"
:PRINT:GOSUB138:INPUT" BA
NKROLL=$";M:IFM>100 OR M<1 THEN6
7 DATA2,4,1,5,1,5,1,6,5,6,1,1,5,
1,2,4,2,6,5,4,1,6,1,4,6,5,3,5,5,
5,6,1,2,2,1,4,4,3,1,1,5,2,3,5,1,
2,1,5,6,2,6,4,6,2,4,2,3,2,2,1
8 N=M:IFQR=1THEN11
9 CLS2:PRINT@73,"DURING THE GAME
";:PRINT@135,"PRESS THE SPACEBAR
";:PRINT@203,"TO PULL THE";:PRIN
T@263,"SLOT MACHINE HANDLE";:PRIN
T@327,"PRESS ANY OTHER KEY";:PR
INT@390,"TO CHECK YOUR BANKROLL"
;:GOSUB133:FORX=1TO2000:NEXT
10 CLS2:PRINT@75,"THE LETTER";:P
RINT@143,"A";:PRINT@205,"ON THE"
;:PRINT@266,"SLOT MACHINE";:PRIN
T@329,"REPRESENTS ANY";:PRINT@39
7,"SYMBOL";:GOSUB130:GOSUB64:FOR
X=1TO500:NEXT
11 CLS3:PRINT@229,"PRESS ANY KEY
TO START";:SCREEN0,1:GOSUB129
12 K$=INKEY$:IFK$="" THEN12
13 PMODEL,1:SCREEN1,0:FORH=1TO3:
FORY=1TO10 STEP RND(4):FORI=H TO
3:X=RND(20)-1:XX=I-1:Z(I)=R(XX,X
):GOSUB56:PLAY"T255L6405V30GO3DV
1504A":NEXTI:NEXTY:NEXTH:W=0
14 IFZ(1)<>4THEN17ELSEIFZ(2)<>4T
HEN29
15 IFZ(3)=4THEN16ELSEIFZ(3)<>2TH
EN29ELSEW=8:GOTO29
16 W=30:GOTO29
17 IFZ(1)<>5THEN19ELSEIFZ(2)<>5T
HEN29ELSEIFZ(3)<>5THEN29
18 W=10:GOTO29
19 IFZ(1)<>3THEN21ELSEIFZ(2)<>3T
HEN29ELSEIFZ(3)<>3THEN29
20 W=200:GOTO29
21 IFZ(1)<>1THEN23ELSEIFZ(2)=1TH
EN22ELSEW=3:GOTO29
22 W=5:GOTO29
23 IFZ(1)<>2THEN26ELSEIFZ(2)<>2T
HEN29ELSEIFZ(3)=3THEN25
24 IFZ(3)<>2THEN29ELSEW=18:GOTO2
9
25 W=6:GOTO29
26 IFZ(1)<>6THEN29ELSEIFZ(2)=6TH
EN27ELSEGOTO29
27 IFZ(3)=6THENW=20:GOTO29
28 W=15
29 IFW<>200THEN30ELSEGOSUB90
30 GOSUB41

```

Listing continued

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File type (Basic, ML, Data)
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Date Created
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Number of Grans allocated
Number of Sectors used
ML file length

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Listing continued

```

31 DRAW"C7":LINE(0,0)-(256,192),
PSET,B:LINE(0,0)-(256,20),PSET,B
F:LINE(0,144)-(72,192),PSET,BF:L
INE(156,144)-(252,192),PSET,BF:M
=M-1+W:IFM=0THEN37
32 K$=INKEY$:IFK$="" THEN32
33 IFK$=CHR$(32) THEN13
34 CLS8:PRINT@136,"YOUR BANKROLL
IS";:PRINT@205,"$M";:PRINT@257,
"PRESS THE SPACEBAR TO CONTINUE"
;:PRINT@323,"PRESS <E> TO END TH
E GAME";:GOSUB140
35 K$=INKEY$:IFK$="" THEN35
36 IFK$=CHR$(32) THEN13 ELSEIFK$
="E" THEN37ELSE34
37 IFM=0 OR M<N THEN38ELSEIFM=N
THEN40ELSE39
38 N=M-N:CLS2:PRINT@199,"I'M SOR
RY YOU LOST";:PRINT@269,"$ABS(N
);:GOSUB134:FORX=1TO900:NEXT:GOT
O145
39 N=M-N:CLS8:PRINT@201,"CONGRAT
ULATIONS";:PRINT@298,"YOU WON $"
N;:SCREEN0,1:GOSUB141:FORX=1TO90
0:NEXT:GOTO145
40 CLS5:PRINT@233,"YOU BROKE EVE
N";:GOSUB133:FORX=1TO500:NEXT:GO
TO145
41 IFW=0THENGOSUB108:RETURN
42 IFW=3THEN80
43 IFW=5THEN81
44 IFW=6THEN82
45 IFW=8THEN83
46 IFW=10THENGOSUB53:GOTO84
47 IFW=15THENGOSUB53:GOTO85
48 IFW=18THENGOSUB54:GOTO86
49 IFW=20THENGOSUB55:GOTO87
50 IFW=30THENGOSUB55:GOTO88
51 IFW=200THEN89
52 RETURN
53 FORY=1TO5:PLAY"T255V3005CD-DE
-EFG-GA-AB-BO3CD-DE-EFG-GA-AB-BV
15":NEXTY:RETURN
54 FORY=1TO6:PLAY"T255V3002CD-DE
-EFG-GA-AB-BO4CD-DE-EFG-GA-AB-BV
15":NEXTY:RETURN
55 FORY=1TO8:PLAY"T255V3005BB-AA
-GG-FEE-DD-CO4CD-DE-EFG-GA-AB-BV
15":NEXTY:RETURN
56 IFZ(I)=1THEN65
57 IFZ(I)=2THEN68
58 IFZ(I)=3THEN71
59 IFZ(I)=4THEN74
60 IFZ(I)=5THEN77
61 IFI=1THENPUT(80,148)-(102,168
),E,PSET:RETURN
62 IFI=2THENPUT(104,148)-(126,16
8),E,PSET:RETURN
63 IFI=3THENPUT(128,148)-(150,16
8),E,PSET:RETURN
64 GET(4,24)-(26,44),C,G:GET(28,
24)-(50,44),A,G:GET(4,72)-(26,92
),O,G:GET(52,72)-(74,92),D,G:GET
(4,96)-(26,116),B,G:GET(128,24)-

```

Listing continued

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```

(150,44),E,G:GET(4,120)-(26,140)
,F,G:GET(81,24)-(92,44),T,G:RETU
RN
65 IFI=1THENPUT(80,148)-(102,168
),C,PSET:RETURN
66 IFI=2THENPUT(104,148)-(126,16
8),C,PSET:RETURN
67 IFI=3THENPUT(128,148)-(150,16
8),C,PSET:RETURN
68 IFI=1THENPUT(80,148)-(102,168
),O,PSET:RETURN
69 IFI=2THENPUT(104,148)-(126,16
8),O,PSET:RETURN
70 IFI=3THENPUT(128,148)-(150,16
8),O,PSET:RETURN
71 IFI=1THENPUT(80,148)-(102,168
),D,PSET:RETURN
72 IFI=2THENPUT(104,148)-(126,16
8),D,PSET:RETURN
73 IFI=3THENPUT(128,148)-(150,16
8),D,PSET:RETURN
74 IFI=1THENPUT(80,148)-(102,168
),B,PSET:RETURN
75 IFI=2THENPUT(104,148)-(126,16
8),B,PSET:RETURN
76 IFI=3THENPUT(128,148)-(150,16
8),B,PSET:RETURN
77 IFI=1THENPUT(80,148)-(102,168
),F,PSET:RETURN
78 IFI=2THENPUT(104,148)-(126,16
8),F,PSET:RETURN
79 IFI=3THENPUT(128,148)-(150,16
8),F,PSET:RETURN
80 GOSUB124:GOSUB93:GET(80,24)-(
106,44),S,G:FORL=1TO3:PUT(188,15
2)-(214,172),S,PRESET:FORU=1TO10
0:NEXTU:PUT(188,152)-(214,172),S
,PSET:PLAY"T3003L4CCP1T15504CFG"
:NEXTL:FORL=1TO600:NEXTL:RETURN
81 GOSUB124:GOSUB93:GET(80,48)-(
106,68),P,G:FORL=1TO5:PUT(188,15
2)-(214,172),P,PRESET:FORU=1TO10
0:NEXTU:PUT(188,152)-(214,172),P
,PSET:PLAY"T5004L8AAP1T15503GCE
":NEXTL:FORL=1TO600:NEXTL:RETURN
82 GOSUB124:GOSUB93:GET(80,72)-(
106,92),Q,G:FORL=1TO6:PUT(188,15
2)-(214,172),Q,PRESET:FORU=1TO10
0:NEXTU:PUT(188,152)-(214,172),Q
,PSET:PLAY"T15002L2FFFP1P1T800
4CGEC":NEXTL:FORL=1TO600:NEXTL:R
ETURN
83 GOSUB124:GOSUB93:GET(80,96)-(
106,116),H,G:FORL=1TO8:PUT(188,1
52)-(214,172),H,PRESET:FORU=1TO1
00:NEXTU:PUT(188,152)-(214,172),
H,PSET:PLAY"T10003L4DDDP1P1T2550
5ABCD":NEXTL:FORL=1TO600:NEXTL:R
ETURN
84 GOSUB124:GOSUB93:GET(80,120)-
(116,140),G,G:FORL=1TO10:PUT(184
,152)-(220,172),G,PRESET:FORU=1T
0100:NEXTU:PUT(184,152)-(220,172
),G,PSET:PLAY"T17002L3BGBP105L1D

```

```

DOLCO5A":NEXTL:FORL=1TO600:NEXTL
:RETURN
85 GOSUB124:GOSUB93:GET(204,24)-
(240,44),I,G:FORL=1TO15:PUT(184,
152)-(220,172),I,PRESET:FORU=1TO
100:NEXTU:PUT(184,152)-(220,172)
,I,PSET:PLAY"T12503AO2BO5CP1T250
01BCAO5L64CDAF":NEXTL:FORL=1TO60
0:NEXTL:RETURN
86 GOSUB124:GOSUB93:GET(204,48)-
(240,68),J,G:FORL=1TO18:PUT(184,
152)-(220,172),J,PRESET:FORU=1TO
100:NEXTU:PUT(184,152)-(220,172)
,J,PSET:PLAY"T2501L4AO3GO5CP1T22
001ACBO4ACB":NEXTL:FORL=1TO600:N
EXTL:RETURN
87 GOSUB124:GOSUB93:GET(204,72)-
(240,92),K,G:FORL=1TO20:PUT(184,
152)-(220,172),K,PRESET:FORU=1TO
100:NEXTU:PUT(184,152)-(220,172)
,K,PSET:PLAY"T7004L4AO1AO5AP1T12
502L32ACDFCG":NEXTL:FORL=1TO600:
NEXTL:RETURN
88 GOSUB124:GOSUB93:GET(204,96)-
(240,116),L,G:FORL=1TO30:PUT(184
,152)-(220,172),L,PRESET:FORU=1T
0100:NEXTU:PUT(184,152)-(220,172
),L,PSET:PLAY"T7502L4CAT10005L32
AP1T21002L24ACFO4G":NEXTL:FORL=1
TO600:NEXTL:RETURN
89 GOSUB121:GOSUB99:GET(204,120)
-(250,140),W,G:FORL=1TO200:PUT(1
80,152)-(226,172),W,PRESET:FORU=
1TO100:NEXTU:PUT(180,152)-(226,
172),W,PSET:PLAY"T10005L8ADBPT2
0003ABC":NEXTL:FORL=1TO600:NEXTL
:RETURN
90 DRAW"C2BM80,16"+A$(9)+A$(0)+A
$(2)+A$(10)+A$(14)+A$(13)+A$(17)
91 FORX=1TO4:SCREEN1,1:GOSUB92:F
ORY=1TO100:NEXTY:SCREEN1,0:GOSUB
92:FORY=1TO100:NEXTY:NEXTX:FORY=
1TO15:PLAY"T255V3004CD-E-EDD-CO3
D-DE-EO5E-DD-CV15":NEXTY:RETURN
92 PLAY"T403L10V31AV16AV8AV3AV1L
20AV15":RETURN
93 X=RND(9):ONX GOTO94,95,97,99,
101,102,104,106,107
94 DRAW"BM84,16"+A$(21)+A$(13)+A
$(18)+A$(22)+A$(20)+A$(8)+A$(12)
:RETURN
95 DRAW"BM24,16"+A$(2)+A$(13)+A$
(12)+A$(6)+A$(15)+A$(0)+A$(17)
96 DRAW+A$(18)+A$(11)+A$(0)+A$(1
7)+A$(8)+A$(13)+A$(12)+A$(16):RE
TURN
97 DRAW"BM40,16"+A$(21)+A$(13)+A
$(18)+A$(22)+A$(0)
98 DRAW+A$(15)+A$(4)+A$(22)+A$(1
1)+A$(18)+A$(2)+A$(10)+A$(21)
99 DRAW"BM18,162"+A$(21)+A$(13)+
A$(18)
100 DRAW"BM18,182"+A$(20)+A$(8)+
A$(12):RETURN

```

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Listing continued

```

101 GOSUB95:GOTO99
102 GOSUB99:DRAW"BM54,16"+A$(17)
+A$(7)+A$(8)+A$(16)+A$(22)+A$(8)
+A$(16)
103 DRAW+A$(22)+A$(5)+A$(18)+A$(
12):RETURN
104 GOSUB99:DRAW"BM70,16"+A$(1)+
A$(4)+A$(22)+A$(6)
105 DRAW+A$(15)+A$(4)+A$(4)+A$(3)
)+A$(21):RETURN
106 DRAW"BM80,16"+A$(0)+A$(22)+A
$(20)+A$(8)+A$(12)+A$(12)+A$(4)+
A$(15):RETURN
107 GOSUB99:DRAW"BM76,16"+A$(6)+
A$(13)+A$(22)+A$(6)+A$(13)+A$(22)
)+A$(6)+A$(13):RETURN
108 X=RND(4):IFX=1ORX=3ORX=4THEN
RETURN
109 X=RND(6):ON X GOTO110,111,11
2,113,114,115
110 GOSUB124:DRAW"BM74,16"+A$(6)
+A$(13)+A$(22)+A$(5)+A$(13)+A$(1
5)+A$(22)+A$(8)+A$(17):GOSUB116:
RETURN
111 GOSUB124:DRAW"BM70,16"+A$(17)
)+A$(15)+A$(21)+A$(22)+A$(0)+A$(
6)+A$(0)+A$(8)+A$(12):GOSUB116:R
ETURN
112 GOSUB124:DRAW"BM60,16"+A$(1)
+A$(4)+A$(22)+A$(0)+A$(22)+A$(20)
)+A$(8)+A$(12)+A$(12)+A$(4)+A$(1
5):GOSUB116:RETURN
113 GOSUB124:DRAW"BM74,16"+A$(1)
+A$(4)+A$(22)+A$(6)+A$(15)+A$(4)
)+A$(4)+A$(3)+A$(21):GOSUB116:RET
URN
114 GOSUB124:DRAW"BM64,16"+A$(14)
)+A$(11)+A$(0)+A$(21)+A$(22)+A$(
0)+A$(6)+A$(0)+A$(8)+A$(12):GOSU
B116:RETURN
115 GOSUB124:DRAW"BM56,16"+A$(10)
)+A$(4)+A$(4)+A$(14)+A$(22)+A$(1
7)+A$(15)+A$(21)+A$(8)+A$(12)+A$
(6):GOSUB116:RETURN
116 X=RND(10):ONX GOTO132,128,13
6,137,135,140,139,129,142,143:FO
RX=1TO400:NEXTX:RETURN
117 A$(0)="U10E2R4F2D4NL6D6BR6":
A$(1)="U12R6F2D2G2NL4F2D2G2NL4BR
8":A$(2)="BU10BE2BR4NF2L4G2D8F2R
4NE2BR8":A$(3)="U12R6F2D8G2NL4BR
8":A$(4)="U12NR8D6NR4D6R8BR6":A$
(5)="U12NR8D6NR4D6BR14":A$(6)="B
U10E2NR6G2D8F2R4E2U4L4BD6R2BR8"
118 A$(7)="U6NU6R8NU6D6BR6":A$(8)
)="R4U12NL4NR4D12R4BR6":A$(9)="B
U2F2R2E2U10NL6R2BD12BR6":A$(10)=
"U6NU6R2NE6F6BR6":A$(11)="NU12R8
BR6":A$(12)="U12R2F2D8F2E2NU10BD
2BR6":A$(13)="BU2U8E2R4F2D8G2NL4
BR8"
119 A$(14)="U12R6F2D2G2L4BD6BR12
":A$(15)="U12R6F2D2G2L4F6BR6":A$

```

Listing continued

Listing continued

```
(16) = "BU2F2R4E2U2H2L4H2U2E2R4F2B
D2BD8BR6" : A$(17) = "BR4U12NL4R4BD1
2BR6" : A$(18) = "BU2NU10F2R4E2NU10B
D2BR6"
120 A$(19) = "BU4NU8F4E4NU8BD4BR6"
:A$(20) = "NU12R2E2NU4F2R2NU12BR6"
:A$(21) = "BU8NU4F4ND4E4NU4BD8BR6"
:A$(22) = "BR12" : RETURN
121 Q=RND(2) : ON Q GOTO122,123
122 DRAW"C1" : RETURN
123 DRAW"C2" : RETURN
124 Q=RND(3) : ONQ GOTO125,126,127
125 GOTO121
126 PAINT(191,2) , 4 , 1 : DRAW"C2" : RE
TURN
127 PAINT(191,2) , 2 , 1 : DRAW"C4" : RE
TURN
128 PLAY"T2O3L6DECO2CL4G" : RETURN
129 PLAY"T5O3L4CEGO4CL8CCCC403G
L8GGGGL4EGEL1C" : RETURN
130 PLAY"O3T4L4DL8AAL4AAL8AAL4AA
L4.B-L8AL2GL4GGAGFL4.GL8FL4ED+EL
2.A" : RETURN
131 PLAY"T5O3L4CEGO4CO3L4.GL4EP3
2AL4.FL4DP32AL4.GL4E" : RETURN
132 PLAY"O2T5L8DDDL2GO3DL8CO2BAO
3L2GL4.D" : RETURN
133 PLAY"O3T5L2.CO2BO3L2CO2L4ABO
3CO2AL2BO3L4DL2EL4C#L2.D" : RETURN
134 PLAY"T4O3L2CL4CL8CL2CL4D#L8D
L4DL8CL4CO2L4BO3L2C" : RETURN
135 PLAY"T3O2L16.GO3CL16EL8.GL16
EL2G" : RETURN
136 PLAY"T2O3L16GGL16.GEL16CO2L1
6.AO3CL16EL8GEL4G" : RETURN
137 PLAY"T3O3L6GGGL2E" : RETURN
138 PLAY"T5O3L8CP8CFP4P8CFGFEP8F
GP4P8CEP8CEP8CEP4CEFEDP8EF" : RETU
RN
139 PLAY"T4O3L4FL8FGAGFCL4DFL2C"
: RETURN
140 PLAY"O3T5L4EGGGAGGEGGAGL2GF"
: RETURN
141 PLAY"T5O3L4CFACL8DL4EL4.DP4L
4DGBDL8EL4FL4.DP4L4EAC+EL8FL4GL4
.FP4L8DL4DL4.EP4L8DL4DL4.EP4L8EE
L4EFL8F+L2.G" : RETURN
142 PLAY"T5O2L3AL6AAB-AGFL2.A" : R
ETURN
143 PLAY"T3O3L4AGACDL8GL8.GL8FL4
G" : RETURN
144 PLAY"T8O3L2GL4CDEFL2GCP16CL2
AL4FGABO4L2CO3CP16CFL4GFEDL2EL4F
EDCL2O2BO3L4CDECL2EL1D" : RETURN
145 CLS2 : PRINT@75, "DO YOU WISH";
: PRINT@138, "TO PLAY AGAIN"; : PRIN
T@238, "PRESS"; : PRINT@299, "<Y> FO
R YES"; : PRINT@367, "OR"; : PRINT@42
7, "<N> FOR NO"; : GOSUB139
146 K$=INKEY$ : IFK$="" THEN146
147 IFK$="Y" THENQR=1 : GOTO3 ELSE
IFK$="N" THENCLS : END
148 GOTO145
149 PCLEAR2 : GOTO2
```

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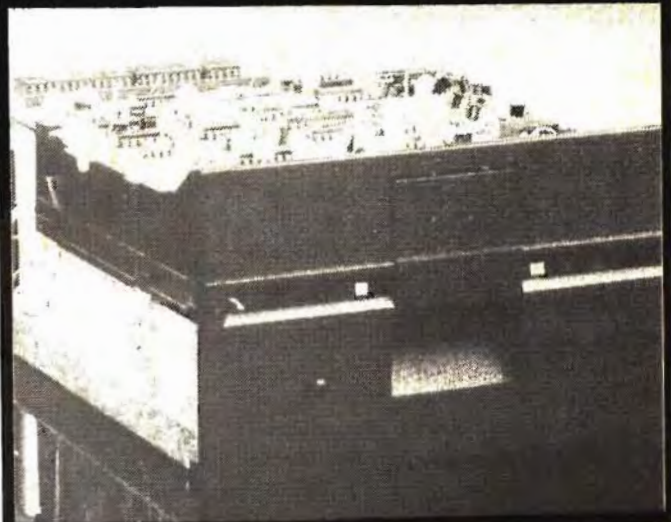
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HOCKEY ONE-ON-ONE

After I bought a Color Computer, I had no knowledge of graphics and only a beginner's knowledge of Basic, so I took certain liberties.

I first created a game based on an idea by Mitchell Grossbach called "Color Breakaway," (*80 Micro*, August 1982, p. 268). I then used the opening ceremony created by Wayne Riggs in "Computer Soccer," (*80 Micro*, April 1983, p. 322). Not wanting to retype this, I used the cassette merge utility by John Nicolettos (*80 Micro*, January 1983, p. 310). The graphics and use of the joystick for shot direction are original.

The game is Hockey One-on-One. The goalie, controlled by the right joystick, is restricted to vertical movement in front of the goal. The left joystick controls the shooter, who has free movement over most of the ice. When you decide to shoot, aim the joystick in the direction you wish the puck to move and press the fire button. You can only shoot to the left. If the X value of the

Break! Shoot! Score!
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joystick is greater than the X value of the puck, nothing will happen.

Once you've taken a shot, you have no more control. Now the goalie must



G	Goalie Array
S	Shooter Array
GY	Vertical Position of Goalie
SX	Horizontal Position of Shooter
SY	Vertical Position of Shooter
PX,PY	Position of Puck
PX1,PY1	Position of Puck After Shot
DX	Horizontal Distance Between Puck and Joystick A1 Reading After Shot
DY	Vertical Distance Between Puck and Joystick B1 Reading After Shot
R	Ratio of DX to DY
GS	Goalie Saves
SG	Shooter Goals
MS	Missed Shots

Table 1. Symbols Array

System Requirements

16K RAM
Extended Color Basic

move into position to make the save. This can only be made from a point just above the goalie's leg pads to a point just below the pads where his skates are.

If he does not get in the way of the puck between these points, and the shot is true, it will pass through and into the net for a score.

After each shot a new screen appears and declares a miss, a save, or a goal. If

it is a miss, the game continues in a few seconds. If it is a goal or a save, a new screen comes on and displays the score in saves, goals, and misses. The game ends after 10 goals or 10 saves. ■

Address correspondence to Charles Boulanger, 62 Springvale Ave., Lynn, MA 01904.

Program Listing. Hockey One-on-One

```

10 CLS
20 AS=STRINGS(30,"*"):PRINT@33,AS
30 PRINT@102,"HOCKEY! ONE ON ONE"
40 PRINT@163,"THE RIGHT JOYSTICK CONTROLS"
50 PRINT@200,"THE GOALIE."
60 PRINT@227,"THE LEFT JOYSTICK CONTROLS":PRINT@259,"THE SHOOTER
.TO SHOOT,AIM"
70 PRINT@291,"JOYSTICK AT GOAL AND PRESS":PRINT@328,"FIRE BUTTON
."
80 PRINT@422,"PRESS ENTER TO BEGIN":PRINT@481,AS:SCREEN 0,1
90 AS=INKEYS:IF AS=CHR$(13) THEN 100 ELSE 90
100 CLS:PMODE 3,1:PCLS:SCREEN 1,1
110 DRAW"C4;BM50,188;U150;R155;D80;L155;BU32;R70;U48;D7;R85;D5;L
85;D7;R85;D5;L85;D7;R85;D5;L85;D7;R85;D5;L155;D7;R155;D5;L155;D7
;R155;D5;L155;D7;R155"
120 PAINT(62,40),3,4:PAINT(130,40),4,4:PAINT(130,46),5,4:PAINT(1
30,52),4,4
130 PAINT(130,58),5,4:PAINT(130,64),4,4:PAINT(130,72),5,4:PAINT(
130,76),4,4
140 PAINT(130,84),5,4:PAINT(130,88),4,4:PAINT(130,96),5,4:PAINT(
130,100),4,4
150 PAINT(130,108),5,4:PAINT(130,112),4,4:PAINT(130,120),5,4
160 X=56:Y=42:FOR S=1 TO 5:FOR A=1 TO 6:CIRCLE(X,Y),2,5:X=X+12
170 NEXT A:X=56:Y=Y+10:NEXT S
180 X=62:Y=47:FOR S=1 TO 4:FOR A=1 TO 5:CIRCLE(X,Y),2,5:X=X+12
190 NEXT A:X=62:Y=Y+10:NEXT S
200 PLAY"T4;L4;C;L8;D;E;F;L2;G;L8;C;D;L4;E;L8;F;L4;D;L2;C"
210 PLAY"L8;O1;G;L16;E;L4;C;E;G;O2;L2;C;L8;E;L16;D;L4;C;O1;E;F#;
L2;G;L8;G;G"
220 PLAY"O2;L4;E;L8;D;L4;C;O1;L2;B;L8;A;B;L4;O2;C;C;O1;G;E;C;L8.
;G;L16;E"
230 PLAY"L4;C;E;G;O2;L2;C;L8.;E;L16;D;L4;C;O1;E;F#;L2;G;L8;G;G"
240 PLAY"O2;L4.;E;L8;D;L4;C;O1;L2;B;L8;A;B;O2;L4;C;C;O1;G;E;C;O2
;L8;E;E"
250 PLAY"L4;E;F;G;L2;G;L8;F;E;L4;D;E;F;L2;F;L4;F"
260 PLAY"L4.;E;L8;D;L4;C;O1;L2;B;L8;A;B;L4;O2;C;O1;E;F#;L2;G;L4;
G;"
270 PLAY"O2;L4;C;C;L8;C;O1;B;L4;B;L4;A;A;O2;D;L8;F;F;D;C;L4;C;
O1;L4.;B;L8;G;G"
280 PLAY"O2;L4.;C;L8;D;E;F;L2;G;L8;C;D;L4.;E;L8;F;L4;D;L2;C"
290 FOR I=1 TO 500:NEXT I
300 PMODE 3,1:PCLS:SCREEN 1,1
310 PRINT@166,"THE GAME WILL BEGIN":PRINT@295,"IN A FEW SECONDS"
:SCREEN 0,1
320 DIM G(6,4),S(12,6)
330 PSET(12,5,3):PSET(14,5,3)
340 FOR I=6 TO 9:PSET(10,I,3):PSET(16,I,3):NEXT I
350 FOR I=6 TO 18:PSET(I,10,3):NEXT I
360 FOR I=4 TO 18:PSET(I,11,3):NEXT I
370 FOR I=2 TO 18:PSET(I,12,3):PSET(I,19,3):PSET(I,20,3):NEXT I
380 FOR I=13 TO 15:PSET(18,I,3):NEXT I
390 FOR I=2 TO 16:PSET(I,13,3):PSET(I,18,3):NEXT I
400 FOR I=0 TO 14:PSET(I,14,3):PSET(I,17,3):NEXT I
410 FOR I=0 TO 12:PSET(I,15,3):NEXT I
420 FOR I=0 TO 24:PSET(I,16,3):NEXT I
430 FOR I=4 TO 19:PSET(I,26,3):NEXT I
440 FOR I=20 TO 25:PSET(4,I,3):PSET(6,I,3):PSET(8,I,8):PSET(10,I
,8):PSET(12,I,3):PSET(14,I,8):PSET(16,I,8):PSET(18,I,3):NEXT I
450 FOR I=12 TO 15:PSET(22,I,3):PSET(24,I,3):NEXT I
460 FOR I=0 TO 24:PRESET(I,0,5):PRESET(I,1,5):PRESET(I,2,5):PRE
SET(I,3,5):PRESET(I,4,5):NEXT I
470 FOR I=0 TO 24:PRESET(I,27,5):PRESET(I,28,5):PRESET(I,29,5):P
RESET(I,30,5):NEXT I:PRESET(2,19,5):PRESET(2,20,5)
480 FOR I=226 TO 232:PSET(I,36,3):NEXT I
490 FOR I=228 TO 232:PSET(I,35,3):NEXT I
500 FOR I=33 TO 34:PSET(230,I,3):PSET(232,I,3):NEXT I
510 FOR I=28 TO 32:PSET(250,I,3):NEXT I:PSET(250,33,3)
520 FOR I=27 TO 32:PSET(230,I,3):PSET(232,I,3):NEXT I:PSET(232,2
5,4)
530 PSET(230,26,4):PSET(232,26,4)

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540 FOR I=28 TO 31:FOR Z=242 TO 248:PSET(Z,I,3):NEXT Z:NEXT I
550 FOR I=26 TO 27:FOR Z=242 TO 246:PSET(Z,I,4):NEXT Z:NEXT I
560 PSET(234,28,4):PSET(234,27,4):PSET(234,26,4):PSET(236,27,4):
PSET(236,26,4):PSET(238,26,4)
570 FOR I=234 TO 246:PSET(I,25,4):PSET(I,24,4):NEXT I
580 FOR I=236 TO 246:FOR Z=21 TO 23:PSET(I,Z,4):NEXT Z:NEXT I
590 FOR I=236 TO 246:PSET(I,20,4):NEXT I
600 FOR I=214 TO 220:PSET(I,34,3):PSET(I,33,3):NEXT I
610 Z=0
620 FOR I=17 TO 31 STEP 2:PSET(236-Z,I,3):Z=Z+2:NEXT I:Z=0
630 FOR I=18 TO 32 STEP 2:PSET(236-Z,I,3):Z=Z+2:NEXT I:Z=0
640 FOR I=236 TO 244:PSET(I,19,4):NEXT I:PSET(242,18,4)
650 PSET(238,18,3):PSET(240,18,3):FOR I=238 TO 242:PSET(I,17,3):
NEXT I
660 FOR I=240 TO 244:PSET(I,16,3):NEXT I:FOR I=242 TO 246:FOR Z=
13 TO 15:PSET(I,Z,3):NEXT Z:NEXT I
670 FOR I=12 TO 22:FOR Z=228 TO 230:PSET(Z,I,3):NEXT Z:NEXT I
680 PSET(228,24,3):PSET(228,23,3):PSET(230,11,3):PSET(242,12,3):
PSET(244,12,3):PSET(242,11,3)
690 FOR I=232 TO 240:FOR Z=14 TO 15:PSET(I,Z,4):NEXT Z:NEXT I
700 FOR I=232 TO 238:PSET(I,16,4):NEXT I:PSET(232,17,4):PSET(234
,17,4):PSET(234,18,4)
710 FOR I=232 TO 240:FOR Z=11 TO 13:PSET(I,Z,3):NEXT Z:NEXT I
720 FOR I=6 TO 10:PSET(232,I,4):PSET(238,I,4):NEXT I
730 FOR I=234 TO 236:PSET(I,5,4):PSET(I,10,4):NEXT I
740 FOR I=208 TO 256:FOR Z=0 TO 3:PRESET(I,Z,5):NEXT Z:NEXT I
750 FOR I=208 TO 256:FOR Z=37 TO 42:PRESET(I,Z,5):NEXT Z:NEXT I
760 FOR I=0 TO 40:FOR Z=206 TO 208:PRESET(Z,I,5):NEXT Z:NEXT I
770 FOR I=0 TO 40:FOR Z=254 TO 256:PRESET(Z,I,5):NEXT Z:NEXT I
780 GET(0,0)-(24,30),G,G
790 GET(206,42)-(254,0),S,G
800 PCLS
810 DRAW"BM 32,72;L12;G8;D8;F8;G8;D8;F8;R12"
820 DRAW"BM 32,72;U4;L16;G10;D10;F8;G8;D10;F10;R16;U4"
830 PAINT(18,96),4,8
840 LINE(0,0)-(256,192),PSET,B
850 DRAW"BM0,24;E20;R236"
860 DRAW"BM0,167;F20;R236"
870 CIRCLE(6,96),2,3
880 PAINT(128,2),3,8
890 PAINT(128,190),3,8
900 LINE(34,4)-(34,188),PSET
910 GY=86
920 SX=200:SY=116
930 A=0:B=0
940 A1=0:B1=0
950 PMODE 3,1
960 SCREEN 1,1
970 POKE65495,0
980 GY=GY-INT((32-B)/7)
990 IF GY<48 THEN GY=48
1000 IF GY>100 THEN GY=100
1010 PUT(38,GY)-(62,GY+30),G,PSET
1020 A=JOYSTK(0):B=JOYSTK(1)
1030 SX=SX-INT((32-A1)/7)
1040 SY=SY-INT((32-B1)/7)
1050 IF SX>200 THEN SX=200
1060 IF SX<94 THEN SX=94
1070 IF SY>186 THEN SY=186
1080 IF SY<48 THEN SY=48
1090 PUT(SX,SY)-(SX+48,SY-42),S,PSET
1100 PX=SX+8:PY=SY-5
1110 PSET(PX,PY,3)
1120 A1=JOYSTK(2):B1=JOYSTK(3)
1130 IF PEEK(65280)=125 OR PEEK(65280)=253 THEN 1150
1140 GOTO 980
1150 IF A1>0 THEN 980
1160 POKE 65494,0
1170 PLAY"L200;O1;V21B-V18A#V14G#V10F#V8D#V6CV6C"
1180 PUT(SX,SY)-(SX+48,SY-42),S,PSET
1190 PRESET(PX,PY)
1200 A=JOYSTK(0)
1210 A1=JOYSTK(2)*4:B1=JOYSTK(3)*3
1220 DX=PX-A1
1230 IF B1>PY THEN DY=B1-PY
1240 IF B1<PY THEN DY=PY-B1
1250 IF B1=PY THEN PY=B1
1260 R=DY/DX
1270 POKE65495,0
1280 GY=GY-INT((32-B)/8)
1290 IF GY<48 THEN GY=48
1300 IF GY>100 THEN GY=100
1310 PUT(38,GY)-(62,GY+30),G,PSET
1320 A=JOYSTK(0):B=JOYSTK(1)
1330 DX=DX-10
1340 IF PY>B1 THEN PY=(PY-(R*5))
1350 IF PY<B1 THEN PY=(PY+(R*5))
1360 IF PY=B1 THEN PY=B1

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1370 PY1=INT(PY)
1380 PX1=DX
1390 PSET(PX1,PY1,3)
1400 IF PX1<=34 AND PY1>72 AND PY1<121 THEN 1620
1410 IF PX1<=58 AND PX1>40 AND PY1>GY+18 AND PY1<GY+28 THEN 1470
1420 IF PX1<=34 THEN 1700
1430 IF PY1<5 THEN 1700
1440 IF PY1>187 THEN 1700
1450 PRESET(PX1,PY1)
1460 GOTO 1280
1470 POKE 65494,0
1480 PLAY"L60;O1;G-V31D-V15A-V8CV4"
1490 FOR I=1 TO 20
1500 PUT(38,GY)-(62,GY+30),G,PSET
1510 PRESET(PX1,PY1)
1520 PX1=PX1+2:PLAY"L255;O1;F-V10"
1530 PSET(PX1,PY1,3)
1540 NEXT I
1550 FOR I=1 TO 500:NEXT I
1560 GS=GS+1
1570 CLS(3)
1580 PRINT@224," THE GOALIE MADE THE SAVE"
1590 FOR I=1 TO 1000:NEXT I
1600 IF GS=10 THEN 1850
1610 GOTO 1750
1620 POKE 65494,0
1630 FOR I=1 TO 3:CIRCLE(6,96),2,4:PLAY"L8;O1;F-":CIRCLE(6,96),2,5:NEXT I:CIRCLE(6,96),2,3:FOR I=1 TO 500:NEXT I
1640 SG=SG+1
1650 CLS(4)
1660 PRINT@224," THE SHOOTER SCORES A GOAL"
1670 FOR I=1 TO 1000:NEXT I
1680 IF SG=10 THEN 1820
1690 GOTO 1750
1700 POKE 65494,0
1710 FOR I=1 TO 500:NEXT I:CLS(2)
1720 PRINT@224," THE SHOOTER MISSED"
1730 FOR I=1 TO 1000:NEXT I
1740 MS=MS+1:GOTO 800
1750 CLS
1760 PRINT@66,"GOALIE SAVES":PRINT@81,"SHOOTER GOALS"
1770 PRINT@134,GS:PRINT@151,SG
1780 PRINT@234,"SHOTS MISSED":PRINT@270,MS
1790 PRINT@392,"THE GAME GOES ON":SCREEN 0,1
1800 FOR I=1 TO 1500:NEXT I
1810 GOTO800
1820 CLS:PRINT@168,"THE SHOOTER WINS":PRINT@235,SG;"TO";GS
1830 PRINT@291,"IF YOU WISH TO PLAY AGAIN":PRINT@363,"PRESS ENTER":SCREEN0,1
1840 AS=INKEY$:IF AS=CHR$(13) THEN 1880 ELSE 1840
1850 CLS:PRINT@168,"THE GOALIE WINS":PRINT@235,GS;"TO";SG
1860 PRINT@291,"IF YOU WISH TO PLAY AGAIN":PRINT@363,"PRESS ENTER":SCREEN0,1
1870 AS=INKEY$:IF AS=CHR$(13) THEN 1880 ELSE 1870
1880 GS=0:SG=0:MS=0:GOTO 800

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BY PETER PAPLASKAS
HOT CoCo STAFF

CRAM—MC-10 STYLE

Program Listing. Cram

```

1 CLS
2 PRINT @ 74, "W E L C O M E"
4 PRINT @ 142, "T O"
6 PRINT @ 204, "C R A M"
8 PRINT @ 456, "INSTRUCTIONS
(Y/N?)"
9 AS=INKEY$
10 IF AS="Y" THEN 15
12 IF AS="N" THEN 38
13 GOTO 8
14 REM INSTRUCTIONS
15 CLS:PRINT @ 33,"THE OBJECT OF
THE GAME IS TO"
16 PRINT @ 65,"CRAM AS MUCH OF
THE LINE ONTO"
17 PRINT @ 97,"THE SCREEN
WITHOUT RUNNING"
18 PRINT @129,"INTO THAT SAME
LINE BY HITTING"
19 PRINT @161,"ANY KEY TO MAKE A
RIGHT ANGLE"
20 PRINT @193,"TURN. THE
COMPLETE NUMBER OF"
21 PRINT @225,"YOUR TURNS AND
PREVIOUS HIGH"
22 PRINT @257,"SCORE WILL BE
RECORDED ON THE"
23 PRINT @289,"SCREEN AFTER
EVERY GAME. IF"
24 PRINT @321,"YOU RUN INTO YOUR
LINE A"
25 PRINT @353,"CERTAIN PITCH OF
TONES WILL"
26 PRINT @385,"END YOUR GAME."
27 PRINT @452,"THIS IS A
DEMONSTRATION"
28 FOR X=1 TO 20000:NEXT X
29 REM DEMONSTRATION
30 CLS7:TL=0:TR=63:VT=1:VB=31
31 FOR K=TL TO
TR:SET(K,TL,5):NEXTK
32 FOR K=VT TO
VB:SET(TR,K,5):NEXTK
33 FOR K=TR-1 TO TL STEP

```

Listing continued

This simple, yet addicting game for the micro CoCo is guaranteed to give hours of enjoyment.

Cram is for Radio Shack's latest Color Computer, the MC-10. It is a conversion from an article by Hardin Brothers, which appeared in the August 1982 issue of *80 Micro*, p. 234. I thought this would be an excellent candidate for the MC-10, because it uses only 1,531 bytes of RAM.

The game is quite simple; hit any key to make the moving line turn at right angles, so as to avoid the border and the line itself. Your score is based on how many right turns you complete. Also, another score is recorded for previous highs.

The game ends when you either hit the surrounding border or if you run into the line itself. You will then hear a series of tones that end the game.

The REM statements explain fully the operation of the program. ■

System Requirements

MC-10
4K RAM

Listing continued

```

-1:SET(K,VB,5):NEXTK
34 FOR K=VB-1 TO VT-1
STEP-1:SET(TL,K,5):NEXTK
35 TL=TL+1:TR=TR-1:VT=VT+1:
VB=VB-1
36 IF TL=16 THEN GOTO 8
37 GOTO 31
38 CLS7
39 GOSUB 280
40 L=0:R=63:T=1:
B=31:N=0:CLS(7):GOSUB250
50 REM MOVE RIGHT
60 J=J+1:IF J=R THEN 200
65 SET(J,I,5)
70 IF INKEY$="" THEN 60
72 SOUND128,1:N=N+1:R=J
80 REM MOVE DOWN
90 I=I+1:IF I=B THEN 200
95 SET(J,I,5)
100 IF INKEY$="" THEN 90
102 SOUND128,1:N=N+1:B=I
110 REM MOVE LEFT
120 J=J-1:IF J=L THEN 200
125 SET(J,I,5)
130 IF INKEY$="" THEN 120
132 SOUND128,1:N=N+1:L=J
140 REM MOVE UP
150 I=I-1:IF I=T THEN 200
155 SET(J,I,5)
160 IF INKEY$="" THEN 150
162 SOUND128,1:N=N+1:T=1:GOTO60
170 REM DELAY VERTICAL
180 FOR Z=1 TO 30:NEXT Z
190 REM GAME OVER
195 FOR X=1 TO 255:SOUND
X,1:NEXT X
200 FOR X=215 TO 150
STEP-2:SOUNDX,1:NEXT X
205 CLS:PRINT@228,
"TURN=";N;"PREVIOUS HIGH=";M:IF
N>M THEN M=N
210 FOR I=1 TO
2000:NEXTI:CLS:GOTO40
250 I=1:J=0:AS=INKEY$:RETURN
280 M=0:RETURN

```

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You are GeoJogger, fastest human alive. It is a moonless night on Castle Crag, your lofty redoubt. From the distant metropolis of New San Los City, a shaft of light shoots skyward to throw a call for help on a sullen expanse of cloud. The projected symbol: a well-worn sneaker.

"This can mean but one thing," you mutter. "The dread Dr. D'Estroi!"

A minute later, after hot-footing it the hundred miles along Interstate 87.5, you stand in the office of the man who summoned you—Police Commissioner Fuddles.

"You have guessed correctly. Dr. D'Estroi is on the prowl," he confirms.

You rub your chin, savoring past run-ins with the evil genius D'Estroi, a former pediatrician crazed by too many Saturday-morning cartoons, and who is now a sociopathic litterbug.

"Never fear," you say, "I will find him before he litters this great North American continent of ours."

Fuddles *ahems*, "I'm sure you will, GeoJogger, but do so as quickly as possible. Your last job cost us more than \$2 million in highway user taxes."

"That's the way I travel, Commissioner. The only superpower I have is that of speed."

Fuddles sighs. "Try to stay off asphalt roads then."

"I'm on my way," you tell him, "and my pledge is this: Though I may have to cover every state and com-

monwealth, it's temporary. The next time you turn on the CoCo, graphics will be back along with a memory of 8,487 bytes.

Your Objective

In this game you are GeoJogger. You travel from area to area by tapping four keys: N, for north; S, for south; W, for west; and E, for east. Do not tap enter after pressing a key. Also, do not tap, tap, tap; press a key once and wait to see what happens.

You are searching for the location of Dr. D'Estroi, who never moves during the game. He can be in any state, commonwealth, province, or territory. He is not in Washington, DC, which doesn't appear in the game.

How do you find him?

- Look for clues to his whereabouts.
- When you know where he is, figure out how to go there. If you do, you win the game.
- You will find it useful to obtain and trade objects offered by the friendly people you meet along the way.

Turn to the cover of this magazine.

Use the clues on the cover of this magazine to find the evil Dr. D'Estroi and stop his littering.

monwealth of the Union, every province and territory of Canada, I shall not rest until I have tracked down Dr. D'Estroi. And when I have, I shall offer him psychotherapy so he may resume a useful role in society. In addition, I might tweak his nose."

You zip down the highway, leaving a wake of flame.

"Call the road repair crew," Fuddles wearily instructs an aide.

Instructions

That's the scenario of GeoJogger, a 16K Extended Color Basic logic-adventure game. What comes next is critically important to the health of the program. Before using the program, type the following in command mode and tap enter: PMODE 0: PCLEAR 1.

You must also type in these commands before you attempt to CLOAD the program from a CSAVEd tape. Else, it probably won't run. The commands let the computer hold 13,095 bytes for text (compared to the usual 8,487 bytes) by temporarily taking over the memory reserved for graphics. Re-

System Requirements

16K RAM
Extended Color Basic



Program Listing. GeoJogger

```

100 REM * GEOJOGGER * TRS-80 EXT
ENDED COLOR BASIC 16K * RICHARD
RAMELLA
110 CLS: PMODE 0: PCLEAR 1: CLS:
CLEAR 1000: DIM A$(67),V$(15),W
$(15)
120 DATA ALABAMA,ALASKA,ARIZONA,
ARKANSAS,CALIFORNIA,COLORADO,CON
NECTICUT,DELAWARE,FLORIDA,GEORGI
A,HAWAII,IDAHO,ILLINOIS,INDIANA,
IOWA,KANSAS,KENTUCKY,LOUISIANA,M
AINE,MARYLAND,MASSACHUSETTS,MIC
HIGAN,MINNESOTA,MISSISSIPPI,MISS
OURI,MONTANA,NEBRASKA
130 DATA NEVADA,NEW HAMPSHIRE,NE
W JERSEY,NEW MEXICO,NEW YORK,NOR
TH CAROLINA,NORTH DAKOTA,OHIO,OK
LAHOMA,OREGON,PENNSYLVANIA,RHODE

```

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ISLAND,SOUTH CAROLINA,SOUTH DAK
OTA,TENNESSEE,TEXAS,UTAH,VERMONT
,VIRGINIA,WASHINGTON,WEST VIRGIN
IA,WISCONSIN,WYOMING
140 DATA ALBERTA,BRITISH COLUMBI
A,MANITOBA,NEW BRUNSWICK,NEWFOUN
DLAND,NOVA SCOTIA,ONTARIO,PRINCE
EDWARD ISLAND,QUEBEC,SASKATCHEW
AN,NORTHWEST TERRITORIES,YUKON T
ERRITORY,ATLANTIC OCEAN,PACIFIC
OCEAN,GULF OF MEXICO,MEXICO,THE
FROZEN NORTH
150 DATA >K B>O LC @LOK,> PB>PEB
II,> IRJM LC @L>I,> @>KQ>ILRMB,
> MFKB @LKB, > M>FO LC KBT PKB>H
BOP,> QLQBJ MLIB,LKB QLK @EFIF M
LTABO,/ QLKP IL?PQBOP,/ Q>KH@>OP
PRKCILTBO LFI,1- LRK@BP PFISBO,

```

Listing continued

On it you will find clues to both Dr. D'Estroi's whereabouts and to the objects you must find with which you trade for other objects.

Dr. D'Estroi loves to litter, so he leaves scraps with clues and taunts for you to find. The clues are coded in the listing, so you can key in the game without spoiling any surprises.

At times you might think the direction logic is strange. For example, a traveler going south from Canada's Northwest Territories could wind up in any of five Canadian provinces. I had to

choose one and make it the same every time. Also, you might quibble with my directions at times. For example, Maine seems to be north of New Hampshire; yet, you travel east from New Hampshire into southern Maine.

This game also has some "guest stars" included for the sheer pleasure of it. In various places you will run across mention of other authors and their programs appearing in this special games issue of *HOT CoCo*.

If you get lost while playing GeoJogger, mail me your address and 50 cents,

and I'll use it for postage, envelope, and copying to send you the *Secrets of GeoJogger*, a modest one-page explanation of the game. If you live outside the U.S. or Canada, I must cover my costs by asking that you send \$1 or the equivalent in your nation's currency. Write me: Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926.

Because of the program's length, I can't offer debugging help, as I do in the column Elmer's Arcade.

Now, go forth and bring Dr. D'Estroi to justice. ■

```

. AF>JLKA,!.----,!.----,>K LIA OL
T?L>Q
160 FOR A=172 TO 182: PRINT @ A,
"*";: PRINT @ A+64,"*";: NEXT: P
RINT @ 204,"*GEOJOGGER*";: PRINT
@ 293,"BY RICHARD RAMELLA";
170 FOR A=1 TO 67: READ A$(A): N
EXT: FOR A=1 TO 15: READ V$(A):
NEXT: GOSUB 1770
180 B$="LOCATION: ": C$="83690XM
TWYXQJUUZYLQTTTPHQTXJJQXJRNXXNRU
TWYFSYHQZJMJWJ,XFSTYMWJ/TSIJWKZQ
Q^FUYNRUZQXN[J%NIJF": E$="DR. D'
ESTROI HINT"
190 FOR A=1 TO TIMER STEP TIMER/
10: B=RND(10): NEXT: A=RND(10):
ON A GOTO 200,1210,1290,1020,910
,550,570,610,630,1440
200 Y=1: GOSUB 1750
210 GOSUB 1710: ON Z GOTO 1150,6
90,390,410
220 Y=2: GOSUB 1750
230 GOSUB 1710: ON Z GOTO 1690,1
690,1620,1570
240 GOSUB 1760: GOTO 220
250 Y=3: GOSUB 1750
260 PRINT " DR. D'ESTROI HAS CRA
MMED GRAND CANYON WITH MULTICOLO
RED BRICKS,BUT A FEW GO'S AT MAR
K GOODWIN'SSMASHOUT CLEARS THE P
ROBLEM."
270 GOSUB 1710: ON Z GOTO 1190,3
00,1670,890
280 Y=4: GOSUB 1750: V=12: GOSUB
1800
290 GOSUB 1710: ON Z GOTO 710,99
0,570,690
300 Y=5: GOSUB 1750: V=4: GOSUB
1800
310 GOSUB 1710: ON Z GOTO 1020,1
620,1670,810
320 Y=6: GOSUB 1750
330 GOSUB 1710: ON Z GOTO 1310,1
190,890,1170
340 Y=7: GOSUB 1750
350 PRINT "AND IN NEW LONDON THE
NAVY TAKES SHORE LEAVE JUST TO P
LAY WILLIAM BONNELL'S GAME: SUBMA
RINE SIMU- LATION."
360 GOSUB 1710: ON Z GOTO 630,91
0,1590,1590
370 Y=8: GOSUB 1750
380 GOSUB 1710: ON Z GOTO 860,61
0,610,1590
390 Y=9: GOSUB 1750: V=2: GOSUB
1800
400 GOSUB 1710: ON Z GOTO 410,16
50,1650,1590
410 Y=10: GOSUB 1750
420 PRINT "CHARLES LEVINSKI'S DR
AGRACE GETS YOU SOME QUICK MILEAG

```

```

E."
430 GOSUB 1710: ON Z GOTO 930,20
0,390,1110
440 Y=11: GOSUB 1750: GOTO 2000
450 Y=12: GOSUB 1750
460 GOSUB 1710: ON Z GOTO 740,10
20,1190,1310
470 Y=13: GOSUB 1750
480 GOSUB 1710: ON Z GOTO 1290,7
10,550,490
490 Y=14: GOSUB 1750
500 GOSUB 1710: ON Z GOTO 650,47
0,550,970
510 Y=15: GOSUB 1750
520 GOSUB 1710: ON Z GOTO 670,78
0,710,470
530 Y=16: GOSUB 1750: V=10: GOSU
B 1800
540 GOSUB 1710: ON Z GOTO 780,32
0,990,710
550 Y=17: GOSUB 1750
560 GOSUB 1710: ON Z GOTO 970,71
0,1150,1230
570 Y=18: GOSUB 1750
580 GOSUB 1710: ON Z GOTO 280,11
70,1650,690
590 Y=19: GOSUB 1750: V=9: GOSUB
1800
600 GOSUB 1710: ON Z GOTO 1400,1
500,840,1590
610 Y=20: GOSUB 1750
620 GOSUB 1710: ON Z GOTO 1040,1
270,1230,370
630 Y=21: GOSUB 1750
640 GOSUB 1710: ON Z GOTO 840,91
0,1590,1060
650 Y=22: GOSUB 1750: V=5: GOSUB
1800
660 GOSUB 1710: ON Z GOTO 1460,1
290,490,1460
670 Y=23: GOSUB 1750
680 GOSUB 1710: ON Z GOTO 1460,9
50,510,1290
690 Y=24: GOSUB 1750
700 GOSUB 1710: ON Z GOTO 1150,2
80,570,200
710 Y=25: GOSUB 1750
720 PRINT "A GIANT GUPPY CRUISES
THE": PRINT "MISSISSIPPI RIVER,
ESCAPED FROM RICHARD RAMELLA'S
ELMER'S ARCADE COLUMN."
730 GOSUB 1710: ON Z GOTO 510,53
0,280,470
740 Y=26: GOSUB 1750
750 IF H<>1 THEN 770 ELSE PRINT:
PRINT E$: ": PRINT: FOR T=20 T
O 28: GOSUB 760: PRINT G$;: NEXT
: PRINT: FOR T=29 TO 36: GOSUB
760: PRINT G$;: NEXT: PRINT: FOR
T=37 TO 49: GOSUB 760: PRINT G$
;: NEXT: PRINT: H=H+1: GOTO 770

```



```

760 FOR G=1 TO 300: NEXT G: G$=C
HR$(ASC(MID$(C$,T,1))-5): RETURN
770 GOSUB 1710: ON Z GOTO 1530,4
50,1310,950
780 Y=27: GOSUB 1750
790 IF K$<>" THEN 800 ELSE K$=V
$(1): PRINT " A GENEROUS NEBRASK
AN GIVES YOU ";V$(1)
800 GOSUB 1710: ON Z GOTO 1130,1
310,530,510
810 Y=28: GOSUB 1750
820 PRINT "WITH THE RIGHT STAKES
YOU COULD WIN A BUNCH.": V=14:
GOSUB 1800
830 GOSUB 1710: ON Z GOTO 1020,3
00,250,1190
840 Y=29: GOSUB 1750
850 GOSUB 1710: ON Z GOTO 1500,1
210,630,590
860 Y=30: GOSUB 1750
870 PRINT "OUT IN ATLANTIC CITY
THE RAGE ISGABRIEL WEAVER'S HOT
COCO GAME: JACKPOT SLOTS."
880 GOSUB 1710: ON Z GOTO 910,10
40,370,1590
890 Y=31: GOSUB 1750: V=8: GOSUB
1800
900 GOSUB 1710: ON Z GOTO 320,25
0,1670,1170
910 Y=32: GOSUB 1750
920 GOSUB 1710: ON Z GOTO 1500,1
460,1040,1210
930 Y=33: GOSUB 1750
940 GOSUB 1710: ON Z GOTO 1230,1
150,1110,1590
950 Y=34: GOSUB 1750
960 GOSUB 1710: ON Z GOTO 1380,7
40,1130,670
970 Y=35: GOSUB 1750
980 GOSUB 1710: ON Z GOTO 650,49
0,550,1270
990 Y=36: GOSUB 1750
1000 IF H=2 THEN PRINT: PRINT E$
": ": PRINT: FOR T=1 TO 19: PRIN
T CHR$(ASC(MID$(C$,T,1))-5);: FO
R G=1 TO 300: NEXT G,T: H=H+1
1010 GOSUB 1710: ON Z GOTO 530,8
90,1170,280
1020 Y=37: GOSUB 1750
1030 GOSUB 1710: ON Z GOTO 1250,
1620,300,450
1040 Y=38: GOSUB 1750: V=6: GOSU
B 1800
1050 GOSUB 1710: ON Z GOTO 910,9
70,610,860
1060 Y=39: GOSUB 1750: V=13: GOS
UB 1800
1070 IF H<>3 THEN 1100 ELSE PRIN
T: PRINT "FINAL "E$: FOR T=50 TO
90
1080 G$=CHR$(ASC(MID$(C$,T,1))-5

```

```

): IF G$="*" THEN G$="W"
1090 PRINT G$,: NEXT: H=H+1
1100 GOSUB 1710: ON Z GOTO 630,3
40,1590,1590
1110 Y=40: GOSUB 1750
1120 GOSUB 1710: ON Z GOTO 930,4
10,1590,1590
1130 Y=41: GOSUB 1750
1140 GOSUB 1710: ON Z GOTO 950,1
310,780,670
1150 Y=42: GOSUB 1750
1160 GOSUB 1710: ON Z GOTO 550,2
80,200,930
1170 Y=43: GOSUB 1750
1180 GOSUB 1710: ON Z GOTO 990,8
90,1670,570
1190 Y=44: GOSUB 1750
1200 GOSUB 1710: ON Z GOTO 450,8
10,250,320
1210 Y=45: GOSUB 1750
1220 GOSUB 1710: ON Z GOTO 1500,
910,630,840
1230 Y=46: GOSUB 1750
1240 GOSUB 1710: ON Z GOTO 610,1
270,930,1590
1250 Y=47: GOSUB 1750: V=15: GOS
UB 1800
1260 GOSUB 1710: ON Z GOTO 1360,
1620,1020,450
1270 Y=48: GOSUB 1750: V=3: GOSU
B 1800
1280 GOSUB 1710: ON Z GOTO 1040,
970,1230,1230
1290 Y=49: GOSUB 1750
1300 GOSUB 1710: ON Z GOTO 650,6
70,470,650
1310 Y=50: GOSUB 1750
1320 GOSUB 1710: ON Z GOTO 740,4
50,320,780
1330 Y=51: GOSUB 1750
1340 IF H=0 THEN PRINT E$: "(Y+
50)/2-.5: H=H+1
1350 GOSUB 1710: ON Z GOTO 1550,
1360,740,1530
1360 Y=52: GOSUB 1750: V=7: GOSU
B 1800
1370 GOSUB 1710: ON Z GOTO 1570,
1620,1250,1330
1380 Y=53: GOSUB 1750
1390 GOSUB 1710: ON Z GOTO 1550,
1530,950,1460
1400 Y=54: GOSUB 1750
1410 GOSUB 1710: ON Z GOTO 1500,
590,1440,1480
1420 Y=55: GOSUB 1750
1430 GOSUB 1710: ON Z GOTO 1550,
1500,1590,1590
1440 Y=56: GOSUB 1750
1450 GOSUB 1710: ON Z GOTO 1400,
1590,1590,1590
1460 Y=57: GOSUB 1750

```

```

1470 GOSUB 1710: ON Z GOTO 1550,
1380,650,1500
1480 Y=58: GOSUB 1750
1490 GOSUB 1710: ON Z GOTO 1500,
1400,1440,1420
1500 Y=59: GOSUB 1750
1510 PRINT "CHARLES BOULANGER'S
GAME HOCKEY ONE-ON-ONE IS PLAYED
BY EVERYONE IN THESE PARTS."
1520 GOSUB 1710: ON Z GOTO 1550,
1460,910,1420
1530 Y=60: GOSUB 1750
1540 GOSUB 1710: ON Z GOTO 1550,
1330,740,1380
1550 Y=61: GOSUB 1750: V=11: GOS
UB 1800
1560 GOSUB 1710: ON Z GOTO 1690,
1570,1330,1590
1570 Y=62: GOSUB 1750
1580 GOSUB 1710: ON Z GOTO 1690,
220,1360,1550
1590 Y=63: GOSUB 1750
1600 PRINT: PRINT "YOU DRIFT ARO
UND THE OCEAN AND FIND LAND AGA
IN."
1610 GOSUB 1760: Z=RND(6): ON Z
GOTO 390,410,930,370,590,1440
1620 Y=64: GOSUB 1750
1630 IF K$=V$(15) THEN 440
1640 PRINT "YOU MANAGE TO SWIM A
SHORE LOOK- ING LIKE A PRUNE.":
GOSUB 1760: Z=RND(5): ON Z GOTO
300,1020,1250,1360,220
1650 Y=65: GOSUB 1750
1660 PRINT "THE WATER IS WARM.":
PRINT "YOU FIND SHORE AGAIN.":
GOSUB 1760: Z=RND(3): ON Z GOTO
1170,570,390
1670 Y=66: GOSUB 1750
1680 PRINT "YOU HAVE A GREAT VIS
IT WITH FRIENDS. THEN BACK T
O WORK.": GOSUB 1760: Z=RND(4):
ON Z GOTO 300,250,890,1170
1690 Y=67: GOSUB 1750
1700 PRINT: PRINT "B";: FOR T=1
TO 47: PRINT "-R";: FOR G=1 TO 1
0: NEXT G: NEXT: PRINT: PRINT "Y
OU'RE FOUND IN A BLOCK OF ICE, T
HAWED AND SENT ON YOUR WAY.": GO
SUB 1760: Z=RND(3): ON Z GOTO 22
0,1570,1550
1710 PRINT: PRINT "WHERE NOW?"
1720 D$=INKEY$: IF D$<>"N" AND D
$<>"W" AND D$<>"S" AND D$<>"E" T
HEN 1720
1730 IF D$="N" THEN Z=1 ELSE IF
D$="W" THEN Z=2 ELSE IF D$="S" T
HEN Z=3 ELSE IF D$="E" THEN Z=4
1740 D$="": RETURN
1750 CLS: PRINT B$;A$(Y): Z=0: I
F Y<>64 THEN GOSUB 1860: RETURN

```

```

ELSE RETURN
1760 FOR T=1 TO 3000: NEXT: RETU
RN
1770 FOR A=1 TO 15: FOR B=1 TO L
EN(V$(A))
1780 J$=CHR$(ASC(MID$(V$(A),B,1)
)+3): IF J$="#" THEN J$=CHR$(32)
1790 W$(A)=W$(A)+J$: NEXT B: V$(
A)=W$(A): NEXT A: WE=-2: RETURN
1800 IF V$(V-1)="" THEN RETURN E
LSE P$="IF YOU HAVE "+V$(V-1)+",
YOU MAY TRADE FOR "+V$(V)+".
1810 IF K$<>V$(V-1) THEN P$=P$+
" BUT YOU DON'T HAVE IT." ELSE K$
=V$(V): P$=P$+" AND YOU DO."
1820 PRINT
1830 G=0: FOR Q=1 TO LEN(P$): Z$
=MID$(P$,Q,1): PRINT Z$;: FOR T=
1 TO 10: NEXT T: G=G+1: IF G>25
AND Z$=CHR$(32) THEN PRINT: G=0
1840 NEXT Q: IF RIGHT$(P$,7)=""YO
U DO." THEN V$(V-1)=""
1850 RETURN
1860 PRINT: V=RND(10): IF V>1 TH
EN RETURN ELSE PRINT LEFT$(E$,12
)":V=RND(10)
1870 ON V GOTO 1880,1890,1910,19
20,1930,1940,1950,1960,1970,1980
1880 PRINT "NYAH, NYAH, NYAH": G
OTO 1990
1890 PRINT "HOW ARE YA DOING?":
GOTO 1990
1900 PRINT "YOU'LL NEVER FIND ME
!": GOTO 1990
1910 PRINT "IS IT SNOWING THERE?
": GOTO 1990
1920 PRINT "OH, YOU'RE SO TALENT
ED!": GOTO 1990
1930 PRINT "TRY TRY AGAIN...": G
OTO 1990
1940 PRINT "ARE YOU CONFUSED?":
GOTO 1990
1950 PRINT "HAVEN'T YOU BEEN HER
E BEFORE?": GOTO 1990
1960 PRINT "YOU CANNOT FIND ME!"
: GOTO 1990
1970 PRINT "I AM SO CLEVER AND Y
OU AREN'T.": GOTO 1990
1980 PRINT "FACE IT. I'M FAR SUP
ERIOR."
1990 FOR T=1 TO 1000: NEXT T: FO
R T=64 TO 128: PRINT @ T,CHR$(32
);: FOR G=1 TO 10: NEXT G,T: PRI
NT @ 64,"";: RETURN
2000 N$="!FRYEEGYGFOMJROHECGS BR
EEYVBELWICF WUKOBYW,QNIIJWB XUIO
LYQ B.XNFIZAWGFAJ TDWELLNI[OJFY
OSNERSGRJUDCE IHWOM"
2010 FOR X=LEN(N$)-1 TO 1 STEP W
E: PRINT MID$(N$,X,1);: NEXT
2020 END

```

VIPTM

Library

ANNOUNCING The VIP LibraryTM With a Terrific Sale!

Nelson Software Systems is now Softlaw Corporation, under new management. Our Super "Color" Library programs have also undergone a name change. All programs are the same unbeatable Super "Color" Library programs you've heard so much about, but with new VIP names. To introduce our **VIP Library** we are having a special sale on the following pages. Our low prices for such high quality can't be beat so get started today!

'Diamonds in the mud puddle of Color Computer software!'

The Library Concept

State of the Art, Quality, Integrity, Compatibility and Affordability. Five things good software must possess. Five things that epitomize the **VIP LibraryTM**. Each program is the diamond of its class, true excellence. These programs are first in features, first in power, first in memory, and all are affordably priced.

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All **Library** programs are written in machine code specifically for the Color Computer, to work without the interference of a separate operating system such as FLEX. From this comes speed and more workspace for you. **Library** programs work perfectly with every Color Computer, from 16 to 64K. The most advanced hardware and software techniques are used to place programs in rompak cartridges for instant loading and total workspace with any Color Computer.

Perfection With 16, 32 or 64K

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 LibraryTM** 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!

Lowercase Displays

State-of-the-Art graphics allow instant use of four display colors, and eight lowercase displays featuring descending lowercase letters. You can select from 51, 64 or 85 columns by 21 or 24 lines per screen, with wide or narrow characters in the 64 display. These screens provide a pleasant and relaxing way to perform your tasks, with as much text on the

"... PICTURE getting your instantaneous investment report over the phone, using it in your spreadsheet calculation, generating a report, and writing a memo including that report and data from your database with your word processor, and all this with VIP LibraryTM programs..."

screen as is possible. Each program is easy to learn and a joy to use. We take pride in the stringent testing done to make these programs perform flawlessly. Every feature, every convenience, sleek, simple and elegant.

Total Compatibility

All **Library** programs are compatible. Transfer and use of files between programs is easy and carefree. What's better, when you have learned one program the others will come easy. And every program is the best of its kind available.

The Library Programs

For your writing needs is the **VIP WriterTM**, and its spelling checker, the **VIP SpellerTM**. For financial planning and mathematical calculations you can use the **VIP CalcTM**. To manage your information and send multiple mailings there is the **VIP DatabaseTM**. For sending all these files to and from home or the office and for talking to your friends you can have the **VIP TerminalTM**. Finally, to fix disks to keep all your **Library** files in good repair we offer the **VIP Disk-ZAPTM**.

Mini Disk Operating System

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.

Professionalism

The **Library** comes handsomely bound in gold-embossed, padded leatherette binders to grace your work area with the professionalism it deserves. Welcome the **VIP LibraryTM** into your home and office.

A description of each of the **Library** programs, with the special sale price, is contained in the following pages. Please indulge!

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VIP Writer™

(Formerly Super "Color" Writer II)

By Tim Nelson

**RATED TOPS IN RAINBOW, HOT COCO,
COLOR COMPUTER MAGAZINE AND BASIC COMPUTING**
The Official Dragon Microcomputer Word Processor†

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.

The result of two years of research, the VIP Writer™ offers every feature you could desire from a word processor. It is the most powerful, fastest, most dependable and most versatile. With the display, workspace and compatibility features built into the Library the Writer is also the most usable.

"... Nearly every feature and option possible to implement on the Color Computer. The design of the program is excellent; the programming is flawless... Features for the professional, yet it is easy enough for newcomers to master... Certainly one of the best word processors available for any computer..." October 1983 "Rainbow"

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 continuous printing.

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 61K of workspace with the rompak version and 50K with the disk version.
- **TRUE FORMAT WINDOW** to EXACTLY replicate the printed page ON THE SCREEN BEFORE PRINTING, showing centered line headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
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- The ability to control ANY PRINTER, using dynamic text formatting with 27 comprehensive format parameters.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typamatic key repeat and key beep for the pros, ERROR DETECTION and UNDO MISTAKE features, 3 PROGRAM-MABLE functions, auto phrase insert, column creation, an instant HELP TABLE, and a 110 page, fully indexed tutorial.

16K ROMPAK \$59.95

32K DISK \$59.95

†Sold as the Dragon Writer™ ONLY by Dragon Data Ltd. and its distributors.

VIP Speller™

(Formerly Super "Color" Speller)

THE WRITER'S ESSENTIAL COMPANION

Spelling checkers are an invaluable aid to every writer. Habitual misspellings and typos can be found without the eyestrain, boredom and fatigue associated with endless proofreading. The VIP Speller™ is a fast, machine-code proofreading program to correct any VIP Library™ or other ASCII file. It automatically proofreads your documents against a 20,000 word stock dictionary, plus your own customized dictionary and corrects typos or marks them for special attention.

DISK ONLY \$49.95

Lowercase displays not available with this program.

VIP™

Library

VIP Calc™

(Formerly Super "Color" Calc)

TRUE VISICALC™ POWER!

By Kevin Herrboldt

- **UP TO 5 TIMES THE SCREEN DISPLAY AREA OF OTHER SPREADSHEETS!**
- **STATE OF THE ART LOWERCASE DISPLAYS**
- **MEMORY SENSE WITH BANK SWITCHING FOR UP TO 61K in 64K!**
- **ROMPAK CARTRIDGE FOR TOTAL WORKSPACE**
- **EXCLUSIVE VIDEO DISPLAY WINDOWS — EVEN UP TO 16!**
- **USER-DEFINABLE WORKSHEET — UP TO 512 COLUMNS BY 1024 ROWS**
- **WORKS WITH ANY PRINTER, EVEN LETTER QUALITY!**
- **LOCATE COMMAND TO FIND SPECIFIC NUMBERS, LABELS OR FORMULAS**
- **16 DIGIT PRECISION FOR THOSE SPECIAL SCIENTIFIC USES**
- **ALMOST UNLIMITED PROGRAMMABLE FUNCTIONS**

VIP Calc™ is truly the finest and easily the most powerful electronic worksheet and financial modeling program available for the Color Computer, from 16 to 64K. Now every Color Computer owner has access to a calculating and planning tool better than VisiCalc™, containing all its features and commands and then some. WITH USABLE DISPLAYS. Use Visicalc templates with VIP Calc™!

There's nothing left out of VIP Calc™. Every feature you've come to rely on with VisiCalc™ is there, and then some. You get up to **5 TIMES** the screen display area of other spreadsheets for the Color Computer and Memory-Sense with **BANK SWITCHING** to give not just 24, or 30, but **UP TO 61K OF WORKSPACE IN 64K!!!** This display and memory allow you the FULL SIZE, USABLE WORK-SHEETS you require. You also get: User definable worksheet size, up to 512 columns by 1024 rows! * Up to **SIXTEEN VIDEO DISPLAY WINDOWS** to compare and contrast results of changes * **16 DIGIT PRECISION** * Sine, Cosine and other trigonometric functions, Averaging, Exponents, Algebraic functions, and **BASE 2, 8, 10 or 16** entry * Multi-layered Column and Row, Ascending and Descending **SORTS** for comparison of results * **LOCATE FORMULAS OR TITLES IN CELLS** * Easy entry, replication and block moving of frames * Global or Local column width control up to 81 characters width per cell * Create titles of up to 255 characters per cell * Limitless programmable functions * Typamatic Key Repeat * Key Beep * Typeahead * Print up to 255 column worksheet * Prints at any baud rate from 110 to 9600 * Print formats savable along with worksheet * Enter **PRINTER CONTROL CODES** for customized printing with letter quality or dot matrix printer * Combine spreadsheet tables with **VIP Writer™** documents to create ledgers, projections, statistical and financial reports and budgets.

Both versions feature Tape save and load, but the disk version also has the Mini Disk Operating System of the entire Library.

16K ROMPAK \$59.95

32K DISK \$59.95

NEW SALE PRICES!

- **Nine Display Formats: 32 by 16**
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- **Memory Sense - Bank Switching**
- **Up to 51K Disk, 61K Rompak**
- **Mini Disk Operating System**
- **Compatible With All Printers**

A SPECIAL OFFER ON THE WHOLE LIBRARY —

The entire Library, all six great disk programs, can be purchased for only **\$300!**

VIP Terminal™

(Formerly Super "Color" Terminal)

THE FINEST TERMINAL PROGRAM ANYWHERE!

By Dan Nelson

From your home or office you can join the communication revolution. The **VIP Terminal™** opens the world to you. You can monitor your investments with the Dow Jones Information Service, or broaden your horizons with The Source or Compuserve, bulletin boards, other computers, even the mainframe at work.

Picture getting your instantaneous investment report, incorporating it in your spreadsheet calculation, generating a report, and writing a memo incorporating that report and data from your database, all with **Library** programs. Then you can transmit the report to work, or wherever, long distance. The **VIP Terminal™** will become the hub of your **Library**.

FEATURES: Memory-Sense with BANK SWITCHING for full use of workspace, from 16 to 64K * Selectively print data at baud rates from 110 to 9600 * Full 128 character ASCII keyboard * Automatic graphic mode * Word mode (word wrap) for unbroken words * Send and receive **Library** files, Machine Language & BASIC programs * Set communications baud rate from 110 to 9600, Duplex: Half/Full/Echo, Word length: 7 or 8, Parity: Odd/Even or None, Stop Bits: 1-9 * Local linefeeds to screen * Save and load ASCII files, Machine Code & BASIC programs * Lowercase masking * 10 Keystroke Multiplier (MACRO) buffers to perform repetitive pre-entry log-on tasks and send short messages * Programmable prompt or delay for send next line * Selectable character trapping * Send up to ten short messages (KSMs), each up to 255 characters long, automatically, to save money when calling long distance.

All versions allow tape load and save of files and KSMs, but the disk version also has the Mini Disk Operating System common to the **Library**.

16K ROMPAK \$49.95

16K DISK \$49.95

Disk version requires 32K for lowercase displays.

SoftLaw

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**AUTHOR'S SUBMISSIONS
ARE ENCOURAGED.**

VIP Database™

(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.

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design, each divided into up to 255 fields. Each field will hold up to 255 characters. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. You may also combine files, sort and print mailing lists, print "boiler plate" documents, automatically insert text in standardized forms, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Up to five different print formats are available, and control codes may be imbedded for use with all printers.

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

32K DISK \$59.95

VIP Disk-ZAP™

(Formerly Super "Color" Disk-ZAP)

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

Your database file disk, form letter disk, or BASIC program disk goes bad. An I/O error stops loading, or even backing up of the disk. Weeks, even months of work sit on the disk, irretrievable. Now catastrophic disk errors are repairable, quickly and with confidence, using the **VIP Disk-ZAP™**. It is the ultimate repair utility for simple and quick repair of all disk errors. Designed with the non-programmer in mind, the **VIP Disk-ZAP™** will let you retrieve all types of bashed files, BASIC and Machine Code programs.

This high-speed machine code disk utility has a special dual cursor screen display to look at the data on your disk. You are able to: Verify or modify disk sectors at will * Type right onto the disk to change unwanted program names or prompts * Send sector contents to the printer * Search the entire disk for any grouping of characters * Copy sectors * Backup tracks or entire disks * Repair directory tracks and smashed disks * Full prompting to help you every step of the way * 50-plus page Operators Manual which teaches disk structure and repair.

16K DISK \$49.95

Lowercase displays not available with this program.



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All Disk Programs are also available on 3" Diskettes for the Amdek Color AMDISK-III Micro-Floppy Disk System for an additional \$3.00 each.

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BY CHARLES LEVINSKI

DRAGRACE

You pull out onto the track from the staging lanes, with several cars ahead of you. The sound of roaring engines reverberates through your helmet as cars pair up and launch down the quarter mile. Your adrenaline flows as you near the starting line.

Finally, it's your turn. You advance inch by inch, tripping first the prestage and then the staging light. You are in position. The starter presses the button, and the yellow lights flicker down the "Christmas tree." As they near the green light, you rev your engine and prepare to take off.

The instant you see green, you pop the clutch and are thrown back in your seat. As the engine approaches its red line, you slam the shifter into second, then third, and finally fourth gear. All you can do now is keep your foot on the gas and hold your breath, as the finish line moves closer and closer.

Suddenly, you cross the line and it's all over. You brake gradually and pull over to the time shack to get your ticket. You won! And look at that time! Now it's back to the pits, a

All the speed and fun of professional drag racing can be yours with this Dragrace game for CoCos.

minor adjustment, and then the long wait until they call your class for yet another run.

Such is the excitement of drag racing, a sport that pits you and your car against an opponent and the clock. It is just this excitement that I've captured in a simulation for the TRS-80 Color Computer called Dragrace.

In drag racing the cars are built to run down a straight, smooth, flat track exactly ¼ mile long. The key is acceleration, and to that end cars have high-numeric ratio differentials, or rear ends, along with very high-horsepower engines. The mechanics are relatively simple.

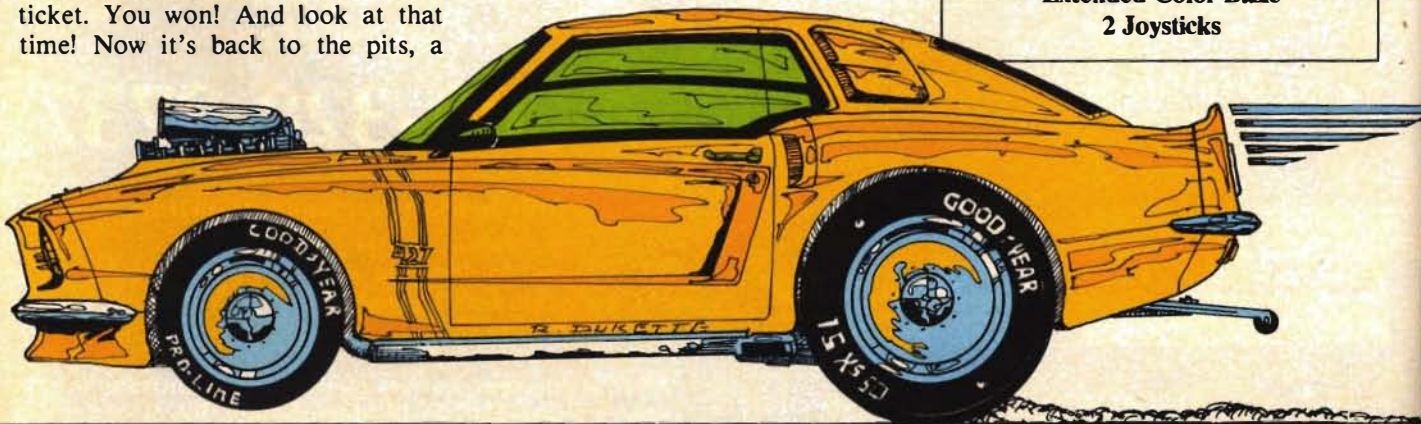
You position your car on the start-

ing line, a process referred to as staging. When you and your opponent are in position, the starter activates the Christmas tree. The Christmas tree is a vertical pole approximately 8 feet high containing a number of lights. At the top are the prestage and stage lights, which aid you in positioning your car exactly on the starting line. Below these are the larger timing lights. There are a number of yellow lights, one above the other, that light in sequence, from top to bottom.

When these are all lit, the green light comes on signaling "go." Timing the clutch release is important since it is essential that your car moves just as the green light comes on. There is, of course, some lag time between releasing the clutch and movement of the car, so leading the green light is important. If you attempt to start too

System Requirements

32K RAM
(16K with changes)
Extended Color Basic
2 Joysticks



```

1 GOTO19
2 CLS
3 TIMER=0:DI=0:REAR=4.56:VEL=0:G
EAR=0:K1=.4:V2=0
4 T1=TIMER
5 K=0:A=JOYSTK(0):B=JOYSTK(1):C=
JOYSTK(3):IFPEEK(65280)=126ORPEE
K(65280)=254THENK=.4
6 IFK=.4THEN12
7 PMODE3,5:SCREEN1,0:COLOR2,4
8 IFVEL>80THENIFLN=0THENDRAWB$(1
):LN=1ELSEDRAWB$(0):LN=0
9 IFA<20ANDB<20THENK=.179ELSEIFA
<20ANDB>35THENK=.137ELSEIFA>35AN
DB<20THENK=.095ELSEIFA>35ANDB>35
THENK=.074ELSEGOTO38
10 IFK<>K1 THENRPM=RPM*K/K1
11 K1=K
12 IFT1/60<1THENIFK<>.4ANDK<>.17
9THEN40
13 IFK<.2THENGEAR=K*19ELSEGEAR=0
14 TH=(64-C)*140+1000:RPM=INT(RP
M+K*(TH-RPM))
15 IFRPM>9500THEN39ELSEIFRPM<700
THEN40ELSET2=TIMER:IFGEAR=0THEN1
6ELSEVEL=INT(RPM/60/GEAR/REAR*9.
425)
16 LINE(0,148)-(221,148),PRESET:

```

```

LINE(0,148)-((10+RPM/45),148),PS
ET:LINE(0,170)-(255,170),PRESET:
LINE(0,170)-(VEL,170),PSET
17 IFK<>.4THENIFLN=0THENDRAWB$(1
):LN=1ELSEDRAWB$(0):LN=0
18 DI=INT(DI+VEL*(T2-T1)/60):IFD
I>=1320THEN41ELSET1=T2:GOTO5
19 PCLEAR8:PMODE3,1
20 PMODE3,1:COLOR1,3:PCLS:RPM=11
00
21 A$="BM0,80;M120,0;BM124,0;M24
1,124;M255,124;BM255,127;C4;M0,1
27;C2;"
22 B$(0)="BM122,0;M111,31;C3;M10
0,63;C2;M89,94;C3;M77,124;C2":B$
(1)="BM122,0;C3;M111,31;C2;M100,
63;C3;M89,94;C2;M77,124"
23 DRAWA$:DRAWB$(0)
24 PAINT(0,0),1,1:PAINT(255,0),.1
,1
25 PAINT(5,150),4,4
26 COLOR2,4:LINE(222,146)-(255,1
50),PSET,BF:COLOR1,3
27 DRAW"C4;BM0,127;M0,0;M255,0;M
255,127"
28 PCOPY1TO5:PCOPY2TO6:PCOPY3TO7
:PCOPY4TO8

```

Listing continued

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Color Computer 16K Ext. Basic

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early, however, the red light located beneath the green will come on, indicating you have fouled. From then on, it's a matter of shifting at the right engine speed to obtain maximum acceleration.

I have made some compromises in simulating a real drag race. In Dragrace, you race only against the clock. Dragrace omits the staging and pre-staging lights because staging takes no racing skill, and there is no steering system because this is among the easiest of tasks in a drag race.

Most of Dragrace is realistic. One joystick acts as the four-speed shifter, while the pushbutton on the joystick acts as the clutch. The other joystick contains the throttle. After you type RUN, there will be a time delay as the graphics are set up. The program will then display a car's-eye view of the dragstrip and Christmas tree.

To start the race, press S. After a short delay (to allow you to set the shifter to first gear, depress the clutch, and grasp the throttle), the top yellow light comes on, followed by the others in sequence. As soon as the first yellow comes on, a line appears on the screen that represents your tachom-

eter. The wider bar to the right is your red line, the engine speed at which your engine starts to come apart. Never let the tachometer reach the red line, whether in gear or not. the lower

*"Set the throttle,
depress the clutch,
and place the shifter
in first gear..."*

line is your speedometer, indicating your relative speed.

Set the throttle, depress the clutch, and place the shifter in first gear before pressing the S key. Failure to do so can cause some embarrassing moments as the lights start down the tree and the program registers that your clutch is engaged.

As the tachometer nears the red line, depress the clutch, shift, and release the clutch quickly. Just as with a real car, the engine RPMs pick up rapidly when the clutch is depressed. That can result in a blown engine so it's up to you to gauge when to shift.

Shifting too early results in long delays as acceleration is slow from very low RPM's. Shifting too late results in the engine overrevving while the clutch is depressed, causing the engine to blow.

Program Operation

Dragrace is only 42 lines long and fairly simple. It takes advantage of all the standard techniques of maximizing speed in Basic, such as placing the most frequently used routines in the beginning of the program, using sequential line numbers, and using multiline statements. You may wish to try using the high-speed POKE, but it has the disadvantage of making your car behave more like a dragster than a super stocker, the class I intended to portray.

Line 1 sends the program to the initialization routine. Line 2 clears the screen, while line 3 initializes some of the variables. I have left the rear-end ratio as a separate variable (REAR) so you can experiment with it. Standard ratios include 4.11, 4.88, and 5.12. Line 4 is part of the ET (elapsed time) timer. Line 5 samples the joysticks and the clutch button.

6809

DATABASE MANAGEMENT

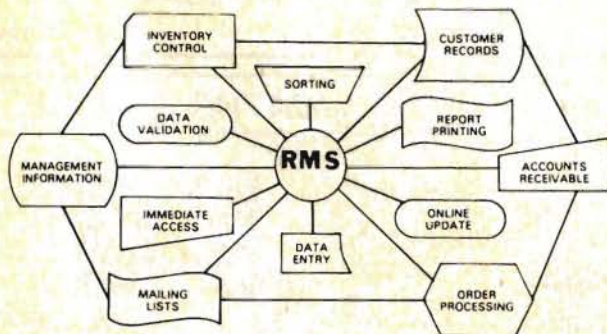
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The variable K determines the acceleration ratio and is a factor of what gear you're in. $K = .4$ means the clutch is depressed, while the numbers listed in line 9 determine the gear.

Line 6 routes the program around the acceleration and shifter sampling routines if the clutch is depressed. Line 7 changes screens when the clutch is released, while line 8 updates the line down the center of the dragstrip. Line 9 determines what gear you're in, and line 10 changes your engine RPM appropriately if you've shifted. Line 11 updates the current gear, while line 12 determines if you've stalled the engine by shifting too early after starting.

Line 13 updates the acceleration constant GEAR unless the clutch is depressed, in which case you are not accelerating. Line 14 calculates throttle setting and RPMs, and line 15 checks for RPMs outside the acceptable limits and updates the speed if the RPMs are okay.

Line 16 updates the tachometer and speedometer on the screen. Line 17 also draws a line down the track, as does line 8, but line 17 draws it continuously. Line 8 updates it only if the velocity is over 80 feet per second.

That way, the track seems to move faster as you accelerate. Line 18 updates the distance traveled and checks to see if you've crossed the finish line. If not, the program loops back to line 5.

Line 19 begins the initialization routines. It clears eight graphics pages

*“Switching pages causes
the Christmas tree
to disappear as
you drive by.”*

and selects PMODE 3. Line 20 initializes the RPMs for the period while the lights come down the Christmas tree, clears the graphics screens, and selects the foreground and background colors. Lines 21 and 22 set up some of the graphics, while lines 23-27 put it on the screen.

Line 28 copies the first four graphics pages to the last four. Line 29 then puts the Christmas tree into the picture on the last four pages.

Switching pages causes the Christmas tree to disappear as you drive by. Line 30 shows the display, and line 31 samples the S key until it is depressed.

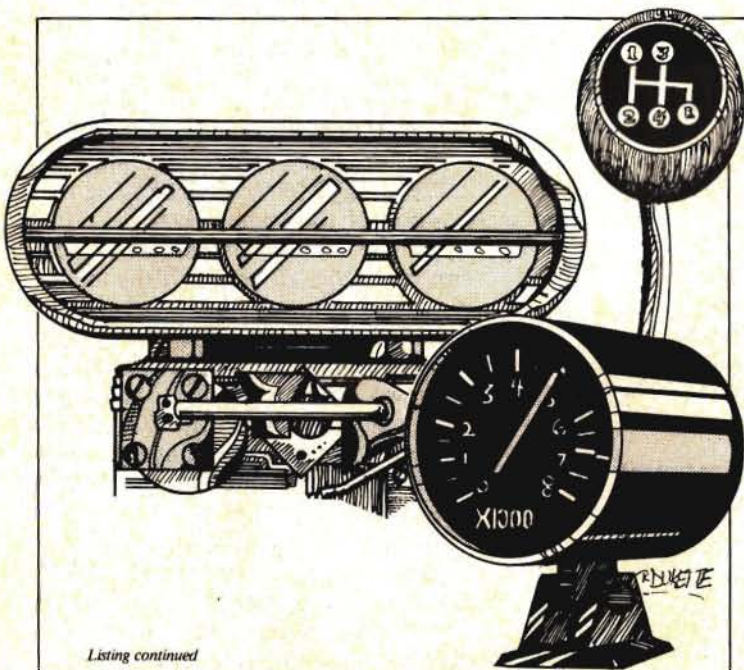
Line 32 reselects the foreground and background colors, while lines 33 and 34 cause the lights to come down the Christmas tree. Line 35 sends the Program to line 2 to begin actual driving, providing you haven't fouled. If you have, line 36 lights the red foul lights and transfers execution to line 42.

Line 37 is a joystick sampling subroutine used during the Christmas-tree-lighting routine. Finally, lines 38-42 are "race over" messages. Only line 41, which also calculates and displays final speed and ET, is desirable.

Running Dragrace

In order to run Dragrace, enter or load the program and type RUN. Be sure both joysticks are installed before beginning—happy racing! ■

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



Listing continued

```
29 DRAW"C2;BM65,111;M65,12;M72,1
2;M72,111;M65,111":PAINT(70,15),
2,2:FORY=16TO105STEP14:CIRCLE(56
,Y),6,2:CIRCLE(81,Y),6,2:PAINT(5
6,Y),3,2:PAINT(81,Y),3,2:NEXTY
30 SCREEN1,0
31 IFINKEY$<>"S"THEN31ELSEFORG=1
TO1000:NEXTG
32 COLOR2,4
```

```
33 FORI=18TO77STEP14:FORN=1TO4:P
AINT(58,I),2,2:PAINT(79,I),2,2:G
OSUB37:IFPEEK(65280)=255ORPEEK(6
5280)=127THEN36ELSENEXTN:NEXTI
34 FORN=1TO2:GOSUB37:NEXTN:PAINT
(58,88),1,2:PAINT(79,88),1,2
35 GOTO2
36 PAINT(58,102),4,2:PAINT(79,10
2),4,2:FORY=1TO500:NEXTI:GOTO42
37 A=JOYSTK(0):C=JOYSTK(3):TH=(6
4-C)*140+1000:RPM=INT(RPM+.4*(TH
-RPM)):IFRPM>9500THEN39ELSELINE(
0,148)-(221,148),PRESET:LINE(0,1
48)-(10+RPM/45),148),PSET:RETUR
N
38 CLS:PRINT"MISSED SHIFT-YOU BL
EW THE":PRINTTAB(10)"TRANSMISSIO
N":FORY=1TO1000:NEXTI:GOTO20
39 CLS:PRINT"OVERREV-BLOWN ENGIN
E":FORY=1TO1000:NEXTI:GOTO20
40 CLS:PRINT"RPM'S TOO LOW-ENGIN
E STALLED":FORY=1TO1000:NEXTI:GO
TO20
41 CLS:PRINT"YOU'VE CROSSED THE
FINISH LINE!":PRINT:PRINT:PRINTU
SING"ET-###.## SECONDS";INT(T2/6
0*100)/100:PRINTUSING"SPEED-###.
## MPH";INT(VEL*3600/5280):FORY=
1TO2000:NEXTI:GOTO20
42 CLS:PRINT"YOU'VE FOULED!!!!!!
":GOTO20
```

ANIMATION ACTION

One of the initial problems in game programming is that Basic programs run very slowly. Fortunately, you can speed them up by shortening the run time of the main program loop.

One method of doing this is to remove everything that is not necessary to the operation of the loop, right

Creating a Basic program with animated graphics is tedious unless you learn to speed up the process.

down to spaces between words. You can then move the excised portions of the operation forward and mask them with a menu or an instruction screen while you are drawing the game screen.

Another way to reduce execution time is to eliminate the erase time that is normally needed by getting enough background to cover the old image. See Fig. 1 as an example.

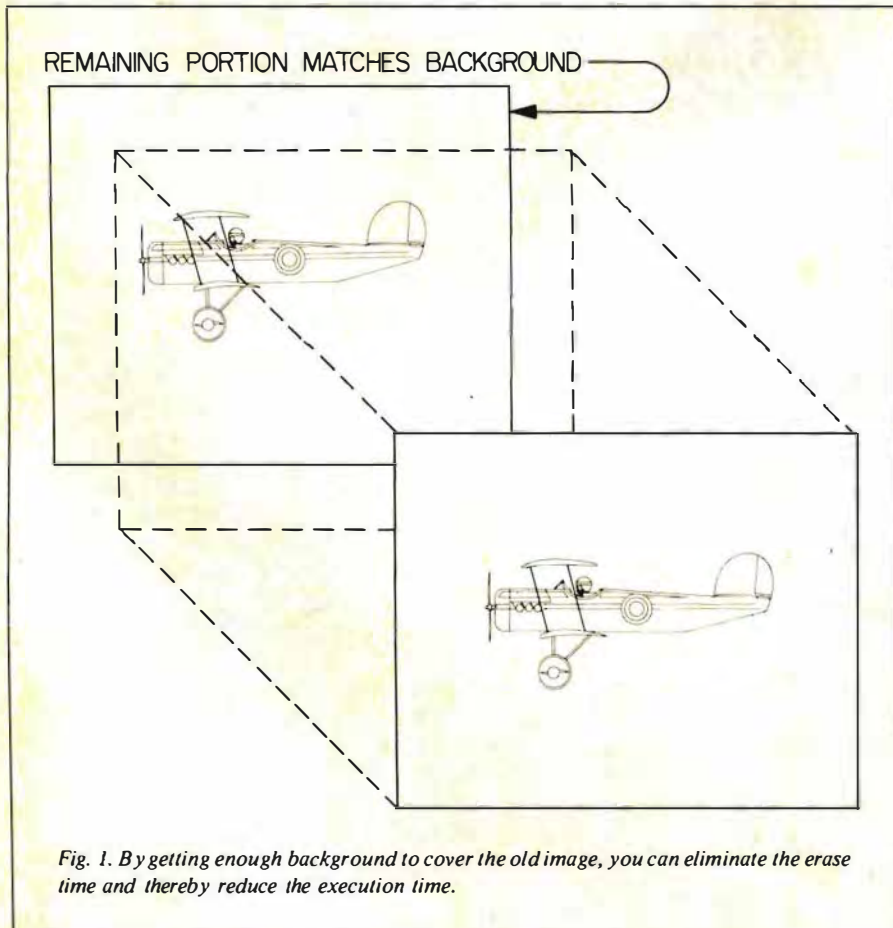


Fig. 1. By getting enough background to cover the old image, you can eliminate the erase time and thereby reduce the execution time.

CoCo Animation

My program, CoCo Animation, causes a ripple effect by changing the position of the image rectangle. This ripple is the price paid to avoid erasure of the old image. If the image is moving upward, then at the midpoint of the change, the new image covers the top half of the rectangle plus two lines, while the old image covers the bottom half of the rectangle. Therefore, the image you see appears to be two lines thicker, which results in the ripple effect.

When writing your own game program, use lines 60-90 of CoCo Animation to occupy the player while your program performs dimensioning, initialization, and drawing functions in lines 100-130. The player cannot enter this phase because he cannot

System Requirements

16K RAM

Extended Color Basic

get to the INKEY\$ code until these functions are completed.

Line 150 displays the completed graphics screen. Line 160, the first line of the main loop, reads the joystick input, while lines 170 and 200 act as limiters that keep the rectangle within the 0 to 255 boundaries. If the player is not confined to these bounds, the program crashes with an fc (illegal function) error.

Lines 180, 190, 210, and 220 are the switching routines. With the joystick centered, the switches are off. If the joystick registers over 40, the plane descends one line per loop. The advantage of this program is that if the joystick registers over 50, the plane descends three lines per loop. Ascent works the same way in lines 210 and 220, except that planes cannot rise as quickly as they can descend. There-

fore, the plane ascends one line per loop for 210 and one line, instead of two, for line 220.

Now that you know where the plane goes, you put it there with line 230. Line 240 is the escape, and line 250 restarts the loop. ■

Address correspondence to L.W. Gross, 394A San Bruno Ave., Brisbane, CA 94005.

```

50 CLS:PCLS:PCLEAR4
60 PRINT" THIS PROGRAM DEMONSTRATES ANI-"
70 PRINT" MATION USING GET-PUT COMMANDS."
80 PRINT @161,"PRESS 'B' TO BEGIN": PRINT@208,"DEMONSTRATION"
90 PRINT@288," PRESS 'E' TO END"
100 PMODE3,1:PCLS3:DIMA(0,25):HH=96
110 DRAW"C2BM128,96;NU4R8H4R6NR4F4NL6R10E6R4D4G4"
120 DRAW"M-18,+4L4G4E2F2G2H2U4L4ND4U6"

```

```

130 GET(128,87)-(163,110),A,G
140 A$=INKEY$:IFA$<>"B"GOTO140
150 SCREEN1,0
160 J=JOYSTK(0):H=JOYSTK(1)
170 IFHH>200THENHH=200
180 IFH>40THENHH=HH+1
190 IFH>50THENHH=HH+2
200 IFHH<16GOTO160
210 IFH<25THENHH=HH-1
220 IFH<15THENHH=HH-1
230 PUT(128,HH-9)-(163,HH+14),A,PSET
240 A$=INKEY$:IFA$="E"THENEND
250 GOTO160

```

Program Listing. CoCo Animation

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Telewriter-64 is feature packed. Besides the standard features

TELEWRITER-64

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Telewriter-64 runs on any 16K, 32K, or 64K system (extended Basic not required) and works with any printer. It has all of the control codes necessary to take full advantage of all of the features in any

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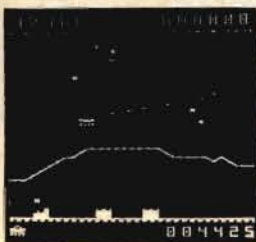
DONKEY KING

DONKEY KING

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



GHOST GOBLER



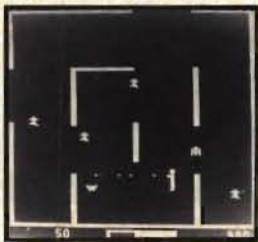
PROTECTORS

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



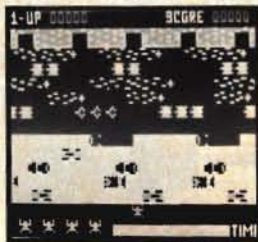
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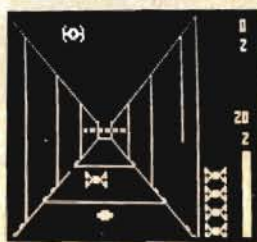
ANDROID ATTACK

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



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BY KARL ANDREASSEN

COLORFUL CRYPTOLOGY— PART III

I went browsing in the newsstands recently to see how many periodicals might carry cryptograms of one kind or another. I found six magazines devoted primarily to crossword puzzles, but each carried at least a few pages of cryptograms.

All these cryptic games were of the substitution type, similar to those appearing in the first and second articles of this series. Thus, they lend themselves nicely to solution with the help of Crypto Helper No. 1. (See *Colorful Cryptology—Part I*, Sept. 1983, p. 90.)

As I've said before, a good cipher must be easy for the intended recipient to decipher, but difficult for the eavesdropper. Use of a random alphabet almost always means that the intended receiver have a copy of the key with him, or have it readily available in some safe place.

An easily memorized pattern alphabet, or a system from which you can derive an alphabet, is more convenient, since you don't need a physical copy of the key.

There are some general

Now that you can hide your messages with a substitution alphabet, take a look at another method.

aspects of the cryptography that have almost become rules over the years. One of the most obvious is the need to keep your communications short.

You have to assume that your message, though addressed to Mr. B, will fall into the hands of Mr. C. Mr. C might be curious enough about your valuable coded message to attempt to

solve the cipher.

His work will be easier if your message is long. If you keep it short, yet send message after message using the same key, you make the codebreaker's work even easier.

You must realize that no matter how clever you might be in devising a secret cipher system, someone somewhere is clever enough to crack it. Your effort, then, must be to delay the unauthorized reading of your secret messages until it is too late to take advantage of the information.

BRDDM

ALHD

ZNDZM



System Requirements

4K RAM
Color Basic

SAGTYCF IYAAN UEUEASPRITDASPRIMROPR OSSLN

ILFS R HAGR N HAGD

HAGDHA OENREP OYNUEFETTUCO LWO LWTYAAETPRI
CEF CAAPAF CEQR H NO TLE DLI SLN H

EAGA SLN H IYTEQR SMSAPAH PRI HGUNLHIGEETN
LNUEFTO REP THAGDET

PCSE ISRWRTE EH NUEFTO H R N N HYO WNN DO
ETLERTTEQR SMETEADADAET

IYAAPR AKO TSOIEA ET IKITYEJAR NHSSLNTYCT
RWO ERGTCRHON NH LVTECKIT

Fig. 1. This Month's Cryptograms

EARLY CRYPTO MACHINES WERE RELATIVELY SIMPLE MECHANICAL
DEVICES WHEN ELECTRICITY BECAME COMMONPLACE MORE COMPLEX
ELECTROMECHANICAL DEVICES WERE DEVELOPED

THE CONCEPT OF COMPUTERS FOR CRYPTOLOGY MAY HAVE ORIGINATED
WITH CHARLES BABBAGE AND HIS DIFFERENCE ENGINE

DO COMPUTERS DREAM OF ELECTRONIC HUMAN PROGRAMMERS IN A WAY
NOT UNLIKE OUR DREAMS OF INTELLIGENT COMPUTERS

Fig. 2. Plaintext Originals of Last Month's Cryptograms

```
10 CLEAR 1000 : 'FILESPEC "CRYPTFUN"  
20 CLS : PRINT@ 10, "FUN WITH CRYPTO"  
30 PRINT@ 40, "@ by Karl Andreassen" : PRINT  
40 PRINT "CONCLUDE MESSAGE WITH A PERIOD <.>": PRINT  
50 PRINT: PRINT "BEGIN YOUR MESSAGE: " : PRINT  
60 Z$=INKEY$ : IF Z$="" THEN 60 'KEYBOARD INPUT  
70 IF Z$="." THEN PRINT: GOTO 100  
80 A$=A$+Z$ : IF LEN(A$)>200 THEN 100 'MESSAGE LENGTH LIMIT  
90 PRINT Z$; : GOTO 60  
100 FOR X=LEN(A$) TO 1 STEP-2 'COLLECT EVERY OTHER LETTER IN  
110 B$=B$+MID$(A$,X,1) : NEXT X 'INVERTED SEQUENCE  
120 FOR X=LEN(A$)+1 TO 1 STEP-2 'COLLECT EVERY MISSED LETTER  
130 C$=C$+MID$(A$,X,1) : NEXT X 'INVERTED SEQUENCE COLLECTION  
140 PRINT B$C$ : END 'COCATENATE INVERTED SEQUENCES
```

Program Listing. Cryptfun

This requires strategy in deciding how, about what, and for what purposes you write. You would be much more likely to spend time and effort cracking a cipher that you knew contained directions for locating hidden treasure, than you would one that you thought contained information of little value.

A locksmith spends many hours learning how locks are made, and how to open them without the key. Just as a locksmith must invest so much time perfecting his craft, so must you, as a cryptanalyst, face a similar challenge.

If you want to learn to read cryptic messages of all types, you will spend time on every cryptogram that comes your way. Of course, as your knowledge increases, you will become more selective about the types of messages on which you'll spend your time. But remember—one of the cryptographer's ploys is to make his most important message seem insignificant.

Cryptanalysis and Microcomputers

A computer terminal on a businessman's desk can save wondrous amounts of time and money. For ex-

ample, many business meetings can now be conducted via computer network, instead of gathering the executives together in person.

But then there's always the possibility that an interloper from a rival company will eavesdrop in on the network and thus gain valuable company secrets.

The computer has long ago proven itself as a peerlessly effective way to store vast amounts of data. But what about the agents who would steal this information, or distort it to mislead its owners? Cryptography has long been a sophisticated means of protecting such information.

Thus, as you become intrigued by the computer-age version of this ancient art, you can be sure that there is room in the field for an expert. Yet only rarely will you find an ad for a crypto expert in the help-wanted section of the daily paper; that's all part of the need for secrecy.

Instead, the ad reads, "Programmer Wanted." If your crypto capabilities quietly come to light during the interview, you might be exactly the person they're looking for. If so, and you're hired, it might be six months before you discover that it's your crypto background that got you the job, and your programming assignment takes on new flavor.

A Few Specifics

This month's program introduces you to the transposition cipher. Transposition methods by themselves are no more secure than the simple substitution cipher, yet they offer the beginner a challenge in analysis because of their difference in approach.

To create a ciphertext, you scramble the letters in a plaintext sentence so that they read backwards or in some order other than normal. Other methods include building horizontal columns of plaintext and picking off the ciphertext vertically. The Program Listing, Cryptfun, is a brief method of creating a transposition cipher from plaintext. Note how lines 130-170 construct the message. It assigns every other letter of the standard alphabet to alternate variables, collects the letters in reverse order, and then puts the two resulting strings together in sequence.

To see how the transposition takes place, enter the standard alphabet into the program instead of a plain-language message. The resultant output reveals the order in which plain-

language letters are rearranged.

The program accepts the spaces between words as letters and redistributes them, creating a misdirecting word arrangement in ciphertext. To see how this affects the order of letters, enter the standard alphabet with a space after every five or six letters.

To decipher a message from this program, count the letters in the message and mark the halfway point. Then rewrite the ciphertext, beginning at the midpoint and working backwards—and don't forget the spaces. If the message has an odd number of characters, divide the line after the odd character.

Then begin at the end of the second half of the ciphertext and type it backwards, directly underneath the first half. Look at the following transposed message and its solution as an example:

EE ETR EBSHTH E O DRHNTIWNE A
AWESUYO
D O E HTHSBE RTE EE
OYUSEWA A ENWITNHR

The message contains 37 characters (letters and spaces), and so you must divide it after the nineteenth letter.

“... Can you write
a program that will
decipher the cyphertext
produced by Cryptfun?”

Type both halves backwards, the second below the first. Now do you see the message? Read the two halves vertically, from top to bottom, and from left to right:

DO YOU SEE WHAT HAS BEEN WRITTEN
HERE

Now for a challenge: Can you write a program that will decipher the ciphertext produced by Cryptfun? If you can, send it in. I'll publish the first (determined by the earliest postmark) simple one in a future article and give you credit.

Figure 1 lists five cipher messages. Cryptfun produced all five, but I altered line 140 to create an alternative column pattern in the last two. You'll have to use the grey matter a bit more for those two than for the other three.

Some Additional Reading

The book, *Cryptanalysis for Microcomputers*, by Caxton C. Foster (Hayden Book Co.), contains quite a number of unsolved cryptograms. If you want to forge ahead of this series of articles and get into the more difficult aspects of cryptography, it is a book worth owning. Its programs are not directed to the CoCo, but you might adapt them, and the appendix lists many tables of frequently used letters and words—invaluable for cryptanalysis.

The Code Breakers, by David Kahn (MacMillan), gives a pretty thorough history of cryptography and a nice overview of different types of ciphers. *Cryptanalysis*, by Helen Fouche Gaines (Dover) is also worth reading.

If enough readers show interest in developing their cryptology skills, perhaps you will see more and more of my cryptic messages within *HOT CoCo's* pages.

As we progress to more difficult ciphers, watch for a contest. ■

Write to Karl Andreassen at 24750
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SYSTEMS SOFTWARE

MACRO-80C

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

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

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

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

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

SOFTWARE DEVELOPMENT SYSTEM

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

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

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

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

MICRO WORKS COLOR FORTH

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

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

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

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

MICROTEXT: COMMUNICATIONS VIA YOUR MODEM!

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

The Microtext module is a program pack containing not only firmware but a second serial port so that both your printer and modem can be connected at the same time. Microtext can be configured for any serial printer that will work with the Color Computer, even if it requires line feeds! But even if you don't have a printer, you can keep a permanent copy of your data by storing to cassette tape. Also, any Radio Shack/Centronics-compatible parallel printer may be used by adding the Micro Works' P180C parallel interface.

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

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

MACHINE LANGUAGE

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

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

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

BOOKS

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

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

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

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

GAMES

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

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

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

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HARDWARE

PARALLEL PRINTER INTERFACE — Serial to parallel converter allows use of all standard parallel printers. P180C plugs into the serial output port, leaving your Rompack slot free. You supply the printer cable. **P180C Price: \$69.95**

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

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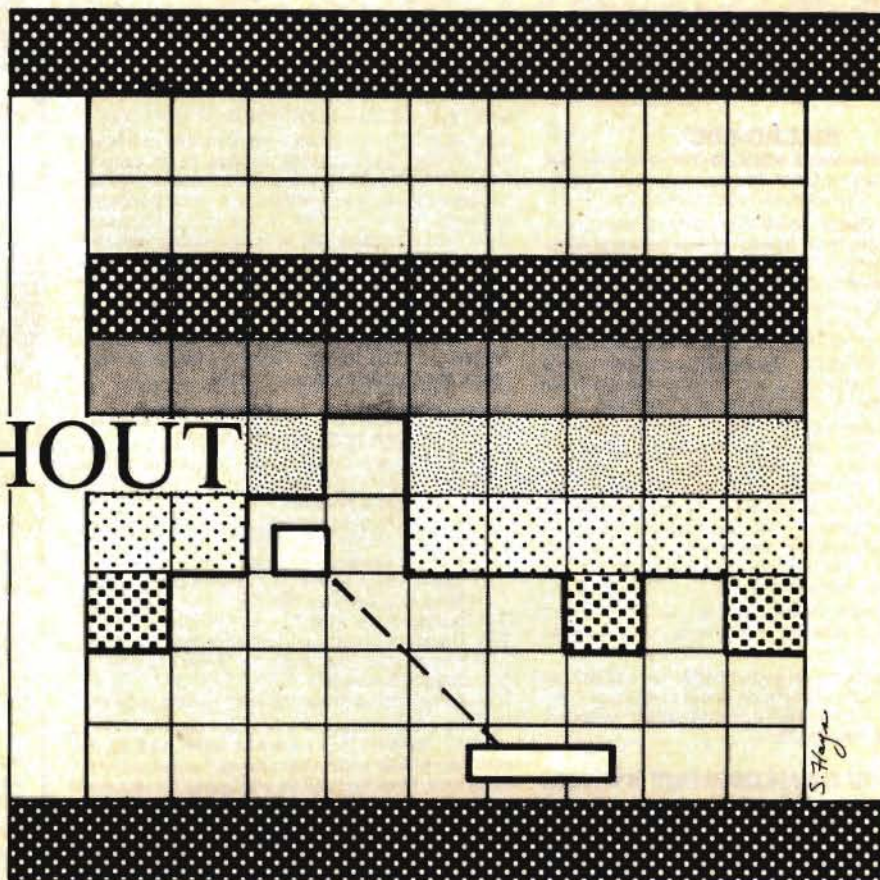
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SMASHOUT



Just about everyone loves to play arcade games. This Program Listing presents a machine-language version of one of the most popular arcade games ever devised. I call my program Smashout and if you can't guess which arcade game this program is fashioned after, you'll just have to assemble the pro-

Do you love arcade games? Smashout gives you the challenge of tumbling these multicolored walls.

gram and see if the display is familiar.

Assembling the Program

You can easily assemble the program with an editor/assembler. Simply type the program in as it appears in the listing. Once you have checked the program for typos, you can make a few copies of the object code. Before you try the game, make copies of the source code. This will take a little extra time, but the copies will be a lifesaver if you've missed any errors.

A detailed explanation of the program's operation is unnecessary. I have, however, included sufficient comments

\$A92A—DISPLAY B IN ALL VIDEO LOCATIONS

This routine will display the character in register B in all video locations.

\$A9DE—SCAN THE JOYSTICKS

This routine will scan the joysticks and return with the following values:

- Memory location \$015A will hold the JOYSTK0 value.
- Memory location \$015B will hold the JOYSTK1 value.
- Memory location \$015C will hold the JOYSTK2 value.
- Memory location \$015D will hold the JOYSTK3 value.

Table 1. The ROM Routines

System Requirements

16K RAM
Editor/Assembler

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Quest is also available on TRS-80C as a 32K extra memory, extra fun adventure. It's a little more difficult and will test the most experienced explorer of the kingdom.

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in the listing to clarify program operation. In addition, Table 1 presents explanations for the ROM routines that the program uses.

Playing the Game

The object of Smashout is to destroy as many of the multicolored walls as possible. Each wall is composed of eight rows of 12 blocks. A wall is destroyed by removing one block at a time. Each time the ball makes contact with a wall, it removes a block, scoring a point. The blocks in each row are worth the following points:

- Row 1—1 point each. (Bottommost row.)
- Row 2—1 point each.
- Row 3—3 points each.
- Row 4—3 points each.
- Row 5—5 points each.
- Row 6—5 points each.
- Row 7—7 points each.
- Row 8—7 points each. (Topmost row.)

Each wall is worth 384 points. Smashout allows an unlimited number of walls per game, but the score counter will roll over at 9,999 points.

There are five balls per game. To put a ball into play, press the fire button on

the right joystick. Keep the ball in play by bouncing it off the paddle, moving it right and left with the right joystick. The first time a ball hits a block in rows 5-8, its speed will double. Start the game over at any time by pressing the reset button on the back of the computer.

Readers who wish to see a cavity or progressive version of Smashout can

contact me personally. I'll try to develop a more advanced version if there is enough interest. I hope you enjoy playing Smashout as much as I enjoyed writing it. ■

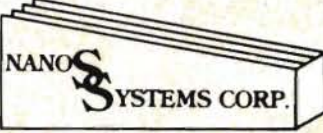
Address correspondence to Mark D. Goodwin, Star Route 79, Box 103, Orland, ME 04472.

Program Listing. Smashout

```

0001 0600
*
* Smashout V1.1
* Copyright 1983 Mark D. Goodwin
*
* ORG = $0600 for cassette.
* ORG = $1000 for disk.
*
0002 0600
*
* ORG $1000
*
* Major Game Loop
*
A0   BRA A0           Loop for game end.
STRT NOP             NOP for RESET.
      LDA #$55        A=RESET flag value.
      STA <*$71       Save it.
      LDX #STRT       X=RESET address.
      STX <*$72       Save it.
      CLI             Enable the IRQ.
      LDB #$90        B=Char to display.
      JSR $A92A       Display it.
  
```

Listing continued



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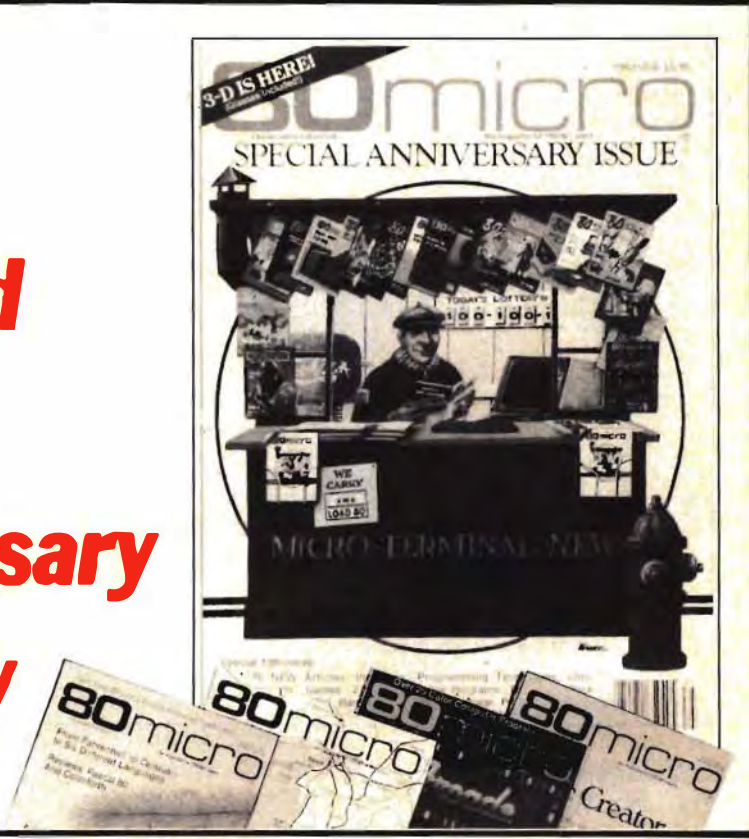




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Listing continued

```

0012 1013 17023B      LBSR DISP      Display wall.
0013 1016 CE05E2      LDU #*5E2      Point to bottom line.
0014 1019 BE131B      LDX #M3        Point to message.
0015 101C 1702C3      LBSR DISM      Display message.
0016 101F 9E8A        LDX <#00BA     Zero X.
0017 1021 BF12FA      STX SCORE      Save it as score.
0018 1024 B6FF        LDA #*FF       A=-1.
0019 1026 B712FC      STA BALLS      Save it as balls.
0020 1029 1702A5      LBSR BALDIS    Display balls.
0021 102C 17026E      LBSR SCODDIS   Display score.
0022 102F B614        LDA #20        A=Ball x-value.
0023 1031 B712EB      STA BX         Save it.
0024 1034 B6FE        LDA #-2        A=Ball x-direction.
0025 1036 B712ED      STA MXD        Save it.
0026 1039 2012        BRA D@         Jump.
0027 103B 73133B      B@ COM DEL1    Flag no paddle.
0028 103E 17013D      C@ LBSR FIGX    Update x-value.
0029 1041 811E        CMPA #30       Y-value = 30?
0030 1043 2708        BEQ D@         Jump if y-value = 30.
0031 1045 B712EC      STA BY         Save y-value.
0032 1048 17016C      LBSR SETB      Display ball.
0033 104B 20F1        BRA C@         Loop.
0034 104D 7F12F9      D@ CLR PS       Flag paddle update.
0035 1050 7F133B      CLR DEL1       Flag paddle.
0036 1053 B612FC      LDA BALLS      A=Balls.
0037 1056 8105        CMPA #5        Balls = 5?
0038 1058 27A6        BEQ A@         Jump if balls = 5.
0039 105A 1701BA      E@ LBSR PADDLE   Update paddle.
0040 105D B6FF00      LDA 652B0      A=PIA1 value.
0041 1060 8401        ANDA #1        Button pressed?
0042 1062 26F6        BNE E@         Loop if not.
0043 1064 CC8001      LDD #*8001     D=Sound values.
0044 1067 170145      LBSR SOUND     Do sound.
0045 106A 170264      LBSR BALDIS    Display # balls.
0046 106D B610        LDA #16        A=Ball y-value.
0047 106F B712EC      STA BY         Save it.
0048 1072 B690        LDA #*90       A=Last character.
0049 1074 B7133B      STA LAST       Save it.
0050 1077 7012ED      NEG MXD        Invert x-direction.
0051 107A B601        LDA #1         A=Y-direction.
0052 107C B712EE      STA MYD        Save it.
0053 107F B6FF        LDA #*FF       A=Delay value.
0054 1081 B7133A      STA DEL        Save it.
0055 1084 1700F7      F@ LBSR FIGX    Update x-value.
0056 1087 8104        CMPA #4        Y-value >= 4?
0057 1089 2408        BHS G@         Jump if y-value >= 4.
0058 108B B604        LDA #4         A=New y-value.
0059 108D 7012EE      NEG MYD        Invert y-direction.
0060 1090 170113      LBSR SO1       Do sound.
0061 1093 B712EC      STA BY         Save y-value.
0062 1096 811B        CMPA #27       Y-value < 27?
0063 1098 2530        BLO J@         Jump if Y-value < 27.
0064 109A B612EB      LDA BX         A=X-value.
0065 109D 4C          INCA          Bump x-value.
0066 109E B012F9      SUBA PS        Subtract paddle pos.
0067 10A1 8109        CMPA #9        Paddle hit?
0068 10A3 2296        BHI B@         Jump if paddle not hit.
0069 10A5 BE12EF      LDX #TABLE     Point to table.
0070 10AB E6B6        LDB A,X        B=New x-direction.
0071 10AA F712ED      STB MXD        Save it.
0072 10AD 7012EE      NEG MYD        Invert y-direction.
0073 10B0 CC9601      LDD #*9601     D=Sound value.
0074 10B3 1700F9      LBSR SOUND     Do sound.
0075 10B6 BE1344      LDX #BTAB      Point to table.
0076 10B9 C660        LDB #96        B=Number of blocks.

```

```

0077 10BB A680        H@ LDA ,X+       Block gone?
0078 10BD 2606        BNE I@         Jump if block not gone.
0079 10BF 5A          DECB          Decrement number of block.
0080 10C0 26F9        BNE H@         Loop till wall checked.
0081 10C2 17018C      LBSR DISP      Display new wall.
0082 10C5 1700EF      I@ LBSR SETB      Display ball.
0083 10C8 20BA        BRA F@         Loop.
0084 10CA B612EE      J@ LDA MYD      A=Y-direction.
0085 10CD 2A16        BPL L@         Jump if going down.
0086 10CF B612EC      LDA BY         A=Y-value.
0087 10D2 8111        CMPA #17       Y-value >= 17?
0088 10D4 102400A0     LBHS P@        Jump if y-value >= 17.
0089 10DB 8109        CMPA #9        Y-value < 9?
0090 10DA 25E9        BLO I@         Jump if y-value < 9.
0091 10DC F61339      LDB BFLAG      Destroy block?
0092 10DF 26E4        BNE I@         Jump if no destroy.
0093 10E1 8009        SUBA #9        A=Block row.
0094 10E3 2014        BRA M@         Jump.
0095 10E5 B612EC      L@ LDA BY         A=Y-value.
0096 10E8 8107        CMPA #7        Y-value < 7?
0097 10EA 102500BA     LBLO P@        Jump if y-value < 7.
0098 10EE 810F        CMPA #15       Y-value >= 15?
0099 10F0 24D3        BHS I@         Jump if y-value >= 15.
0100 10F2 F61339      LDB BFLAG      Destroy block?
0101 10F5 26CE        BNE I@         Jump if no destroy.
0102 10F7 8007        SUBA #7        A=Block row.
0103 10F9 C60C        M@ LDB #12       B=Row length.
0104 10FB 3D          MUL          B=Row offset.
0105 10FC E7E2        STB ,-S        Save row offset.
0106 10FE B612EB      LDA BX         A=X-value.
0107 1101 8008        SUBA #8        Figure block offset.
0108 1103 44          LSRA          Figure block offset.
0109 1104 4A          LSRA          Figure block offset.
0110 1105 ABE0        ADDA ,S+       A=Table offset.
0111 1107 BE1344      LDX #BTAB      Point to table.
0112 110A E686        LDB A,X        B=Block value.
0113 110C 27B7        BEQ I@         Jump if block gone.
0114 110E 6FB6        CLR A,X        Flag block gone.
0115 1110 4F          CLRA          D=Block value.
0116 1111 F312FA      ADDD SCORE     D=New score.
0117 1114 FD12FA      STD SCORE      Save it.
0118 1117 170183      LBSR SCODDIS   Display score.
0119 111A 8601        LDA #1         A=No destroy flag.
0120 111C B71339      STA BFLAG      Save it.
0121 111F F612EC      LDB BY         B=Y-value.
0122 1122 B612EE      LDA MYD        A=Y-direction.
0123 1125 2A02        BPL N@         Jump if going down.
0124 1127 5A          DECB          Decrement y-value.
0125 1128 21          FCB #21        Dummy BRN XX.
0126 1129 5C        N@ INCB          Bump y-value.
0127 112A 54          LSRB          B=Row value.
0128 112B 3401        PSHS CC        Save Carry.
0129 112D 8620        LDA #32        A=Row length.
0130 112F 3D          MUL          D=Row offset.
0131 1130 BE0400      LDX #*400     X=Start of video.
0132 1133 308B        LEAX D,X       X=Row location.
0133 1135 B612EB      LDA BX         A=X-value.
0134 1138 8008        SUBA #8        Figure column offset.
0135 113A 44          LSRA          Figure column offset.
0136 113B 44          LSRA          Figure column offset.
0137 113C 48          ASLA          Figure column offset.
0138 113D 8B04        ADDA #4        Figure column offset.
0139 113F 3086        LEAX A,X       X=Video memory loc.
0140 1141 C60C        LDB #*C        B=Bit mask.
0141 1143 3501        PULS CC        Row even or odd?

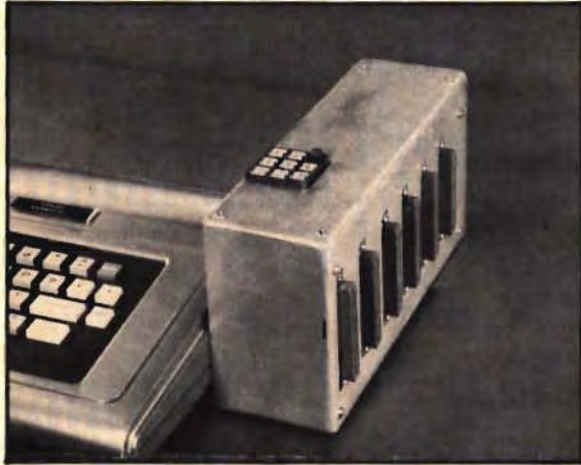
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Listing continued

```

0142 1145 2402      BCC Q@      Jump if even.
0143 1147 54        LSRB        Shift bit mask.
0144 1148 54        LSRB        Shift bit mask.
0145 1149 53        O@         COMB        Invert bit mask.
0146 114A 3404      PSHS B      Save bit mask.
0147 114C A6B4      LDA ,X      A=Video character.
0148 114E A4E4      ANDA ,S     Reset block.
0149 1150 A7B0      STA ,X+     Display character.
0150 1152 A6B4      LDA ,X      A=Video character.
0151 1154 A4E0      ANDA ,S+   Reset block.
0152 1156 A7B4      STA ,X      Display character.
0153 1158 7012EE    NEG MYD     Invert y-direction.
0154 115B B612EC    LDA BY     A=Y-value.
0155 115E 40        NEGA       A=Starting tone.
0156 115F 8B14      ADDA #20   A=Adjust tone.
0157 1161 C60A      LDB #10    B=Tone multiplier.
0158 1163 3D        MUL        B=Tone.
0159 1164 1F98      TFR B,A    A=Tone.
0160 1166 C601      LDB #1     B=Duration.
0161 1168 8D45      BSR SOUND  Do sound.
0162 116A B612EC    LDA BY     A=Y-value.
0163 116D 810C      CMFA #12   Y-value > 12?
0164 116F 220A      BHI Q@     Jump if y-value > 12.
0165 1171 86B0      LDA ##80   A=New delay value.
0166 1173 B7133A    STA DEL    Save it.
0167 1176 2003      BRA Q@     Jump.
0168 1178 7F1339    P@         CLR BFLAG  Flag destroy.
0169 117B 16FF47    Q@         LBRA I@    Loop.

```

```

*
* Update X-value Routine
*

```

```

0170 117E 8D34      FIGX      BSR RESB   Reset ball.
0171 1180 B612EB    LDA BX     A=X-value.
0172 1183 BB12ED    ADDA MXD   Figure new x-value.
0173 1186 8108      CMFA #8    X-value >= 8?
0174 1188 2407      BHS A@     Jump if x-value >= 8.
0175 118A 8608      LDA #8     A=New x-value.
0176 118C 7012ED    NEG MXD    Invert x-direction.
0177 118F 8D15      BSR S01    Do sound.
0178 1191 8136      A@         CMFA #54   X-value < 54?
0179 1193 2507      BLO B@     Jump if x-value < 54.
0180 1195 8636      LDA #54    A=New x-value.
0181 1197 7012ED    NEG MXD    Invert x-direction.
0182 119A 8D0A      BSR S01    Do sound.
0183 119C B712EB    B@         STA BX     Save new x-value.
0184 119F B612EC    LDA BY     A=Y-value.
0185 11A2 BB12EE    ADDA MYD   Figure new y-value.
0186 11A5 39        RTS        Return.
0187 11A6 3402      S01       PSHS A     Save A.
0188 11AB CCAF01    LDD ##AF01 D=Sound value.
0189 11AB 8D02      BSR SOUND  Do sound.
0190 11AD 3582      PULS A,FC  Get A & return.
0191 11AF 978C      SOUND     STA <#00BC Save tone.
0192 11B1 7EA951    JMP #A951  Do sound.

```

```

*
* Set and Reset Ball Routine
*

```

```

0193 11B4 86B0      RESB      LDA ##80   Set Sign flag.
0194 11B6 21        FCB #21    Dummy BRN XX.
0195 11B7 4F        SETB      CLRA     Clear Sign flag.
0196 11B8 3401      PSHS CC    Save Sign flag.
0197 11BA F612EC    LDB BY     B=Y-value.
0198 11BD 54        LSRB      B=Row value.
0199 11BE 8620      LDA #32    A=Row length.

```

```

0200 11C0 3D        MUL        D=Row offset.
0201 11C1 BE0400    LDX #400   X=Start of video.
0202 11C4 308B      LEAX D,X   X=Row location.
0203 11C6 B612EB    LDA BX     A=X-value.
0204 11C9 44        LSRB      Figure column offset.
0205 11CA 3086      LEAX A,X   X=Video location.
0206 11CC C60C      LDB #*C    B=Bit mask.
0207 11CE B612EC    LDA BY     A=Y-value.
0208 11D1 44        LSRB      Is it even or odd?
0209 11D2 2402      BCC A@     Jump if it's even.
0210 11D4 54        LSRB      Shift bit mask.
0211 11D5 54        LSRB      Shift bit mask.
0212 11D6 A6B4      A@         LDA ,X     A=Video character.
0213 11D8 3501      PULS CC    Reset ball?
0214 11DA 2B0D      BMI B@     Jump if reset ball.
0215 11DC B7133B    STA LAST   Save new last char.
0216 11DF 3404      PSHS B     Save bit mask.
0217 11E1 AAEO      ORA ,S+   Set the ball.
0218 11E3 A7B4      STA ,X     Display the ball.
0219 11E5 8606      LDA #6     A=Delay value.
0220 11E7 2007      BRA C@     Jump.
0221 11E9 B6133B    B@         LDA LAST   A=Last character.
0222 11EC A7B4      STA ,X     Display it.
0223 11EE 8602      LDA #2     A=Delay value.
0224 11F0 3402      PSHS A     Save delay value.
0225 11F2 B612ED    LDA MXD    A=X-direction.
0226 11F5 2A01      BPL D@     Jump if it's positive.
0227 11F7 40        NEGA       Make it positive.
0228 11F8 F6133A    D@         LDB DEL    B=Delay value.
0229 11FB 3D        MUL        Figure delay value.
0230 11FC 1F01      TFR D,X    X=Delay value.
0231 11FE 3504      PULS B     B=Delay counter.
0232 1200 B6133B    E@         LDA DEL1   Update paddle?
0233 1203 2606      BNE F@     Jump if no update.
0234 1205 3414      PSHS B,X   Save registers.
0235 1207 8D0E      BSR PADDLE Update paddle.
0236 1209 3514      PULS B,X   Save registers.
0237 120B 3410      F@         PSHS X     Save delay value.
0238 120D 301F      G@         LEAX -1,X  Dec delay value.
0239 120F 26FC      BNE G@     Loop till done.
0240 1211 3510      PULS X     Get delay value.
0241 1213 5A        DECB      Dec number of times.
0242 1214 26EA      BNE E@     Loop till done.
0243 1216 39        RTS        Return.

```

```

*
* Update Paddle Routine
*

```

```

0244 1217 BDA9DE    PADDLE    JSR #A9DE  Scan joystick.
0245 121A B6015A    LDA #15A   A=JOYSTK0.
0246 121D 8108      CMFA #8    Is paddle >= 8?
0247 121F 2402      BHS A@     Jump if paddle >= 8.
0248 1221 8608      LDA #8     A=Paddle position.
0249 1223 8130      CMPA #48   Is paddle < 48?
0250 1225 2502      BLO B@     Jump if paddle < 48.
0251 1227 8630      LDA #48    A=Paddle position.
0252 1229 B112F9    B@         CMFA PS    Same as last?
0253 122C 2722      BEQ E@     Jump if same as last.
0254 122E BE05C4    LDX #5C4   Point to paddle row.
0255 1231 E6B4      D@         LDB ,X     Get a character.
0256 1233 C4F0      ANDB ##F0  Reset the character.
0257 1235 E7B0      STB ,X+    Display new character.
0258 1237 BC05DC    CMPX #5DC  End of row?
0259 123A 26F5      BNE C@     Loop till end of row.
0260 123C B712F9    STA PS     Save paddle position.
0261 123F 44        LSRB      Figure column offset.

```

Listing continued


```

0262 1240 BE05C0      LDX ##5C0      Point to paddle row.
0263 1243 3086      LEAX A, X      X=Paddle location.
0264 1245 C604      LDB #4        B=Length of paddle.
0265 1247 A684      D@ LDA ,X      A=Video character.
0266 1249 BA0C      ORA ##C       Set the paddle.
0267 124B A780      STA ,X+       Display the character.
0268 124D 5A        DECB          Paddle done?
0269 124E 26F7      BNE D@       Loop till paddle done.
0270 1250 39        E@ RTS        Return.

*
* Display Wall Routine
*
0271 1251 BE0422      DISP LDX ##422    Point to row1.
0272 1254 B6CF      LDA ##CF      A=Display character.
0273 1256 A780      A@ STA ,X+       Display it.
0274 1258 BC043E      CMPX ##43E    Top of border done?
0275 125B 26F9      BNE A@       Loop till top done.
0276 125D BE0442      LDX ##442    Point to row2.
0277 1260 A784      B@ STA ,X        Display left border.
0278 1262 A701      STA 1,X      Display left border.
0279 1264 A78B1A      STA $1A,X    Display right border.
0280 1267 A78B1B      STA $1B,X    Display right border.
0281 126A 308B20      LEAX $2,X    Bump border pointer.
0282 126D BC05E0      CMPX ##5E0    Border done?
0283 1270 25EE      BLO B@       Loop till border done?
0284 1272 CE13A4      LDU #DTAB     Point to table.
0285 1275 AEC1      C@ LDX ,U++     X=Start of next row.
0286 1277 2708      BEQ E@       Jump if row = 0.
0287 1279 A6C0      LDA ,U+       A=Display character.
0288 127B C618      LDB #24      B=Length of row.
0289 127D A780      D@ STA ,X+       Display character.
0290 127F 5A        DECB          Row done?
0291 1280 26FB      BNE D@       Loop till row done.
0292 1282 20F1      BRA C@       Loop till wall done.
0293 1284 BE1344      E@ LDX #BTAB     Point to table.
0294 1287 B607      LDA #7        A=Block value.
0295 1289 B00A      BSR F@       Set two rows.
0296 128B B605      LDA #5        A=Block value.
0297 128D B006      BSR F@       Set two rows.
0298 128F B603      LDA #3        A=Block value.
0299 1291 B002      BSR F@       Set two rows.
0300 1293 B601      LDA #1        A=Block value.
0301 1295 C618      F@ LDB #24      B=Length of two rows.
0302 1297 A780      G@ STA ,X+       Save block value.
0303 1299 5A        DECB          Two rows done?
0304 129A 26FB      BNE G@       Loop till two rows done.
0305 129C 39        RTS        Return.

*
* Display Score and Balls
* Routines
*
0306 129D FC12FA      SCODIS LDD SCORE    D=Score.
0307 12A0 10B32710     CMFD #10000   Score < 10000?
0308 12A4 2506      BLO A@       Jump if score < 10000.
0309 12A6 B32710     SUBD #10000   Roll over score.
0310 12A9 FD12FA      STD SCORE     Save new score.
0311 12AC BE1316      A@ LDX #S1      Point to buffer.
0312 12AF CE133C      LDU #CONST    Point to constants.
0313 12B2 3402      B@ FSHS A      Save A.
0314 12B4 B62F      LDA ##2F      A=ASCII 0 - 1.
0315 12B6 A784      STA ,X        Save it in buffer.
0316 12B8 3502      PULS A        Get A.
0317 12BA 6C84      C@ INC ,X      Bump the digit.

```

```

0318 12BC A3C4      SUBD ,U       Subtract the constant.
0319 12BE 24FA      BCC C@       Loop if no carry.
0320 12C0 E3C1      ADDD ,U++     Add back constant.
0321 12C2 3001      LEAX 1,X     Bump buffer pointer.
0322 12C4 BC131A     CMFX #S1+4   Done?
0323 12C7 26E9      BNE B@       Loop till done.
0324 12C9 CE0413     LDU ##413    Point to video loc.
0325 12CC BE130F     LDX #M2      Point to message.
0326 12CF 2011      BRA DISM     Jump.
0327 12D1 7C12FC     BALDIS INC BALLS Bump balls.
0328 12D4 B612FC     LDA BALLS   A=Ball.
0329 12D7 B830      ADDA ##30    A=ASCII value.
0330 12D9 B7130C     STA B1      Save it.
0331 12DC CE0402     LDU ##402    Point to video loc.
0332 12DF BE12FD     LDX #M1      Point to message.
0333 12E2 A680      DISM LDA ,X+     A=Display char.
0334 12E4 2704     BEQ D@       Jump if end of message.
0335 12E6 A7C0      STA ,U+     Display character.
0336 12E8 20FB     BRA DISM     Loop till done.
0337 12EA 39        D@ RTS        Return.

```

*
* Variables, Constants,
* and Messages.
*

```

0338 12EB 00      BX FCB 0
0339 12EC 00      BY FCB 0
0340 12ED 00      MXD FCB 0
0341 12EE 00      MYD FCB 0
0342 12EF FCFDFDFEFE TABLE FCB -4,-3,-3,-2,-2
0343 12F4 0202030304 FCB 2,2,3,3,4
0344 12F9 00      FS FCB 0
0345 12FA 0000     SCORE FDB 0
0346 12FC 00      BALLS FCB 0
0347 12FD 130D011308 M1 FCB 19,13,1,19,8,15,21
0348 1304 142002010C FCB 20,32,2,1,12,12,58,32
0349 130C 002000    B1 FCB 0,32,0
0350 130F 13030F1205 M2 FCB 19,3,15,18,5,58,32
0351 1316 0000000000 S1 BSZ 5
0352 131B 030F101912 M3 FCB 3,15,16,25,18,9,7,8,20,32
0353 1325 31393B3320 FCB 49,57,56,51,32,32,13,1,18
0354 132E 0B20070F0F FCB 11,32,7,15,15,4,23,9,14,0
0355 1338 00      LAST FCB 0
0356 1339 00      BFLAG FCB 0
0357 133A 00      DEL FCB 0
0358 133B 00      DEL1 FCB 0
0359 133C 03EB006400 CONST FDB 1000,100,10,1
0360 1344 0000000000 BTAB BSZ 96
0361 134A 0484      DTAB FDB $484
0362 13A6 FF      FCB $FF
0363 13A7 04A4      FDB $4A4
0364 13A9 BF      FCB $BF
0365 13AA 04C4      FDB $4C4
0366 13AC BF      FCB $BF
0367 13AD 04E4      FDB $4E4
0368 13AF AF      FCB $AF
0369 13B0 0000      FDB 0
0370 13B2      END STRT

```

```

B1 130C BALDIS 12D1 BALLS 12FC BFLAG 1339
BTAB 1344 BX 12EB BY 12EC CONST 133C
DEL 133A DEL1 133B DISM 12E2 DISP 1251
DTAB 13A4 FIGX 117E LAST 1338 M1 12FD
M2 130F M3 131B MXD 12ED MYD 12EE
PADDLE 1217 PS 12F9 RESB 11B4 S1 1316
SCODIS 129D SCORE 12FA SETB 11B7 S01 11A6
SOUND 11AF STRT 1002 TABLE 12EF

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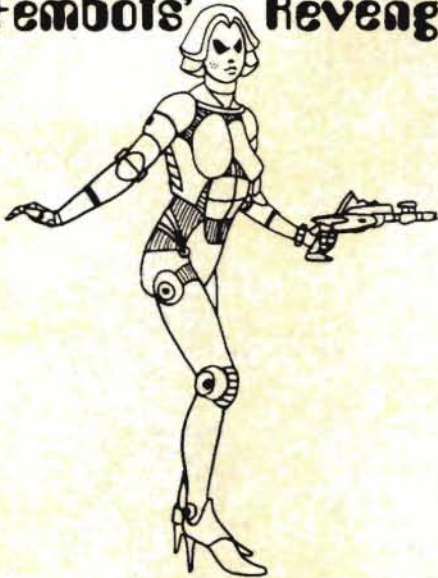
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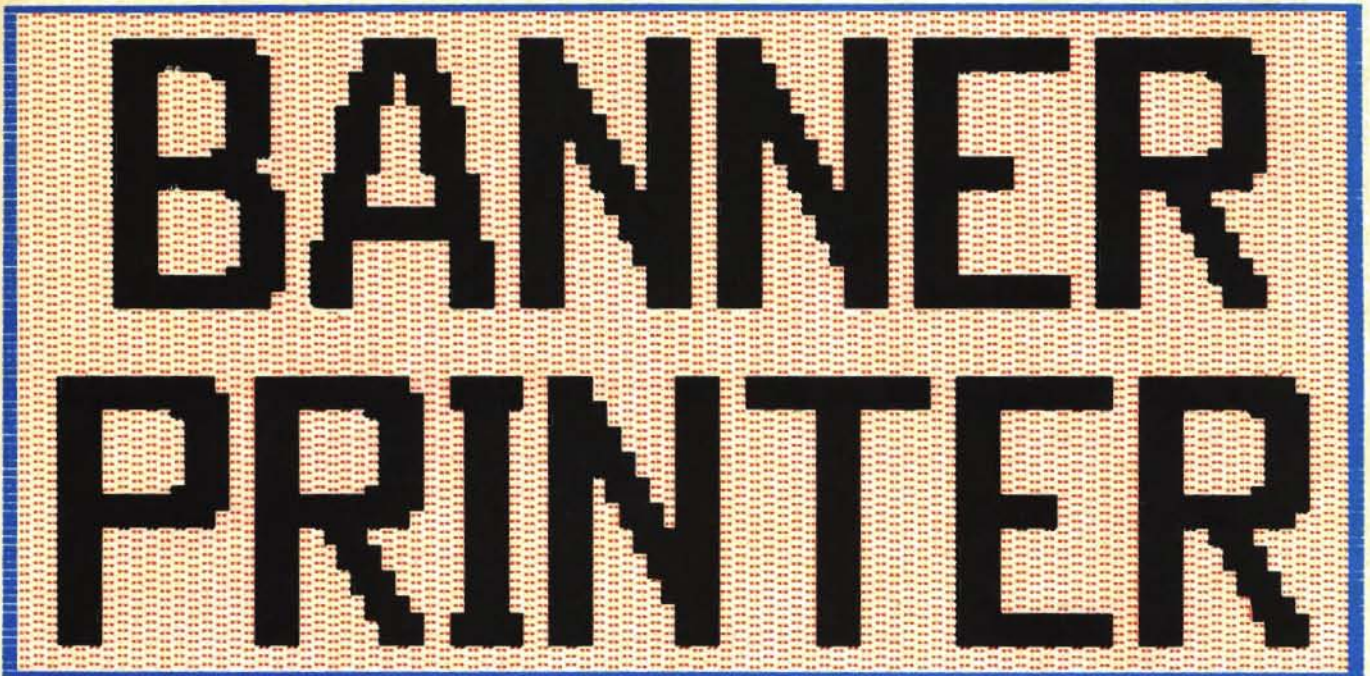
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Has the novelty of a printer finally worn off? Is your printer just sitting there awaiting a LLIST command, screen dump, or word-processed letter? Turn it on and surprise it with a banner printout.

Banner Printer prints 40-, 60-, or 80-column-wide banners on printers that can handle these print widths.

Successive prompts ask for banner width, desired printing characters, and banner message to be printed. Message entry starts a banner printout. Banner completion initiates two more prompts that let you print another copy, begin a new banner, or quit.

The program starts with a title display that prompts you to verify that the printer is turned on and ready. A program description appears after a short delay. Pressing the spacebar starts a series of banner option prompts.

Banner printing options appear as selections are made. First, you choose a banner width. You must then choose one of three built-in backgrounds (blank, :, or > shaded), or a special character to fill your banner's background. The special shading character can be any letter, number, symbol, or graphic pattern in your printer's character table. Selecting a

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built-in background character starts the next option prompt. Selecting a special character requires entry of that character's ASCII code.

A border-printing option lets you choose one of five built-in characters or a special character. In the latter case, you must enter the special character's ASCII code to proceed.

A banner-message-printing option gives you four choices. Option 1 (@ sign) produces even-density message characters, especially when the message has light-printing characters such as L, T, I, 1, or 7.

Printing Char/Inch or Pitch	Width of Banner (in inches)		
	40-WB	60-WB	80-WB
10	4	6	8
12	3.33	5	5.67
*16.5	2.33	3.5	4.67

*MX-80 compressed mode

Table 1. Available Banner Widths

Option 2 prints each banner letter or number using its own character. This selection temporarily defaults to an @ sign whenever the program reads a symbol (except the \$ sign) or a punctuation mark in a message input. The default feature ensures darker symbols and punctuation marks in a banner.

Option 3 provides white characters on very dark or colored backgrounds. The blank characters can be filled in with a contrasting color during a second print run.

Option 4 lets you use any character (letter, number, symbol, or graphic pattern accepted by your printer) for printing message characters. Just press the 4 key and, when prompted, enter the special character's ASCII code.

Banner-message limitations appear after the last printing option has been selected. You must limit your message input to the characters specified in the

System Requirements

**Extended Color Basic
16K RAM after PCLEAR 1 (tape)
32K RAM (disk)
Printer (40 char./line minimum)**

Character Type	Horizontal Space Used (BG Lines)
Valid banner:	(See Note.)
!,',:;	5
()	6
1 1	7
-	10
= space	9
0235679EFL	13
/48\$BCDGHJ	14
KNOPQRSUZ	14
AMTVXY	15
W	17
Line select:	
# % &	2
Invalid message input:	
< > ! * , ? :	0

Note: Each value includes two leading background lines. The lines are automatically added before a character is printed.

Table 2. Character Space Requirements

Variable	Description
A\$	Character printing character
B\$-K\$	Character printing strings
L\$	Background printing character
M\$-V\$	Background printing strings
W\$	Border printing character
X\$	Top margin (normal character)
Y\$	Bottom margin (normal character)
VV\$	Message character read by MID\$
YNS	User response to Y/N prompt
XX\$	Top margin (part of character extends above banner line)
YY\$	Bottom margin (part of character extends below banner line)
Z\$	User response to option prompts
Z	Delay value, PRINT@ location, or number of lines to be printed
ZA	ASCII code of special character printing character
ZB	ASCII code of special border printing character
ZC	Position of character to be read from message
ZD	ASCII code of special background printing character
ZE	Value (1-4) of Z\$ for selected background option
ZF	Value (1-6) of Z\$ for selected border option
ZL	Value (1-3) of Z\$ for selected banner width option
ZP	Value (1-4) of Z\$ for selected character printing character option
ZT	Banner width (40, 60, or 80 characters)
ZZ	ASCII code of character read from message

Table 3. Program Variables

display. You can get commas and colons in a banner only by using substitute characters + and @, as described in the display. If you select a 60- or 80-column banner,

the display includes a description of line-select characters. Either width allows three banner-message lines. The 40-column width limits message print-

out to one line and a "Do not use line-select characters #%& in 40-column wide banners" note replaces the description of the line-select characters.

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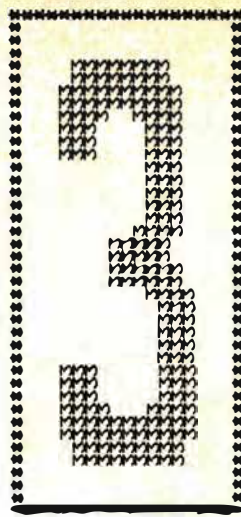
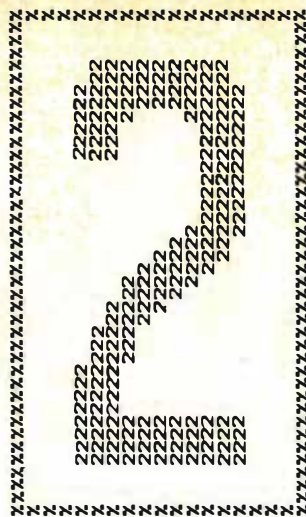
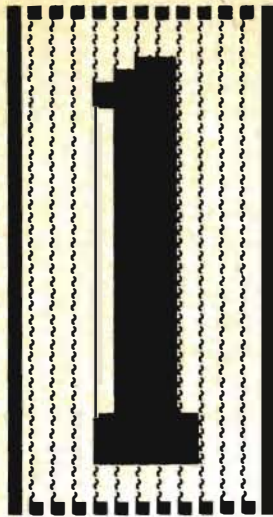
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 3. MX-80 7/72 LINE SPACING.
 4. MX-80 7/72 LINE SPACING IN COMPRESSED CHARACTER MODE.
 5. AJ841 SELECTRONIC 12-PITCH.
 6. AJ841 SELECTRONIC 10-PITCH.
 7. OKIDATA CP110 DOT MATRIX.

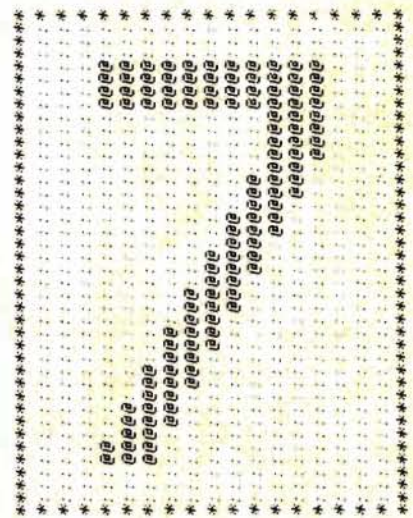
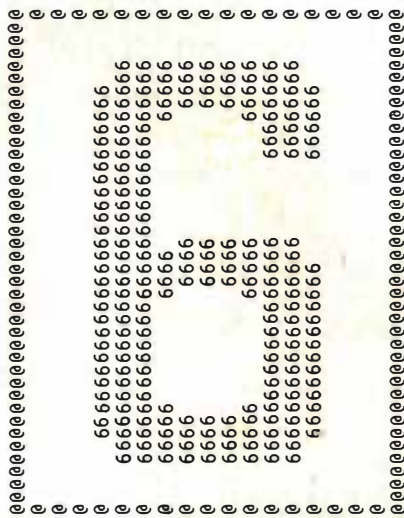
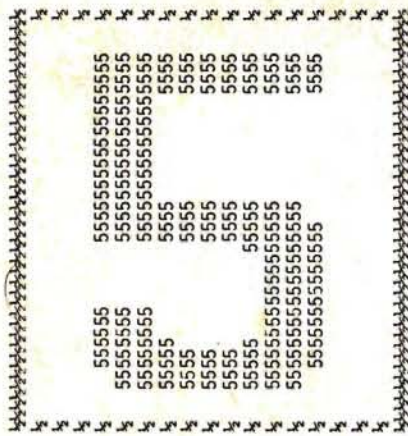
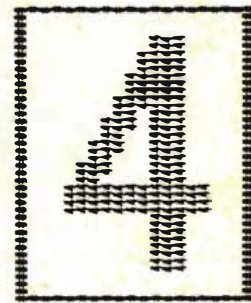


Fig. 1. Single-Run Banner Examples

Also, the program briefly displays "LINE SELECT CHARACTER IGNORED" when it reads one in a banner message during printout.

A bottom-line prompt appears when the banner print run ends. You can print another copy by pressing the Y key. Pressing the N key displays a new prompt that lets you begin a different banner or exit the program.

Printout Examples

The program's banner characters are designed for optimum proportions at six lines per vertical inch and 10 pitch (characters per horizontal inch). Available banner widths range from 2.33-8 inches, depending on printer character-spacing capabilities. Table 1 lists banner widths for 10-, 12-, and 16.5-pitch printouts.

Figure 1 shows typical 40-column-wide, single-run printouts. Numerals

1, 6, and 7 were printed at designed line spacing and pitch. Other numerals show effects of line- and character-spacing variations. Increasing the lines per inch slenderizes characters (see numbers 2 and 3). Increasing the pitch shortens characters and makes them look wider (see number 5). Simultaneously increasing lines per inch and pitch provides normally proportioned characters in a smaller size (see number 4).

Example 1 has an MX-80 ASCII code 126 shaded background, code 175 border, and code 223 character. Examples 2-6 are simple printouts with blank backgrounds. Example 7 has a light-shaded (colon) background with @-sign banner characters for greater contrast.

Character Types and Functions

Message input characters represent

uppercase letters, numbers, and symbols to be reproduced as large banner characters. Printed characters range in width from three print lines for narrow punctuation marks to 15 print lines for the letter W.

Except for Q, all letter and number characters are 32 print columns high. The letter Q's down stroke extends two print columns below the banner message line. A comma also extends two print columns below the message line. Slashes, exclamation points, parentheses, and dollar signs extend two print columns above and below a message line.

Two background lines automatically precede each printable character to provide separation. Table 2 lists all printable and line-select characters along with horizontal spaces (print lines) they use. You must consider the

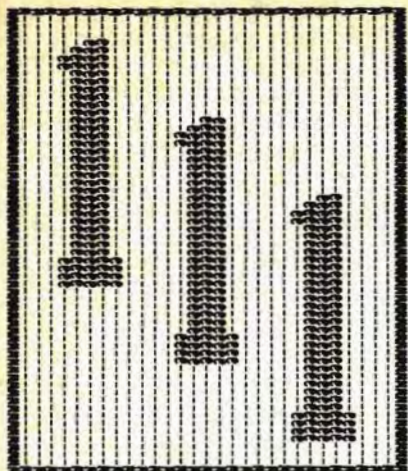


Fig. 2. Spacing Effects of Line Switching

60- and 80-column wide banners. The three characters merely provide convenient ASCII codes for jumping from program statement 30 to top/bottom-margin-setting routines.

Figure 2 shows how message input #1%1&1 positions the three lines available on a 60-column-wide banner. Each line-select character adds two extra background lines where the line switching occurs. Successive, identical line-select characters can be used to add varied spaces in background-line-pair increments. This method simplifies over/under word centering in double-line banners.

Program Key-In and Debug

Banner Printer uses 12,755 memory bytes with remarks and 10,384 bytes without. Delete all remarks, except statement 222 to ensure enough free memory for program execution. Type and enter PCLEAR1 before attempting to load the program into a 16K computer.

Statement 222 is reserved for special codes that your printer might need for initialization or specific operating modes. If used, the program sends the statement 222 codes to the printer when you select a banner width and every time you select a new banner. At its program location, statement 222 ensures that the printer is reinitialized even when it is switched on or off for paper repositioning and ribbon change between banner color print runs.

Type, list, and visually check the entire program before attempting to run it. Then, turn your printer on, start the program, choose the 40-character banner width, and respond

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```

$:XX$=V$+R$+M$:GOTO18
71 'Print !
72 FORZ=1TO7:PRINT#M,Y$V$X$:NEXT
:GOTO18
74 GOSUB12:FORZ=1TO3:PRINT#M,W$Y
Y$D$N$J$E$X$W$:NEXT:GOTO18
75 'Print ' (use two for quotati
on marks)
76 GOSUB12:PRINT#M,Y$U$N$B$L$D$X
X$W$:PRINT#M,Y$U$O$F$X$W$:PRINT
#M,Y$U$P$E$X$W$:GOTO18
77 'Print (
78 GOSUB12:PRINT#M,Y$S$I$S$X$:PR
INT#M,Y$O$J$O$X$:PRINT#M,Y$H$T$H
X$:PRINT#M,W$Y$F$U$F$X$W$:GOT
O18
79 'Print )
80 GOSUB12:PRINT#M,W$Y$F$U$F$X$
W$:PRINT#M,Y$H$T$H$X$:PRINT#M,Y
$O$J$O$X$:PRINT#M,Y$S$I$S$X$:GOT
O18
81 'Print -
82 GOSUB12:FORZ=1TO8:PRINT#M,Y$S
$Q$D$Q$S$X$:NEXT:GOTO18
83 'Print period
84 GOSUB12:FORZ=1TO3:PRINT#M,Y$D
$U$O$X$:NEXT:GOTO18
85 'Print /
86 GOSUB12:PRINT#M,W$Y$F$U$O$X$
:PRINT#M,W$Y$Y$L$G$U$M$X$:PRINT#
M,Y$M$H$T$Q$X$:PRINT#M,Y$P$H$T$N$
X$:PRINT#M,Y$S$H$T$X$:PRINT#M,Y$
S$N$H$S$P$X$:PRINT#M,Y$S$Q$H$S$M
$X$:PRINT#M,Y$T$L$H$R$X$
88 PRINT#M,Y$T$O$H$O$X$:PRINT#M,
Y$T$R$H$L$X$:PRINT#M,Y$U$M$G$L$X
X$W$:PRINT#M,Y$U$O$F$X$W$:GOTO1
8
89 'Print 0
90 GOSUB42:FORZ=1TO3:PRINT#M,Y$D
$U$D$X$:NEXT:GOTO130
91 'Print 1
92 PRINT#M,Y$D$U$B$M$X$:PRINT#M,
Y$J$G$L$X$:PRINT#M,Y$K$X$:PRINT#
M,Y$K$X$:PRINT#M,Y$D$U$O$X$:GOTO
18
93 'Print 2
94 PRINT#M,Y$H$T$F$M$X$:PRINT#M,
Y$H$C$P$S$H$X$:PRINT#M,Y$H$E$N$S$
$H$X$:PRINT#M,Y$D$O$G$S$O$E$X$:P
RINT#M,Y$D$R$E$S$O$D$X$:PRINT#M,
Y$D$S$E$S$N$D$X$:PRINT#M,Y$D$S$L
$E$S$M$D$X$:PRINT#M,Y$D$S$M$E$S$
E$X$
96 PRINT#M,Y$D$S$N$A$I$X$:PRINT#
M,Y$D$S$O$I$X$:PRINT#M,Y$D$S$Q$H
$D$M$X$:GOTO18
97 'Print left side and center o
f 3
98 PRINT#M,Y$M$F$T$F$M$X$:FORZ=1
TO2:PRINT#M,Y$H$T$H$X$:NEXT:PRIN
T#M,Y$E$T$Q$E$X$:GOSUB34
99 'Print right side of 3 or B
100 PRINT#M,Y$D$S$M$E$S$E$X$:PRI

```

```

NT#M,Y$E$S$C$I$X$:PRINT#M,Y$K$X$
:PRINT#M,Y$I$M$D$H$M$X$:PRINT#M,
Y$M$D$H$T$M$X$:GOTO18
101 'Print 4
102 PRINT#M,Y$S$D$O$T$X$:PRINT#M
,Y$S$G$L$T$X$:PRINT#M,Y$S$H$B$Q$
$S$X$:PRINT#M,Y$S$D$L$H$S$N$X$:PR
INT#M,Y$S$D$O$H$S$X$:PRINT#M,Y$S
$D$R$H$P$X$:PRINT#M,Y$S$D$S$M$H$
M$X$:GOSUB32:FORZ=1TO2:PRINT#M,Y
$S$D$O$T$X$:NEXT:GOTO18
103 'Print 5
104 PRINT#M,Y$M$F$Q$B$I$X$:FORZ=
1TO2:PRINT#M,Y$H$Q$B$I$X$:NEXT:P
RINT#M,Y$E$L$S$D$M$S$D$X$:GOSUB3
6:PRINT#M,Y$E$S$E$M$S$D$X$:FORZ=
1TO2:PRINT#M,Y$I$B$M$S$D$X$:NEXT
:PRINT#M,Y$M$H$F$S$O$D$X$:GOTO18
105 'Print 6
106 PRINT#M,Y$M$J$D$M$X$:PRINT#M
,Y$K$X$:PRINT#M,Y$K$X$:PRINT#M,Y
$E$S$D$M$S$E$X$:GOSUB36:PRINT#M,
Y$E$S$E$L$S$E$X$:FORZ=1TO2:PRINT
#M,Y$I$B$Q$H$X$:NEXT:PRINT#M,Y$M
$H$F$S$F$M$X$:GOTO18
107 'Print 7
108 PRINT#M,Y$B$M$U$D$X$:PRINT#M
,Y$E$T$R$D$X$:PRINT#M,Y$H$T$O$D$
X$:PRINT#M,Y$N$H$L$T$D$X$:PRINT#
M,Y$Q$H$Q$S$D$X$:PRINT#M,Y$S$L$H
$N$S$D$X$:PRINT#M,Y$S$O$H$S$D$X$
:PRINT#M,Y$S$R$H$P$D$X$:PRINT#M,
Y$T$M$H$F$X$:PRINT#M,Y$T$P$H$C$X
$:PRINT#M,Y$U$H$X$:GOTO18
109 'Print 8
110 PRINT#M,Y$M$D$H$M$T$X$:PRINT
#M,Y$I$M$D$H$M$X$:PRINT#M,Y$K$X$
:PRINT#M,Y$E$S$I$C$X$:PRINT#M,Y$
D$M$S$E$S$E$X$:GOSUB34:GOTO100
111 'Print 9
112 PRINT#M,Y$M$F$S$H$F$M$X$:FOR
Z=1TO2:PRINT#M,Y$H$Q$B$I$X$:NEXT
:PRINT#M,Y$E$L$S$E$S$E$X$:GOSUB3
6:PRINT#M,Y$E$M$S$D$S$E$X$:PRINT
#M,Y$K$X$:PRINT#M,Y$K$X$:PRINT#M
,Y$M$J$D$M$X$:GOTO18
113 'Print ;
114 GOSUB12:PRINT#M,Y$B$L$D$O$D$
T$L$X$:PRINT#M,Y$L$F$O$D$L$T$X$:
PRINT#M,Y$M$E$O$D$T$L$X$:GOTO18
115 'Print =
116 GOSUB12:FORZ=1TO7:PRINT#M,Y$
M$S$D$O$D$M$S$X$:NEXT:GOTO18
117 'Print :
118 GOSUB12:FORZ=1TO3:PRINT#M,Y$
M$S$D$O$D$M$S$X$:NEXT:GOTO18
119 'Print A
120 PRINT#M,Y$H$U$X$:PRINT#M,Y$I
$T$X$:PRINT#M,Y$J$S$X$:PRINT#M,Y
$S$I$D$O$X$:PRINT#M,Y$S$D$O$I$X$
:PRINT#M,Y$S$D$S$O$H$X$:PRINT#M,
Y$S$D$T$D$X$:PRINT#M,Y$S$D$S$O$H
$X$:PRINT#M,Y$S$D$O$I$X$:PRINT#M
,Y$S$I$D$O$X$

```


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to all displayed prompts. If any display looks distorted, find and check the display statements against the printed statements. Remarks identify all routines in the listing. When displays are good, enter a single-character message (such as 1) to verify banner top and bottom margins.

Check and correct all statements that define or set margins that look bad.

Check statements that identify or define selected background and border printing characters if they do not appear in your printed banner.

Only a printout of all banner characters can verify integrity of the

entire program. If you choose this method, print a 40-character-wide banner with a blank background, a + sign border, and a message input that contains all printable characters. The verification will use a lot of paper, but will prevent banner aborts later.

Banner character errors can be

Listing continued

```
122 PRINT#M,Y$JSS$X$:PRINT#M,Y$I
$T$X$:PRINT#M,Y$H$U$X$:GOTO18
123 'Print B
124 GOSUB32:GOSUB38:GOTO100
125 'Print C
126 GOSUB42:GOSUB44:PRINT#M,Y$E$
T$Q$E$X$:FORZ=1TO2:PRINT#M,Y$H$T
$H$X$:NEXT:PRINT#M,Y$M$F$T$F$M$X
$:GOTO18
127 'Print left side and center
of D
128 GOSUB32:GOSUB44:PRINT#M,Y$D$
U$D$X$
129 'Print right side of D O Q o
r 0
130 PRINT#M,Y$E$T$Q$E$X$:PRINT#M
,Y$K$X$:PRINT#M,Y$K$X$:PRINT#M,Y
$M$J$D$M$X$:GOTO18
131 'Print E
132 GOSUB32:GOSUB38:GOSUB44:GOTO
18
133 'Print F
134 GOSUB32:FORZ=1TO4:PRINT#M,Y$
S$Q$D$M$S$D$X$:NEXT:FORZ=1TO4:PR
INT#M,Y$U$O$D$X$:NEXT:GOTO18
135 'Print G
136 GOSUB42:FORZ=1TO3:PRINT#M,Y$
D$U$D$X$:NEXT:PRINT#M,Y$D$Q$D$S$
Q$D$X$:PRINT#M,Y$E$P$D$S$P$E$X$:
FORZ=1TO2:PRINT#M,Y$H$F$S$M$H$X$
:NEXT:PRINT#M,Y$M$D$H$M$S$F$M$X$
:GOTO18
137 'Print H
138 GOSUB32:FORZ=1TO6:PRINT#M,Y$
S$Q$D$Q$S$X$:NEXT:GOSUB32:GOTO18
139 'Print I
140 PRINT#M,Y$D$U$D$X$:GOSUB32:P
RINT#M,Y$D$U$D$X$:GOTO18
141 'Print left side of J
142 PRINT#M,Y$M$F$U$X$:PRINT#M,Y
$H$U$X$:PRINT#M,Y$H$U$X$:PRINT#M
,Y$E$N$U$X$
143 'Print center and right side
of J or U
144 GOSUB48:PRINT#M,Y$E$U$N$X$:P
RINT#M,Y$K$X$:PRINT#M,Y$K$X$:PRI
NT#M,Y$M$J$F$X$:GOTO18
145 'Print K
146 GOSUB32:PRINT#M,Y$S$N$G$Q$S$
X$:PRINT#M,Y$S$Q$G$N$S$X$:PRINT#
M,Y$S$O$D$H$S$X$:PRINT#M,Y$S$L$H
$M$H$P$X$:PRINT#M,Y$Q$H$S$H$M$X$
:PRINT#M,Y$N$H$S$Q$G$X$:PRINT#M,
Y$H$T$O$D$X$:PRINT#M,Y$E$U$L$B$X
$:PRINT#M,Y$C$U$P$X$:GOTO18
```

```
147 'Print L
148 GOSUB32:GOSUB48:GOSUB48:GOTO
18
149 'Print M
150 GOSUB32:PRINT#M,Y$T$M$H$B$O$
X$:PRINT#M,Y$S$Q$H$B$S$X$:PRINT#
M,Y$S$M$H$B$O$S$X$:PRINT#M,Y$Q$H
$B$T$X$:PRINT#M,Y$S$M$H$B$O$S$X$
:PRINT#M,Y$S$Q$H$B$S$X$:PRINT#M,
Y$T$M$H$B$O$X$:GOSUB32:GOTO18
151 'Print N
152 GOSUB32:PRINT#M,Y$T$O$H$A$N$
X$:PRINT#M,Y$T$L$A$H$Q$X$:PRINT#
M,Y$S$Q$A$H$L$S$X$:PRINT#M,Y$S$N
$A$H$O$S$X$:PRINT#M,Y$S$H$A$R$S$
X$:PRINT#M,Y$P$A$H$M$T$X$:GOSUB3
2:GOTO18
153 'Print O
154 GOSUB42:GOSUB44:GOTO130
155 'Print P
156 GOSUB32:FORZ=1TO5:PRINT#M,Y$
S$Q$D$M$S$D$X$:NEXT:PRINT#M,Y$S$
Q$E$S$E$X$:FORZ=1TO2:PRINT#M,Y$S
$Q$I$B$X$:NEXT:PRINT#M,Y$T$H$F$M
$X$:GOTO18
157 'Print Q
158 GOSUB42:PRINT#M,Y$D$U$D$X$:P
RINT#M,Y$F$T$Q$D$X$:PRINT#M,W$Y$
$H$T$Q$D$X$:PRINT#M,W$Y$F$U$D$X
$:GOTO130
159 'Print R
160 GOSUB32:PRINT#M,Y$S$Q$D$S$M$
D$X$:PRINT#M,Y$S$Q$D$S$M$D$X$:PR
INT#M,Y$S$O$F$S$M$D$X$:PRINT#M,Y
$S$L$H$A$S$M$D$X$:PRINT#M,Y$Q$H$
D$M$S$D$X$:PRINT#M,Y$N$H$A$M$E$S
$E$X$:PRINT#M,Y$H$A$P$I$B$X$:PRI
NT#M,Y$F$S$I$B$X$:PRINT#M,Y$D$S$
O$H$F$M$X$:GOTO18
161 'Print left side and center
of S
162 PRINT#M,Y$M$F$S$H$F$M$X$:FOR
Z=1TO2:PRINT#M,Y$H$Q$I$B$X$:NEXT
:PRINT#M,Y$E$L$S$E$S$E$X$:GOSUB3
8
163 'Print right side of S or $
164 PRINT#M,Y$E$S$E$S$L$E$X$:FOR
Z=1TO2:PRINT#M,Y$I$B$Q$H$X$:NEXT
:PRINT#M,Y$M$H$F$S$F$M$X$:GOTO18
165 'Print T
166 GOSUB46:GOSUB32:GOSUB46:GOTO
18
167 'Print U
168 PRINT#M,Y$M$F$J$X$:PRINT#M,Y
$K$X$:PRINT#M,Y$K$X$:PRINT#M,Y$E
```

Listing continued

Listing continued

```

$N$U$X$:GOTO144
169 'Print V
170 PRINT#M,Y$U$H$X$:PRINT#M,Y$T
$I$X$:PRINT#M,Y$S$M$I$F$X$:PRINT
#M,Y$Q$I$C$R$X$:PRINT#M,Y$N$H$F$
S$R$X$:PRINT#M,Y$H$C$T$P$X$:PRIN
T#M,Y$G$U$L$X$:PRINT#M,Y$H$C$T$P
$X$:PRINT#M,Y$N$H$F$S$R$X$:PRINT
#M,Y$Q$I$C$R$X$:PRINT#M,Y$S$M$I$
F$X$
172 PRINT#M,Y$T$I$X$:PRINT#M,Y$U
$H$X$:GOTO18
173 'Print W
174 PRINT#M,Y$T$Q$B$H$X$:PRINT#M
,Y$S$O$D$I$X$:PRINT#M,Y$K$X$:PRI
NT#M,Y$I$G$L$S$X$:PRINT#M,Y$H$E$
N$T$X$:PRINT#M,Y$P$H$F$P$S$X$:PR
INT#M,Y$S$M$H$G$R$X$
176 PRINT#M,Y$T$H$A$R$X$:PRINT#M
,Y$S$M$H$G$R$X$:PRINT#M,Y$P$H$F$
P$S$X$:PRINT#M,Y$H$E$N$T$X$:PRIN
T#M,Y$I$G$L$S$X$:PRINT#M,Y$K$X$:
PRINT#M,Y$S$O$D$I$X$:PRINT#M,Y$T
$Q$B$H$X$:GOTO18
177 'Print X
178 PRINT#M,Y$D$L$U$C$X$:PRINT#M
,Y$G$T$O$E$X$:PRINT#M,Y$H$B$S$Q$
H$X$:PRINT#M,Y$N$H$B$S$H$B$L$X$:
PRINT#M,Y$Q$H$B$M$H$B$O$X$:PRINT
#M,Y$L$S$I$R$X$
180 PRINT#M,Y$S$O$H$B$S$M$X$:PRI
NT#M,Y$L$S$I$R$X$:PRINT#M,Y$Q$H$
B$M$H$B$O$X$:PRINT#M,Y$N$H$B$S$H
$B$L$X$:PRINT#M,Y$H$B$S$Q$H$X$:P
RINT#M,Y$G$T$O$E$X$:PRINT#M,Y$D$
L$U$C$X$:GOTO18
181 'Print Y
182 PRINT#M,Y$U$O$D$X$:PRINT#M,Y
$U$H$X$:PRINT#M,Y$T$O$D$H$X$:PRI
NT#M,Y$T$H$D$O$X$:PRINT#M,Y$S$O$
H$D$S$X$:PRINT#M,Y$I$D$O$S$X$:PR
INT#M,Y$I$T$X$:PRINT#M,Y$I$D$O$S$
$X$:PRINT#M,Y$S$O$H$D$S$X$:PRINT
#M,Y$T$H$D$O$X$:PRINT#M,Y$T$O$D$
H$X$
184 PRINT#M,Y$U$H$X$:PRINT#M,Y$U
$O$D$X$:GOTO18
185 'Print Z
186 PRINT#M,Y$D$U$D$X$:PRINT#M,Y
$G$T$P$D$X$:PRINT#M,Y$H$B$M$T$D$
X$:PRINT#M,Y$H$E$S$R$D$X$:PRINT#
M,Y$D$N$H$A$S$O$D$X$:PRINT#M,Y$D
$Q$H$A$L$S$D$X$:PRINT#M,Y$D$L$S$
H$A$Q$D$X$:PRINT#M,Y$D$S$O$H$A$N
$D$X$:PRINT#M,Y$D$S$R$H$E$X$
188 PRINT#M,Y$D$M$T$H$B$X$:PRINT
#M,Y$D$T$P$G$X$:PRINT#M,Y$D$U$D$
X$:GOTO18
189 'Print one background line a
nd right-hand border
190 PRINT#M,Y$V$X$:PRINT#M,STRIN
G$(ZT,W$)
191 'Do five linefeeds

```

Listing continued

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traced to routines and subroutines that print the characters. Find the remark that identifies the character's printing statement, then check the statement against the corresponding printed statement in the listing.

Also check all statements called by GOSUBs in the printing statement. Just two GOSUBs and one GOTO routine (32, 44, and 130), for example, print the letter D. GOSUBed routines print identical parts of several characters. Suspect these routines when two or more characters have similar defects.

Multicolor Banners

Multicolor banners require a separate print run for each color used. Use the same message input for all print runs. The banner paper's start position, established for the first color print run, must be exactly the same for the remaining print runs.

Tractor-pin feed is preferred over friction feed when printing multicolor banners since it maintains good lateral alignment during paper advance and backfeed. Index marks at the printer's paper output area provide adequate repositioning marks for longitudinal alignment.

Friction-feed mechanisms on some printers do not advance and backfeed paper in exact alignment. So, index marks should be used at paper output and at input areas of printer. Both sets of index marks must be aligned laterally and longitudinally for each color print run.

Before starting, review the entire multicolor banner procedure. It might prevent a surprise during or between banner print runs. Prepare all needed materials and look up special character ASCII codes that might be used. Type any required printer mode control codes into statement 222. Then, verify that printer power is off, and proceed as follows:

1. Hand-letter your intended message input on a piece of paper for reference when responding to message input prompts.
2. Decide on your background, border, and banner message colors.
3. Insert paper and install background printing ribbon in printer.
4. Attach a short strip of white sticky-back label to some part of printer, adjacent to one edge of the paper.
5. Using a fine-point pencil, draw a short index line across the banner paper's edge and the fixed label strip. The two resulting marks will be used as paper repositioning indexes for subsequent color print runs.
6. Turn printer power on.
7. Start the program and select the desired banner width when prompted.
8. Select your background character, then blank border and banner message characters.
9. Referring to the hand-lettered message prepared in step 1, type your message input, double-check it, and press enter.
10. When the background is done, press the N key in response to the

"Another copy?" prompt.

11. Stop at this point and turn printer power off.
12. Gently pull straight back on the trailing part of the banner paper (just enough to eliminate slack) and backfeed it with the printer's paper feed knob. Continue backfeeding until the paper's index mark moves past the fixed index mark about 1/2 inch.
13. Slip a small sheet of paper between the banner paper and ribbon guide on the print head or movable type element.
14. Replace ribbon with one for the next print run.
15. Remove the protective slipsheet inserted in step 13.
16. Using the paper-feed knob, carefully advance the banner paper until its index mark aligns exactly with the fixed index mark.
17. Turn printer power on and press Y key in response to the "New banner?" prompt.
18. Select a blank background, your border character, and a blank banner message character. (If banner message and border are to be the same color, both can be printed during this print run.)
19. Repeat steps 9-17.
20. If applicable, repeat steps 18 and 19 for the banner-message print run. Except in step 18, select a blank background and border, and your banner-message-printing character.

Double-Line Banners

Double-line banners can be printed

Listing continued

```

192 FORZ=1TO5:PRINT#M," ":NEXT
193 'Display ANOTHER COPY? prompt
194 PRINT@481,"DO YOU WANT ANOTHER COPY(Y/N)?"
196 YN$=INKEY$:IFYN$="Y"THEN254ELSEIFYN$<>"N"THEN196
197 'Display NEW BANNER? prompt
198 GOSUB28:FORT=0TO99:NEXT:PRINT@481,"DO YOU WANT A NEW BANNER(Y/N)?"
200 YN$=INKEY$:IFYN$="Y"THENCLS:GOTO218ELSEIFYN$<>"N"THEN200
202 CLS1:END
203 'Program title
204 CLS:FORZ=9TO425STEP32:PRINT@Z,"BANNER PRINTER";:NEXT
206 PRINT@453,"VERIFY THAT PRINTER IS":PRINT@486,"TURNED ON AND READY.";:SCREEN0,1:FORZ=0TO2999:NEXT
207 'Program description

```

```

208 CLS:PRINT@3,"THIS PROGRAM PRINTS BANNERS WITH 32-COLUMN-HIGH CHARACTERS ON ANY ONE OF THREE LINES. A BANNER MAY HAVE A CLEAR OR SYMBOL-CHARACTER SHADED BORDER AND/OR BACKGROUND
.
210 PRINT@195,"PROMPTS LET YOU SELECT THE BACKGROUND, BORDER, AND BANNER LETTER/NUMBER PRINTING CHARACTERS. EXCEPT WHEN A BLANK OR A SPECIAL CHARACTER IS SELECTED, THE PROGRAM USES THE @ SIGN TO PRINT MOST SYMBOLS.
212 PRINT@419,"A FINAL PROMPT ASKS FOR THE BANNER MESSAGE TO BE PRINTED. PRESS <SPACEBAR> TO CONTINUE";
214 IFINKEY$<>" "THEN214
216 CLS:PRINT@35,"THE BANNER MESSAGE MAY BE UP TO 240 CHARACTER S/SPACES LONG. WHEN BANNER IS PRINTED, YOU MAY SELECT TO PRINT

```

Listing continued

only in 80-column wide mode. They require two print runs for single or double colors, plus another print run for each additional color.

Position the banner paper at the same start point before each print run. (See steps 4, 5, 11, and 12 of the multicolor-banner procedure.)

Use a blank or light-shaded background for single-color banners. One of the banner message lines will overprint the background shading.

Use one message input to print the background, the border, and the longest one of two words or banner message lines. Use a different message input to print the shorter word/line during the second print run.

Center the shorter word/line by adding line-select characters # for top-line or & for bottom-line printing. Each line-select character preceding the shorter word/line will move it right two print lines.

See Table 2 for horizontal space (print lines) used for characters in each line of your double-line banner. Divide the difference in print lines used by two. The result is the number of extra line-select characters that must precede your shorter word/line message input. ■

Address correspondence to Francis S. Kalinowski, 16 North Alder Drive, Orlando, FL 32807.

Listing continued

```
ANOTHER COPY, PRINT A NEW BANNER, OR QUIT.":PRINT@227,"BANNERS MAY BE PRINTED IN ANY ONE OF THE AVAILABLE WIDTHS.
217 'Banner width prompt
218 PRINT@323,"SELECT YOUR BANNER'S WIDTH.":PRINT@394,"1. 40-COLUMN":PRINT@426,"2. 60-COLUMN":PRINT@458,"3. 80-COLUMN
220 Z$=INKEY$:IFZ$=""THEN220ELSE ZL=VAL(Z$):IFZL=1THENZT=40ELSEIF ZL=2THENZT=60ELSEIFZL=3THENZT=80 ELSEIFZL<1ORZL>3THEN220
221 'Printing mode control codes (if needed by printer)
222 '**** THIS STATEMENT IS REVERSED FOR SPECIAL CODES REQUIRED TO SET UP YOUR PRINTER ****
223 'Banner background prompt
224 CLS:PRINT@35,"WHICH BACKGROUND DO YOU WANT?":PRINT@101,"1. CLEAR (BLANK)":PRINT@133,"2. LIGHTLY SHADED (:)":PRINT@165,"3. HERRINGBONE SHADED (>)":PRINT@197,"4. SPECIAL SHADED
226 Z$=INKEY$:IFZ$=""THEN226ELSE ZE=VAL(Z$)
228 IFZE<1ORZE>4THEN226ELSEIFZE=1THENL$=""ELSEIFZE=2THENL$=" "ELSEIFZE=3THENL$=">"ELSEIFZE=4THEN GOSUB26:PRINT@384,"";:INPUT"";ZD:L$=CHR$(ZD)
229 'Banner border prompt
230 CLS:PRINT@36,"WHICH BORDER DO YOU WANT?":PRINT@102,"1. #:PRINT@134,"2. *":PRINT@166,"3. +":PRINT@198,"4. %":PRINT@230,"5. NONE (BLANK)":PRINT@262,"6. SPECIAL CHARACTER
232 Z$=INKEY$:IFZ$=""THEN232ELSE ZF=VAL(Z$)
234 IFZF<1ORZF>6THEN232ELSEIFZF=1THENW$="#"ELSEIFZF=2THENW$="*"ELSEIFZF=3THENW$="+"ELSEIFZF=4THENW$="%"ELSEIFZF=5THENW$=" "ELSEIFZF=6THEN GOSUB26:PRINT@384,"";:INPUT"";ZB:W$=CHR$(ZB)
235 'Message printing character prompt
236 CLS:PRINT@33,"WHICH BANNER MESSAGE PRINTING CHARACTER
```

```
DO YOU WANT?":PRINT@131,"1. @ SIGN":PRINT@163,"2. MESSAGE CHARACTER":PRINT@195,"3. NONE (BLANK)":PRINT@227,"4. SPECIAL CHARACTER
238 Z$=INKEY$:IFZ$=""THEN238ELSE ZP=VAL(Z$)
240 IFZP<1ORZP>4THEN238ELSEIFZP=4THEN GOSUB26:PRINT@384,"";:INPUT"";ZA
241 'Banner message character limitations
242 CLS:PRINT" ONLY LETTERS, NUMBERS, SPACES, AND SYMBOLS ;'(). !/= AND $ MAY BE USED AS MESSAGE CHARACTERS. IF NEEDED, USE + IN MESSAGE FOR A COMMA IN BANNER PRINTOUT OR USE @ FOR A COLON IN PRINTOUT.
244 IFZL<2THENPRINT@194,"NOTE: DO NOT USE LINE-SELECT CHARACTERS %& IN 40-COLUMN WIDE BANNERS.":ELSEPRINT@193,"PREFIX MESSAGE SEGMENTS WITH # FOR TOP LINE, % FOR CENTER LINE OR & FOR BOTTOM LINE PRINTOUT.
245 'Banner message prompt
246 PRINT@294,"WHAT IS YOUR MESSAGE":PRINT@320,""
248 INPUT"";AA$
249 'Add end-of-message flag
250 AA$=AA$+CHR$(91):M=-2
251 'Define background printing strings
252 M$=L$+L$:N$=L$+M$:O$=L$+N$:P$=L$+O$:Q$=L$+P$:R$=L$+Q$:S$=L$+R$:T$=S$+S$:U$=S$+T$:V$=S$+U$
254 GOSUB28
255 'Print left-hand border
256 PRINT#M,STRING$(ZT,W$):ONZL GOTO258,260,262
258 Y$=W$+N$:X$=N$+W$:YY$=L$:XX$=L$:PRINT#M,Y$V$X$:PRINT#M,Y$V$X$:GOTO264
260 Y$=W$+S$+P$:X$=P$+S$+W$:YY$=S$+N$:XX$=N$+S$:GOTO264
262 Y$=W$+T$+R$:X$=R$+T$+W$:YY$=T$+P$:XX$=P$+T$
263 'Print 1 background line and go to read-message routine
264 ZC=@:PRINT#M,Y$V$X$:GOTO18
```

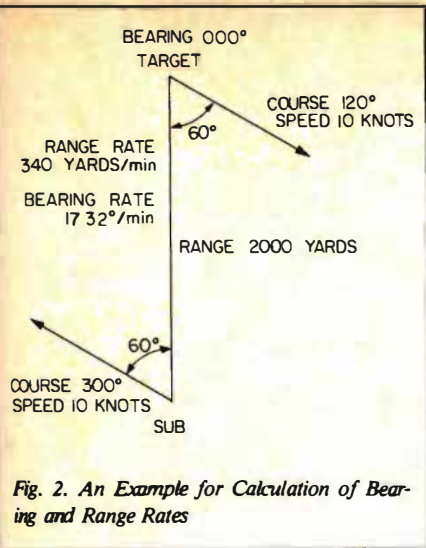



Fig. 2. An Example for Calculation of Bearing and Range Rates

program provides initial sonar data. You should construct a simple LOS diagram from this data to help orient yourself to the situation.

The sub is at periscope depth (above 70 feet) and 5 knots. At this depth and speed, you can raise the periscope and

“Do not raise the scope for too long a period of time, or you will be detected.”

observe the target. At depths below 70 feet or speeds greater than 10 knots, you cannot raise the periscope. Do not raise the scope for too long a period of time, or you will be detected. You should make an observation in less than 10 seconds.

From the periscope observation,

the user estimates range and course. Add this information to the LOS diagram.

Range is inversely proportional to the number of horizontal divisions that the target covers in the periscope. For this periscope, there are eight divisions per degree of arc. One degree of

arc at one nautical mile is 100 feet high. This target is 100 feet high. When it covers eight divisions in the periscope, it is one nautical mile, or approximately 2,000 yards, away. Similarly, four divisions are 4,000 yards, and two divisions are 8,000 yards.

Course: The direction of travel measured clockwise from north between 000 and 360 degrees.

Speed: The rate of travel measured in knots. A knot is one nautical mile per hour. A nautical mile is 2,024 yards (approximated by 2,000 yards).

Range: The distance between sub and target, usually measured in yards.

Bearing: The direction of the target from the sub, measured clockwise from north between 000 and 360 degrees. This is the LOS.

Relative Bearing: (RB) The direction of the target from the sub, measured clockwise from the bow (front) of the sub between 000 and 360 degrees.

Torpedo Lead Angle: (TLA) The angle measured from the LOS to the torpedo course.

Angle on the Bow: (AOB) The angle measured clockwise or counterclockwise from the bow of the target to the LOS between 000 and 180 degrees. It is called “port” if you see the port (left) side of the target or “starboard” if you see the starboard (right) side of the target.

Track Distance: The distance the torpedo must travel to intersect with the target course, extended in either direction. This must be less than 4,000 yards in this model.

Target Speed Across the LOS: The speed of the target perpendicular to the LOS. It is target speed times the sine of AOB.

Sub Speed Across the LOS: The sub speed times the sine of RB.

Torpedo Speed Across the LOS: Torpedo speed times the sine of TLA.

Speed in the LOS: Speed parallel to the LOS. Equals speed times the cosine of the appropriate angle.

Relative Speed: The apparent speed to the sub. It is as if the sub were stationary and the target had all the speed.

Range Rate: Proportional to relative speed in the LOS. If the target is traveling at 10 knots with AOB = 60 degrees and sub is traveling at 10 knots with the RB = 60 degrees, the relative speed in the line of sight is $10 \cdot \cos(60) + 10 \cdot \cos(60) = 10$ knots. The two ships are approaching at 10 knots or 20,400 yards/hour or 340 yards/minute. The range rate is 340 yards/minute. Refer to Fig. 2.

Bearing Rate: (BR) Proportional to the relative speed across the LOS. In Fig. 2, the relative speed across the LOS is $10 \cdot \sin(60) + 10 \cdot \sin(60) = 17.32$ knots. At 2,000 yards (one nautical mile) the bearing rate is $(\text{SPEED IN KNOTS})/(\text{RANGE IN MI.}) = 17.32$ degrees/minute.

The Generated Solution: What the sub thinks the target is doing. Torpedo course is calculated by the ship’s computer based on the generated solution. It does this by matching the speed of the torpedo across the LOS with the speed of the target across the LOS. This is a collision course caused by forcing a zero bearing rate.

Torpedo Course: Target bearing + torpedo lead angle.

Table 1. Definitions

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Observe the target. You determine the course from the angle on the bow (AOB). Refer to Fig. 1. The target course is the reciprocal of the bearing (180 degrees plus or minus bearing) plus a port AOB or minus a starboard AOB. Figure 3 shows the eight different perspectives that appear in the program. More perspectives could be drawn if computer memory were not a limitation.

Perspective 1 is the target coming straight at the sub. Refer to the circle

“Having the target course and range, the user adjusts target speed until the generated bearing rate matches the actual bearing rate reported by sonar.”

diagram in Fig. 3. This perspective is shown when the AOB is less than port or starboard 15 degrees. Perspectives 2 and 8 represent AOBs between 15 and 74 degrees. Notice how the front deck line appears. Perspectives 3 and 7 represent AOBs between 75 and 104 degrees. Perspectives 4 and 6 are AOBs between 105 and 164 degrees. The stern (rear of target) is seen in these. Perspective 5 (the target going straight away) is for AOBs greater than port or starboard 165 degrees.

Having the target course and range, the user adjusts target speed until the generated bearing rate matches the actual bearing rate reported by sonar. When these are equal, the solution is “tracking.” If the solution remains tracking, it is the correct solution. If

Command	Meaning
OD XXXX <enter>	Make sub depth XXX feet
OS XX <enter>	Make sub speed XX knots
OC XXX <enter>	Make sub course XXX degrees
TC XXX <enter>	Make generated target course XXX degrees
TS XX <enter>	Make generated target speed XX knots
TR XXXXX <enter>	Make generated range XXXXX yards
AT XX.X <enter>	Advance simulation XX.X min.
TA <enter>	Put true data into the generated solution—only for cheaters or novices
FI <enter>	Fire the torpedo
US <enter>	Up scope
TB <enter>	Set generated bearing = to sonar true bearing; if the generated solution is wrong, the generated bearing will soon be wrong—watch this
RD <enter>	Restore the display if it gets “messed up,” which can happen if you hit clear at command input
ANY KEY <enter>	Advance simulation time .1 minute and update display
QUIT <enter>	Exit from the program
RUN <enter>	Start a new run right now

Table 2. Commands

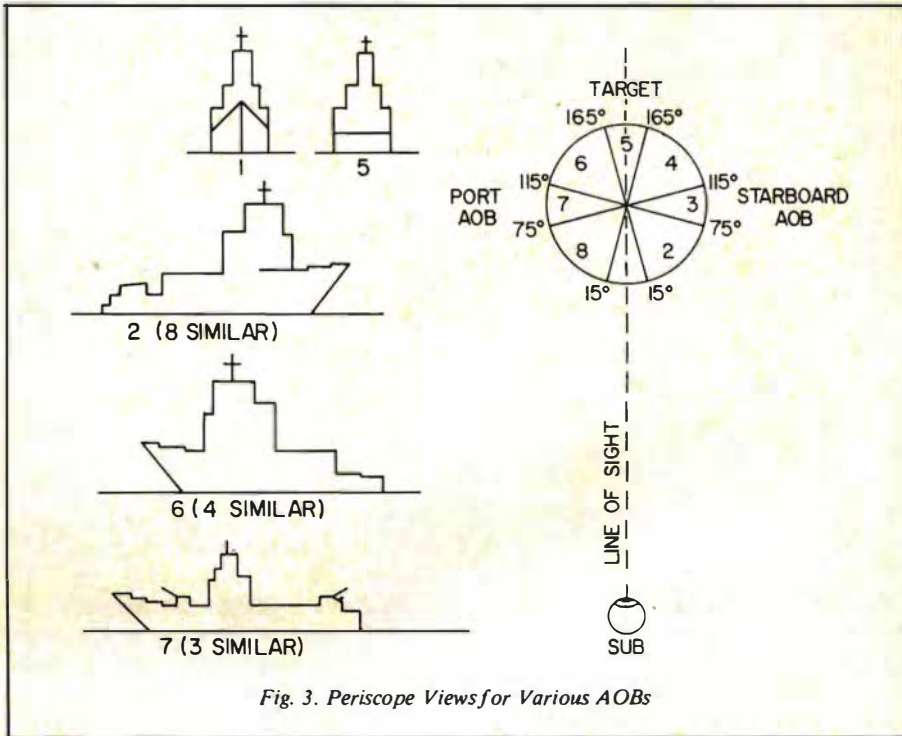


Fig. 3. Periscope Views for Various AOBs

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the generated and actual bearing rates begin to differ, either the target changed course or speed (zigged), or the solution was not correct.

that track for some period of time. An example of this is Fig. 4. In the first LOS diagram the target is getting closer. In the second the target is getting farther away. They both have the

There are any number of solutions

Variable	Function
A	Function to calculate torpedo course
A\$	Command string
A()	Graphic image of torpedo
A1()	Graphic image of torpedo
A2()	Graphic image of torpedo
AB	Angle on the bow
AC	Submarine acceleration
AN\$	Display string for angle on bow
B()	Bearing of target 0—passed to and from position keeping routine 1—actual data (truth) 2—generated data
B1	New bearing—compared to last value for rate
BR()	Bearing rate of target (0,1,2) *
C()	Submarine course 0—passed to and from position keeping routine 1—sub course 2—torpedo course
CT()	Target course (0,1,2)* Old course—used to detect zigs Sub depth Distance to target track—if >4,000 yards, the torpedo stops
DC	Desired course
DD	Desired depth
DR	Depth rate
DS	Desired speed
DT	Delta time of simulation = .1 minutes
DX	Change in distance in LOS
DY	Change in distance across LOS
F1	Torpedo course
H	Hit switch 1 = hit 2 = shut down 3 = miss
HMS\$	Draw string for divisions on scope
M	A function that keeps bearings and courses between 000 and 360 degrees
MI	2,024 yards/nautical mile
MM	Rate at which correlations are made between desired and actual courses and speeds—value of .5 means half the discrepancy is corrected each delta time of the simulation
OC\$	Value of the command string
R()	Range (0,1,2) *
R1	New range—compare to old to get range rate
RB	Relative bearing
RR()	Range rate (0,1,2) *
SS()	Draw strings for different target aspects
S()	Submarine speed 1—passed to and from position keeping routine 2—actual 3—torpedo
SA	Relative speed across line of sight
SF	Scale factor to make target the right size
SF\$	String of SF
SI\$	Side of target seen (P or S)
SO	Old target speed used to detect zigs
ST()	Target speed (0,1,2) *
SW	Switch indicating a range estimate entered
T	Time
T0	Intermediate value of torpedo course
T1\$	Titles for display
TA	Track angle
X	Function argument, also used for miss distance

*Subscripts have same meaning as for B().

Table 3. Main Variables

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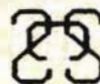
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Lines	Function
9900-9904	Break disable
9905 +	Initialization and display
30-33	Position-keeping subroutine
35	Command input
50-220	Display of information (control room)
300-340	Calculate torpedo course
350	End-of-run display
400-450	Fire torpedo, calculate hit/miss
500-599	Periscope display, scale target size
600-612	Torpedo display and animation
1000-1030	Calculate actual data every DT
1110-1147	Calculate generated data every DT
1200-1320	Simulation control loop
1400-1430	Decode commands

Table 4. Program Structure

same bearing rate at the instant shown and continue to track for a little while. Both cannot be right.

The control-room display at the time of firing is shown in Photo 1. The top line is submarine data, including the actual sonar bearing of the target. On the next line are course rate, depth rate, and acceleration.

The next two lines are target data. The actual bearing rate from sonar is shown for comparison with the generated bearing rate. Torpedo data is on the next line. The sub's computer calculates torpedo courses at the time of firing based on the generated solution. The bottom lines are for command input and communications output.

To get to a good firing point, the sub might have to go deep and fast. The simulation restricts the submarine

to above 1,000 feet and less than 30 knots. To close the range to the target and get to a good firing point, select a course for the sub that is ahead of the target. This produces a good AOB, or aspect at the firing point. Refer to your LOS diagram to help pick a leading course.

If the sub goes too fast at too shallow a depth, "cavitation" (propeller noise) occurs. This results in detection by the target, and an attack occurs. You can find the relationship of speed and depth producing cavitation experimentally, or you can look for it in the program.

The torpedo travels 4,000 yards at a speed of 45 knots. If the target is going away from you, the torpedo might shut down before it reaches the target, even if you are closer than 4,000 yards when you fire. If the target is getting closer, the range at the time of firing may be greater than 4,000

yards. The track distance must be less than 4,000 yards. Refer to Fig. 1. The computer knows this distance, but I will let you figure it out.

While maneuvering deep and at high speed, the target can change course and speed. You know this if a previous tracking solution deteriorates. Sonar can also detect the change and tell you about a possible target "zig." You must decide whether to slow down and go up to periscope depth to see what happened, or continue to try to close the target range. Sonar has been known to make mistakes. It detects true "zigs" about one-third of the time and reports occasional spurious "zigs."

The program begins with sonar reporting initial contact with the target, giving the bearing and a rough estimate of range based on the loudness of the target and judgment of the operator.

The simulation initializes the target course to produce an AOB less than 135 degrees. Target speed is between 5 and 25 knots, and range is between 2,250 and 6,250 yards. The target changes course and speed independently. The changes are limited to less than 10 knots and 45 degrees. There is a 90-percent chance that it will change one or both at least every 10 simulation minutes. One-tenth of a minute passes each time you enter a command. The AT command advances more time, but you cannot enter commands while time is advancing. If sonar detects a zig, the AT command interrupts to allow entry of a new command.

Commands to control the parameters of the generated solution,

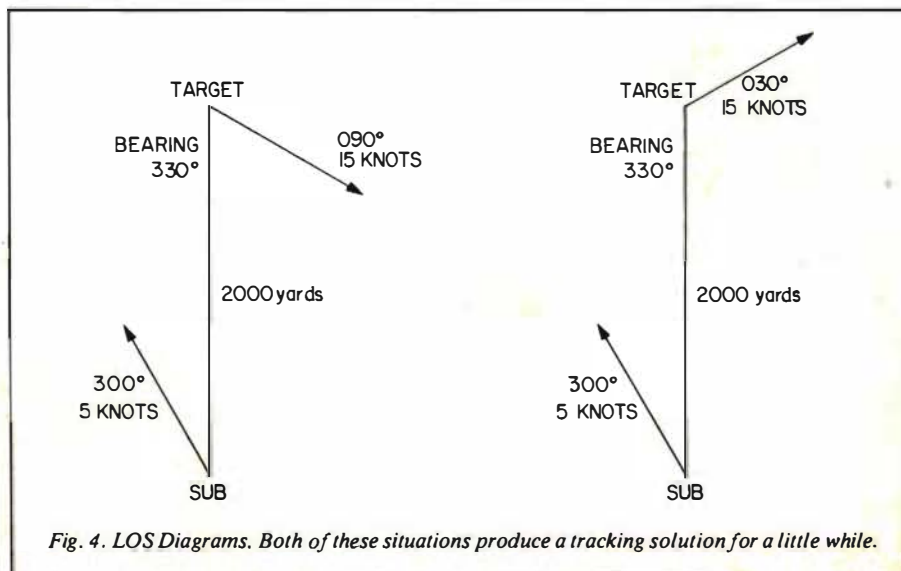
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Table 5. Cross Reference of Statement Labels and Variables

Line Numbers

30	300 400 1000 1110	J	421 500 594 596 600 601 606 607 610 612 1009 1140
35	1220		1141 10002
50	35 350 1401 10070	JK	1007 1008 1224
200	1225	K	594 600 606 607 610 612
215	330	M()	32 325 420 502 1141 9906
300	1410	MI	30 10000
350	596	MM	1002 1003 1005 10000
400	1410	OC\$	1224 1400 1402 1403 1404 1405 1406 1407 1420
500	1416	R()	30 31 205 300 350 400 430 580 1000 1009 1110 1405
502	425 435 450		1411 1420 9905 10000 10020
504	520 10003	RI	30 31
520	503		
580	530 531 532 533 534 535 536		
593	593		
594	592		
599	599		
600	592		
605	592		
610	605		
1000	1223 1224		
1140	1030		
1220	1320 10070		
1223	1419		
1400	1222		
1420	1401 1402 1403 1404 1405 1406 1407 1408 1410 1411		
	1416		
9900	10		
9905	9904		
10070	10070		

Table continued

Variables

A	30 430 440 580 594 600 9906 9907 10000
AS	35 216 593 596 599 1220 1224 1400 1401 1402 1403
	1404 1405 1406 1407 1408 1410 1411 1416 10070
A()	320 420 9905 9906
A1	610 9908
A1()	9905
A2	606 9908
A2()	9905
AB	502 530 531 532 533 534 535 536 537
AC	200 1003 1018 1019
AN\$	210 1110
AN()	32 1000 1110 9905
BS	350
B()	30 31 200 205 300 350 430 502 1000 1023 1110 1141
	1408 1411 1416 9905 9906 10000 10010
B1	30 31 32
BR()	31 210 1000 1110
C()	30 200 215 320 325 421 425 440 605 1000 1004 1005
	1022 1141 9905 10000 10001 10040
CO	1006 1007
CR	200 1005 1022
CT()	30 32 205 300 350 400 430 440 502 1000 1006 1007
	1023 1110 1141 1406 1411 1416 9905 10000
D0	200 500 1002 1021 1023 10000 10001
D1	430 435 440
DC	1004 1005 1402 10001
DD	1002 1404 10001
DR	200 1002 1021
DS	1003 1403 10001
DT	30 31 1002 1003 1005 1018 1021 1022 1200 1224 10000
DX	30
DY	30
F1	420 425 430 440 605
G	9907 9908
H	425 435 450 592 601 605
H1	9904
H2	9902
H3	9900 9901 9904
H4	9900 9903
H7	9902
H8	9900 9902
HA	9903
HM\$	517 10002
I	7 596 9900 9901 9902 9903 10003



Photo 2. Periscope View Just After Firing



Photo 3. A Hit

maneuver the submarine, and fire the torpedo are included in Table 2.

Details of the Program

Type in the Program Listing without comments or unnecessary spaces. Doing so leaves about 600 bytes of memory in a 16K machine during execution. This amount is necessary to evaluate FNA and FNM (functions A and M). Basic apparently allocates memory dynamically to evaluate functions.

```

RB      30
RR( )  31 210 1000 1110
S$     530 531 532 533 534 535 536 537 591
S$( )  530 531 532 533 534 535 536 537 9905 9910 9911 9912
      9913 9914 9915 9916 9917
S( )   30 200 215 300 310 400 410 500 1000 1003 1018 1019
      1023 9905 10000 10001 10040
SA     30 310 410
SF     580 581 590
SF$    590 591
SI$    32 1110
SO     1006 1007
ST( )  30 205 300 350 400 1000 1006 1007 1023 1110 1407
      1411 1416 9905 10000
SW     1030 1420
T      200 1200 10000
T0     310 320 410 420
T1$    59 10061
T2$    59 10062
T3$    59 10063
T4$    59 10064
T5$    59 10065
T6$    59 10066
T7$    59 10067
T8$    59 10069
TA     30 32
TI     30 10000
X      440 450 9905 9906

```

Lines 9900-9905 disable the break key except during command input. In line 9905, the POKE 65495,1 causes the program to execute faster. If your computer does not support this, delete the POKE.

Table 5 is a cross reference of statement labels and variables. This is very useful in understanding the program flow. Table 3 defines the variables in the program, while Table 4 summarizes the program structure.

Photo 2 shows the target just after firing. It has a port 124 degrees AOB at 2,181 yards. Photo 3 shows the target after it has been hit. With some practice you can do this. Good luck! ■

Address correspondence to William Bonnell, 239 Mason Ave., Rochester, NY 14626.

Program Listing. Formatted Listing of the Simulation

```

0 *****
1 'SUBMARINE SIMULATION
2 'COPYRIGHT W.S. BONNELL 1982
3 '239 MASON AVE
4 'ROCHESTER, NEW YORK 14626
5 '*****
6 '
7 CLS:PRINT@232,"SUBMARINE":PRINT@266,"SIMULATION":FORI=0TOL000:
NEXT
10 GOTO 9900
30 RB=C(0)-B(0):TA=CT(0)-B(0):SA
=ST(0)*SIN(TA/A)-S(0)*SIN(RB/A):
DY=R(0)+ST(0)*MI/TI*DT*COS(TA/A)
-S(0)*MI/TI*DT*COS(RB/A):DX=ST(0)
)*MI/TI*DT*SIN(TA/A)-S(0)*MI/TI*
DT*SIN(RB/A):R1=SQR(DX*DX+DY*DY)
:B1=B(0)+A*ATN(DX/DY)
31 RR(0)=(R1-R(0))/DT:BR(0)=(B1-
B(0))/DT:R(0)=R1:B(0)=B1
32 TA=FNM(CT(0)-B1):AN(0)=(180-T
A)*((TA>180)+ABS(TA<=180)):IF TA
>180 THEN SI$="P" ELSE SI$="S"
33 RETURN
35 PRINT@448,"":LINE INPUT"ente
r command":A$:PRINT@448,"":PRINT
@480,"":IFLEN(
A$)>15 THEN GOSUB50:RETURN ELSE
RETURN
50 CLS
59 PRINT "OWN SHIP":PRINT T1$:PR
INT:PRINTT8$:PRINT:PRINTT2$:PRIN
TT5$:PRINT:PRINTT6$:PRINTT3$:PRI
NT:PRINTT4$:PRINTT7$
200 PRINT@64,"":PRINT USING "##
.## ";T:PRINT USING"###.# ";C(1
),S(1),B(1),D0:PRINT@128,"":PRI
NT USING"#### ";CR,DR,AC
205 PRINT@224,"":PRINT USING "#
#### ";R(2),CT(2),ST(2),B(2):
210 PRINT@320,"":PRINT USING "#
###.# ";BR(1),BR(2),RR(2):PRINT
" ";AN$
215 PRINT@416,"":PRINTUSING "##
### ";C(2),S(2)
216 IF A$="FI" THEN PRINT @430,"
X";
220 RETURN
300 S(0)=0:R(0)=R(2):ST(0)=ST(2)
:CT(0)=CT(2):B(0)=B(2):GOSUB 30
310 T0=SA/S(2)
320 C(2)=FNA(T0)
325 C(2)=FNM(C(2))
330 GOSUB 215
340 RETURN
350 GOSUB 50:PRINT@172,"GENERATE
D/ACTUAL":PRINT@256,"":PRINTUS
ING"#### ";R(1),CT(1),ST(1),B(1
):PRINTB$:RETURN
400 S(0)=0:R(0)=R(1):ST(0)=ST(1)
:CT(0)=CT(1):GOSUB 30
410 T0=SA/S(2)
420 F1=FNM(FNA(T0))
421 PRINT@430,"X":FOR J=
1 TO300:NEXT:PRINT@480,"FISH AWA
Y-COURSE ";PRINT USING"###";C(2
):FOR J=1 TO2000:NEXT
425 IF F1=C(2) THEN H=1:GOTO 502
430 D1=R(1)/SIN((CT(1)-F1)/A)*SI
N((CT(1)-B(1))/A)
435 IF D1>4000 THENH=2:GOTO 502

```

Listing continued

```

440 X=SIN((C(2)-F1)/A)*D1/SIN((C
T(1)-C(2))/A)
450 IF ABS(X)<75 THEN H=1:GOTO 5
02 ELSE H=3:GOTO 502
500 IF D0>70 OR S(1) >10 THEN PR
INT@480, "SCOPE WONT GO UP
";:FOR J=1 TO 1000:NEXT:RETURN
502 AB=B(1)-180-CT(1):AB=FNM(AB)
503 GOTO 520
504 PCLS:COLOR 1,0
505 SCREEN 1,1
508 CIRCLE (128,96),80
510 LINE(128,96)-(128,176),PSET
512 LINE -(48,95),PRESET
514 LINE -(208,95),PSET
516 PAINT(128,19),1,1
517 LINE(128,96)-(128,16),PRESET
:DRAW HM$
518 RETURN
520 GOSUB 504
530 IF AB>345 OR AB<15 THEN S$=S
$(1):GOTO 580
531 IF AB<75 THEN S$=S$(5):GOTO
580
532 IF AB<105 THEN S$=S$(3):GOTO
580
533 IF AB<165 THEN S$=S$(7):GOTO
580
534 IF AB<195 THEN S$=S$(2):GOTO
580
535 IF AB<255 THEN S$=S$(6):GOTO
580
536 IF AB<285 THEN S$=S$(0):GOTO
580
537 IF AB<345 THEN S$=S$(4)
580 SF=INT(8.38*A*ATN(100/(3*R(1
)))+.5):IF SF<1 THEN SF=1
581 IF SF>18 THEN SF=18
590 SF$="S"+STR$(SF)
591 DRAW SF$+S$
592 IF H=1 THEN 594 ELSE IF H=2
THEN 600 ELSE IF H=3 THEN 605
593 A$=INKEY$:IF A$="" THEN 593
ELSE RETURN
594 FOR J=175 TO 113 STEP -2:FOR
K=1 TO 10:PLAY"O4V31T255A":NEXT
:PUT(124,J)-(132,J-15),A,PSET:NE
XT:FOR J=1 TO 50:PLAY"OlV31T255C
":NEXT
596 FOR J=1 TO 50:CIRCLE(128,96)
,J,0:NEXT:GOSUB350:PRINT @448,"R
UN OR QUIT ";:PRINT@480,"WELL DO
NE";:FOR I=0 TO 1 STEP 0:A$=INKE
Y$:IF A$="R" THEN RUN ELSE IF A$
="Q" THEN CLS:POKE 65494,0:STOP
ELSE NEXT
599 A$=INKEY$:IF A$=""THEN599ELS
E RETURN
600 FOR J=175 TO 125 STEP-2:FOR
K=1 TO 10:PLAY"O4V31T255A":NEXT:
PUT(128,J)-(136,J-15),A,PSET:NEX
T
601 PRINT@480,"TORPEDO SHUT DOWN
";:FOR J=1 TO 1000:N

```

```

EXT:H=0:RETURN
605 H=0:IF C(2)>F1 THEN 610
606 FOR J=170 TO 112 STEP-2:FORK
=1 TO 10:PLAY"O4V31T255A":NEXT:P
UT(114-170+J,J)-(122-170+J,J-15)
,A2,PSET:NEXT
607 FOR K=1 TO 200:NEXT:PRINT@48
0,"MISS LEFT ";:FOR J
=1 TO 1000:NEXT:RETURN
610 FOR J=170 TO 112STEP-2:FOR K
=1 TO 10:PLAY"O4V31T255A":NEXT:P
UT(136+170-J,J)-(144+170-J,J-15)
,A1,PSET:NEXT
612 FOR K=1 TO 200:NEXT:PRINT@48
0,"MISS RIGHT ";:FO
R J=1 TO 1000:NEXT:RETURN
1000 S(0)=S(1):R(0)=R(1):C(0)=C(
1):B(0)=B(1):CT(0)=CT(1):ST(0)=S
T(1):GOSUB30:BR(1)=BR(0):RR(1)=R
R(0):R(1)=R(0):B(1)=B(0):AN(1)=A
N(0)
1002 DR=(DD-D0)*MM/DT
1003 AC=(MM*(DS-S(1))/DT)
1004 IF DC-C(1)>180 THEN DC=DC-3
60 ELSE IF DC-C(1)<-180 THEN DC=
DC+360
1005 CR=MM*(DC-C(1))/DT
1006 SO=ST(1):CO=CT(1):CT(1)=CT(
1)+(45-RND(90))*(RND(100)<=2):ST
(1)=ABS(ST(1)+(10-RND(20))*(RND(
100)<=1))
1007 IF SO*CO<>ST(1)*CT(1) THEN
IF RND(3)=1 THEN PRINT@480,"POSS
IBLE ZIG";:JK=10000
1008 IF RND(100)=1 THEN PRINT@48
0,"POSSIBLE ZIG ";:JK=
10000
1009 IF R(1)<1000 THEN CLS0:FORJ
=1TO3000:NEXT:CLS:PRINT"YOU DIED
":POKE 65494,0:STOP
1018 S(1)=S(1)+DT*AC
1019 IF S(1)>=30 AND AC>=0 THEN
S(1)=30:AC=0
1021 D0=D0+DT*DR:IF D0>1000 THEN
D0=999:DR=0
1022 C(1)=C(1)+DT*CR
1023 IF S(1)>(.08*D0+6)^.94 THEN
PRINT@480,"CAVITATING
";:CT(1)=B(1)-180:ST(1)=35
1030 IF SW=0 THEN 1140
1110 R(0)=R(2):B(0)=B(2):CT(0)=C
T(2):ST(0)=ST(2):GOSUB30:BR(2)=B
R(0):RR(2)=RR(0):R(2)=R(0):B(2)=
B(0):AN(2)=AN(0):AN$=SI$+STR$(IN
T(AN(2)))
1140 FOR J=0 TO 2
1141 C(J)=FNM(C(J)):B(J)=FNM(B(J)
):CT(J)=FNM(CT(J))
1147 NEXT
1200 T=T+DT
1215 RETURN
1220 GOSUB 35:IF A$="RUN" THEN R
UN ELSE IF A$="QUIT"THEN CLS:POK
E 65494,0:STOP

```

```

1222 GOSUB 1400
1223 GOSUB 1000
1224 IF A$="AT" THEN FOR JK=1 TO
VAL(OC$)/DT-1:GOSUB 1000:NEXT
1225 GOSUB 200
1320 GOTO 1220
1400 A$=A$+" ":OC$=MID$(A$,3):A
$=LEFT$(A$,2)
1401 IF A$="RD" THENGOSUB50:GOTO
1420
1402 IF A$="OC" THEN DC=VAL(OC$)
:GOTO 1420
1403 IF A$="OS" THEN DS=VAL(OC$)
:GOTO 1420
1404 IF A$="OD" THEN DD=VAL(OC$)
:GOTO 1420
1405 IF A$="TR" THEN R(2)=VAL(OC
$):GOTO 1420
1406 IF A$="TC" THEN CT(2)=VAL(O
C$):GOTO 1420
1407 IF A$="TS" THEN ST(2)=VAL(O
C$):GOTO 1420
1408 IF A$="TB" THEN B(2)=B(1):G
OTO 1420
1410 IF A$="FI" THEN GOSUB 300:G
OSUB 400:GOTO 1420
1411 IF A$="TA" THEN CT(2)=CT(1)
:ST(2)=ST(1):R(2)=R(1):B(2)=B(1)
:GOTO 1420
1416 IF A$="US" THEN TIMER=0:GOS
UB 500:IF TIMER>1000 THEN CT(1)=
B(1)-180:ST(1)=35:PRINT@480,"THE
Y SAW US";:GOTO 1420 ELSE GOTO 1
420
1419 GOTO 1223
1420 OC$="":IF R(2)>0 T
1430 RETURN
9900 IF PEEK(&H3EB9)<>&H32 THEN
CLEAR200,&H3EB0:FOR I=&H82B9 TO&
H831E:POKEI-&H4400,PEEK(I):NEXT
ELSE 9904
9901 FORI=0 TO 2:POKE&H3EBD+I,18
:NEXT:I=&H3F1E
9902 POKEI,&H26:POKEI+1,3:POKEI+
2,&H7E:POKEI+3,&H83:POKEI+4,&H22
:POKEI+5,&H7E
9903 POKEI+6,&HA4:POKEI+7,&H4C
9904 POKE&H19B,&H3E:RUN9905
9905 POKE 65495,1:CLEAR200:DIMSS$
(7),C(3),S(3),CT(3),ST(3),R(3),B
(3),AN(3),A(3),A1(3),A2(3):X=RND
(-TIMER):PMODE4,1
9906 DEF FNA(X)=B(1)+A*ATN(X/SQR
(-X*X+1)):DEF FNM(X)=SGN(X)*(ABS
(X)/360-INT(ABS(X)/360))*360-360
*(X<0)
9907 PCLS:CIRCLE(128,96),2,1,3:G
ET(124,108)-(132,93),A,G
9908 PCLS:DRAW "C1BM128,96;E6F1G
6H1":GET (126,100)-(134,85),A1,G
:PCLS:DRAW"BML34,96;H6G1F6E1":GE
T(128,104)-(136,89),A2,G:PCLS
9910 S$(0)="C0BM120,96NL22R38U4L
4U2H3NE3L4D2L20U6L4U6L2NU2L2D4L2

```

```

D4L2D4L6U2L4NH3D2L4U1L4U1L4U1L4F
10"
9911 S$(1)="C0BM128,96L6U4NE6U4R
2U4R2U6R2U3NL2NR2D3R2D6R2D4R2D4N
H6D4L6"
9912 S$(2)="C0BM128,96L6U8R2U4R2
U6R2U3NL2NR2D3R2D6R2D4R2D8L6"
9913 S$(3)="C0BM136,96NR22L38U4R
4U2E3NH3R4D2R20U6R4U6R4NU2R2D4R2
D4R2D4R6U2R4NE3D2R4U1R4U1R4U1R4G
10"
9914 S$(4)="C0BM120,96BL8H9R4D1R
4D1R4NR4U6R2U6R4U3NL2NR2D3R4D4R4
D8R12D4R3U2R4D2R2D2R2D1L40"
9915 S$(5)="C0BM136,96BR8E9L4D1L
4D1L4NL8U6L2U6L4U3NR2NL2D3L4D4L4
D8L12D4L3U2L4D2L2D2L2D1R40"
9916 S$(6)="C0BM120,96BL8H9R4D1R
4D1R4U6R2U6R4U3NL2NR2D3R4D4R4D8R
12D4R9D3L4NU3L34"
9917 S$(7)="C0BM136,96BR8E9L4D1L
4D1L4U6L2U6L4U3NR2NL2D3L4D4L4D8L
12D4L9D3R4NU3R34"
10000 T=0:R(1)=2250+RND(4000):B(
1)=RND(360):C(1)=RND(360):S(1)=5
:CT(1)=B(1)-45-RND(270):ST(1)=5+
RND(20):DT=.1:TI=60:A=57.2957795
1:S(2)=45:D0=60:MI=2024:MM=.5
10001 DS=S(1):DC=C(1):DD=D0
10002 HM$="D5NL5":FOR J=1 TO 4:H
M$=HM$+HM$:NEXT:HM$="S4C0"+HM$
10003 GOSUB 504:FOR I=0TO2000:NE
XT
10010 CLS:PRINT"SONAR CONTACT BE
ARING"B(1)
10020 IF R(1)>3500 THEN PRINT "B
EYOND 3500 YDS." ELSE PRINT "LES
S THAN 3500 YDS."
10040 PRINT "SUB COURSE"C(1)"SPE
ED"S(1)
10052 PRINT"COMMANDS - OS,OC,OD,
TC,TS,TR,TB,FI,AT,RD,US,TA,RUN,Q
UIT
10055 PRINT:PRINT"YOU HAVE THE C
ONN,":PRINT"I STAND RELIEVED":PR
INT
10060 PRINT"HIT ANY KEY TO START
10061 T1$="time course speed bea
rs depth"
10062 T2$="TARGET DATA(GENERATED
)"
10063 T3$="bearing rate range r
ate bow"
10064 T4$="TORPEDO SOLUTION(GENE
RATED)"
10065 T5$="range course speed be
aring"
10066 T6$="actual ---generated-
--> angle"
10067 T7$="course speed ready fi
red"
10069 T8$=" cr dr ac"
10070 A$=INKEY$:IF A$=""THEN 100
70 ELSE CLS0:GOSUB50:GOTO 1220

```

JOURNEY TO THE CENTER OF THE ROM—PART II

Last month I explained how the Color Basic interpreter uses certain areas of the Color Computer's memory to perform specific tasks. This month I'll take a close look at the remaining areas of the Color Computer's memory, which include the Basic-program area, the simple-variables area,

Learn how the Color Basic interpreter manipulates the CoCo's memory to perform specific tasks.

the array-variables area, the free-memory area, the stack area, the reserved-memory area, the Extended Color Basic ROM area, the Color Basic ROM area, the Disk Extended Color Basic ROM area (or ROM pack area), and the input/output area.

The Basic-Program Area

The Basic-program area starts at the location pointed to by the start of the Basic-program area pointer, which is stored in the Basic-communications area at memory locations \$0019 and \$001A. The normal start of the Basic-program area for Color Basic is \$0601.

The Simple-Variables Area

The simple-variables area follows the Basic-program area. The start of the simple-variables area pointer is stored in the Basic-communications area at memory locations \$001B and \$001C. Color Basic stores each variable as a 7-byte block. The first 2 bytes of a variable block are used to store the variable name. For numeric variables, Color Basic simply stores the first two characters of the variable name as these 2 bytes.

For string variables, Color Basic stores the first character of the variable name as the first byte and the second character of the variable name with bit 7 set as the second byte. The 5 bytes that follow the variable name store the floating-point value for numeric variables or the string length and the string address for string variables.

Table 1 illustrates how Color Basic stores a numeric variable in the simple-variables area. Table 2 illustrates how

00	First Character of the Variable Name
+01	Second Character of the Variable Name
+02	EXP of the Floating-Point Value
+03	MSB of the Floating-Point Value
+04	NMSB of the Floating-Point Value
+05	NNMSB of the Floating-Point Value
+06	LSB of the Floating-Point Value

Where:

EXP	is the exponent
MSB	is the most-significant byte
NMSB	is the next-most-significant byte
NNMSB	is the next next-most-significant byte
LSB	is the least-significant byte

Table 1. A Numeric Variable

00	First Character of the Variable Name
+01	Second Character of the Variable Name with Bit 7 Set
+02	String Length
+03	Reserved
+04	MSB of the String Address
+05	LSB of the String Address
+06	Reserved

Where:

MSB	is the most-significant byte
LSB	is the least-significant byte

Table 2. A String Variable

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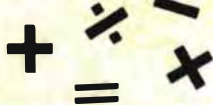
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Color Basic stores a string variable in the simple-variables area.

The Array-Variables Area

The memory area that follows the simple-variables area is the array-variables area. The start of the array-variables area pointer is stored in the Basic-communications area at memory locations \$001D and \$001E. Table 3 illustrates how Color Basic would store an array variable in the array-variables area. For the purpose of this illustration assume that the array variable was dimensioned as A(5,4).

The Free-Memory Area

The free-memory area immediately follows the array-variables area. The start of the free-memory area pointer is stored in the Basic-communications area at memory locations \$001F and \$0020. The free-memory area is unused by the Color Basic interpreter.

The Stack Area

The stack area immediately follows the free-memory area. The start of the stack area is the address pointed to by the 6809's hardware stack pointer (register S). In addition to storing the values required for normal 6809 stack operation, Color Basic uses the stack area to store temporary information. Each time the Color Basic interpreter encounters a FOR statement, it places information on the stack that will be used by a corresponding NEXT statement.

Table 4 illustrates the FOR frame that the Color Basic interpreter would place on the stack after a FOR statement is encountered. Each time the Color Basic interpreter encounters a GOSUB statement, it places informa-

00	41	First Character of the Variable Name
+01	00	Second Character of the Variable Name
+02	00	MSB of the Offset to the Next Array
+03	9F	LSB of the Offset to the Next Array
+04	02	Number of Subscripts in the Array
+05	00	MSB of the Number of Elements + 1 in the Second Subscript
+06	05	LSB of the Number of Elements + 1 in the Second Subscript
+07	00	MSB of the Number of Elements + 1 in the First Subscript
+08	06	LSB of the Number of Elements + 1 in the First Subscript
+09	Element 0,0	(5-Byte Block)
+0E	Element 1,0	(5-Byte Block)
+13	Element 2,0	(5-Byte Block)
+18	Element 3,0	(5-Byte Block)
+1D	Element 4,0	(5-Byte Block)
+22	Element 5,0	(5-Byte Block)
+27	Element 0,1	(5-Byte Block)
+2C	Element 1,1	(5-Byte Block)
+31	Element 2,1	(5-Byte Block)
+36	Element 3,1	(5-Byte Block)
+3B	Element 4,1	(5-Byte Block)
+40	Element 5,1	(5-Byte Block)
+45	Element 0,2	(5-Byte Block)
+4A	Element 1,2	(5-Byte Block)
+4F	Element 2,2	(5-Byte Block)
+54	Element 3,2	(5-Byte Block)
+59	Element 4,2	(5-Byte Block)
+5E	Element 5,2	(5-Byte Block)
+63	Element 0,3	(5-Byte Block)
+68	Element 1,3	(5-Byte Block)
+6D	Element 2,3	(5-Byte Block)
+72	Element 3,3	(5-Byte Block)
+77	Element 4,3	(5-Byte Block)
+7C	Element 5,3	(5-Byte Block)
+81	Element 0,4	(5-Byte Block)
+86	Element 1,4	(5-Byte Block)
+8C	Element 2,4	(5-Byte Block)
+91	Element 3,4	(5-Byte Block)
+96	Element 4,4	(5-Byte Block)
+9B	Element 5,4	(5-Byte Block)

Table 3. An Array Variable

tion on the stack that will be used by a corresponding RETURN statement.

Table 5 illustrates the GOSUB frame that the Color Basic interpreter would

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00	MSB of the FOR's ESP
-01	LSB of the FOR's ESP
-02	MSB of the FOR's Basic Line Number
-03	LSB of the FOR's Basic Line Number
-04	EXP of the TO Value
-05	MSB of the TO Value
-06	NMSB of the TO Value
-07	NNMSB of the TO Value
-08	LSB of the TO Value
-09	SF of the STEP Value
-0A	EXP of the STEP Value
-0B	MSB of the STEP Value
-0C	NMSB of the STEP Value
-0D	NNMSB of the STEP Value
-0E	LSB of the STEP Value
-0F	MSB of the FOR's VARPTR
-10	LSB of the FOR's VARPTR
-11	FOR Token

Where

EXP is the exponent
 MSB is the most-significant byte
 NMSB is the next-most-significant byte
 NNMSB is the next next-most-significant byte
 LSB is the least-significant byte
 SF is the sign flag
 ESP is the encoded-statement pointer

Table 4. A FOR Frame

00	MSB of the Return Address
-01	LSB of the Return Address
-02	MSB of the GOSUB's ESP
-03	LSB of the GOSUB's ESP
-04	MSB of the GOSUB's Basic Line Number
-05	LSB of the GOSUB's Basic Line Number
-06	GOSUB Token

Where:

MSB is the most-significant byte
 LSB is the least-significant byte
 ESP is the encoded-statement pointer

Table 5. A GOSUB Frame

FF00-FF03	PIA1
FF00	Bits 0-1 Joystick Buttons
	Bits 0-6 Keyboard Row Input
	Bit 7 Joystick Comparison Value
FF01	PIA Control Register A
	CA1 63.5 μSEC IRQ
	CA2 LSB of Output to MUX
FF02	Bits 0-7 Keyboard Column Output
FF03	PIA Control Register B
	CB1 16.7 mSEC IRQ
	CB2 MSB of Output to MUX
FF20-FF23	PIA2
FF20	Bit 0 Cassette Input
	Bit 1 RS-232 Output
	Bits 2-7 DAC Output
FF21	PIA Control Register A
	CA1 RS-232 Carrier-Detect FIRQ
	CB2 Cassette Motor Control
FF22	Bit 0 RS-232 Input
	Bit 1 Sound
	Bit 2 RAM Jumper Input
	Bit 3 VDG CSS
	Bit 4 VDG GM0 and I/E
	Bit 5 VDG GM1
	Bit 6 VDG GM2
	Bit 7 VDG A/G
FF23	PIA Control Register B
	CB1 Cartridge FIRQ
	CB2 Sound Enable
FFC0-FFC5	Video Display Mode
FFC6-FFD3	Video Memory Start
FFD4-FFD5	RAM Bank
FFD6-FFD9	MPU Speed
FFDA-FFDD	Memory Size
FFDE-FFDF	Memory Type
FFF0-FFFF	Vectors
FFF0	Not Used
FFF2	SWI3
FFF4	SWI2
FFF6	FIRQ
FFF8	IRQ
FFFA	SW1
FFFC	NMI
FFFE	RESET

Table 6. The Input/Output Area

place on the stack after it encounters a GOSUB statement.

Note that Tables 4 and 5 refer to the ESP. The ESP is the encoded-statement pointer, which is used by Color Basic to point to the location in memory of the current byte being executed. The encoded-statement pointer is stored in the Basic-communications area at memory locations \$00A6 and \$00A7.

The String-Space Area

The string-space area immediately follows the stack area. The start of the string-space area pointer is stored in the Basic-communications area at memory locations \$0021 and \$0022. Color Basic uses the string-space area to store string values.

The Reserved-Memory Area

The reserved-memory area immediately follows the string-space area. The start of the reserved-memory area pointer is stored in the Basic-communications area at memory locations \$0027 and \$0028. The reserved-memory area is set aside by the CLEAR statement for the storage of machine-language sub-routines.

The Extended Color Basic ROM Area

The memory area from \$8000 to \$9FFF is reserved for the Extended Color Basic ROM.

The Color Basic ROM Area

The memory area from \$A000 to

\$BFFF is the location of the Color Basic ROM.

The Disk Extended Color Basic ROM or ROM-Pack Area

The memory area from \$C000 to \$FEFF is reserved for either the Disk Extended Color Basic ROM or a ROM pack.

The Input/Output Area

The memory area from \$FF00 to \$FFFF is the hardware input/output area. Table 6 illustrates how the Color Computer uses this area. ■

Address correspondence to Mark D. Goodwin, Star Route 79, Box 103, Orland, ME 04472.

Coming Next Month

If you have children, you probably use your Color Computer as an aid in their education. December's HOT CoCo focuses on education in the home and in the classroom.

We will feature a number of application programs. You only have to type them in and they'll be ready for use. If you are confident in your programming, perhaps you prefer to write software suited to your child's needs. If so, F. J. Rauche will tell you how to write educational programs that your child will enjoy using.

Many of you have probably seen and used a states-and-capitals quiz program on your CoCo. But how many of you have seen a world-capitals program? Well, that's just what Duncan Dempster wrote for our December issue.

Does the right word always escape you in conversation? Michael Polito's "Muff Duff" is a vocabulary builder that will have you using ten-dollar words in no time at all. You can put your own vocabulary list in the program, too.

"Hear Here," by Tom Jones is a speaking/spelling tutor that incorporates a prerecorded voice in the program, so it is better understood than most synthesized voices. You can use the word list provided with Hear Here, or you can make your own.

We haven't forgotten the teachers among our readers. Norman Garrett's "Making the Grade" helps educators figure grade curves, making their lives a little easier.

And a New Education Column

Teachers and parents alike will appreciate our recent addition to our monthly column list: The Educated Guest. Dr. Charles Santee, the column's author, has been in education for many years, and he is excited about the possibilities the CoCo presents as a teaching aid.

He will discuss commercial software, telling you which package best suits your needs. He will often provide a program or two of his own. And, of course, he will give you his opinions on where computer-aided education is (or should be) going.

Also in December, we will review some of the recent additions to the CoCo educational software library.

Other stuff

Don't worry if you're not interested in education, because we'll have lots of other good articles in our December issue. We'll have games, utilities, and maybe a hardware project or two. We'll also have all our regular features, such as Doctor ASCII, The Basic Beat, and Elmer's Arcade. And perhaps something special for Christmas. ■

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BY MARTIN H. GOODMAN

THE DANGERS OF ROM PACKS

Never, under *any* circumstances, plug in or unplug a ROM pack with your computer turned on. Several magazines (including this one) have published articles that tell you to do this, but if you do, you run a significant chance of burning out a number of expensive chips.

Why Are There ROM Packs?

ROM packs are the quickest, most convenient way for a novice computer user to enter a program. No knowledge of any language or operating-system syntax is needed to get the program running. One just plugs in the cartridge and turns on the computer and (in most cases) the program just auto-executes.

What Is a ROM Pack?

A ROM pack is a cartridge that contains program data in the form of ROMs (read-only memory chips) or (in the case of many non-Tandy ROM packs) in the form of UV EPROMs (ultra-violet, erasable programmable read-only memory chips). These chips are connected to the edge card connector that plugs into the cartridge port on the side of your computer. Once plugged in, the chips in the ROM pack are electrically connected to the system bus of your computer, and can be read or run as program data in the same fashion that the computer reads and runs the Basic operating system, which also resides on ROM chips.

Generally, ROM packs are configured so that their data resides from address hex C000 on up. Currently available ROM packs range in size from 2K to 12K of data.

The auto-execute feature of many ROM packs is achieved by shorting one of the computer's clock lines to one of

ROM packs are an easy way for novices to load software. But don't misuse them or you'll ruin chips.

its interrupt lines on the ROM-pack card itself. The first instruction of auto-execute ROM packs must reside at address hex C000, as that is the address that the computer's control transferred to when the interrupt in question occurs.

What Is the Cartridge Port?

The cartridge port on the side of your computer is actually a system port. It brings out of the computer the address, data, interrupt, power, and other electrical lines needed to add extra memory (as in ROM packs) or other functions (such as disk control, EPROM programmers, and special input/output capabilities).

On most other computers, the system port connects to the guts of the computer through some auxiliary circuitry called buffers—chips that interpose themselves between the central processor and memory chips of your computer and the unpredictable outside world.

The Color Computer, however, is a budget machine. To keep the price down Tandy dispensed with such buffer circuitry when it designed the CoCo's system port. Thus many of the contacts on the system port connect directly to pins on the most expensive and delicate chips in your computer.

Atari computers also have unbuffered cartridge ports. Atari gets around the problem that CoCo owners have by providing a microswitch interlock on

the door that covers their cartridge port. Any time an Atari cartridge is inserted or removed, the power to the computer automatically shuts off.

Now, most of the circuitry in your computer works off a single +5-volt supply. Indeed, your two most expensive chips, the 6809 central processor and the 6883 memory-management chip, will kick their feet in the air and die within a few nanoseconds of seeing plus or minus 12 volts on any of their lines. The problem here is that plus and minus 12 volts *are* present on the system port. Specifically, the CPU halt line is adjacent to the -12-volt line and the nonmaskable interrupt (NMI) line from the CPU is located adjacent to the +12-volt line.

These lines are not used by simple ROM packs, which require only +5 volts, a cartridge-select line, and the address and data lines. On the ROM packs distributed by Tandy the traces for the 12-volt lines and the lines adjacent to those traces are removed. This greatly increases the safety of Tandy's ROM packs when they are abused.

In addition, Tandy (and most, but not all other ROM pack manufacturers) shorten or cut the trace that supplies the +5 volts to the cartridge (trace #10). This increases the likelihood that, when the cartridge *is* plugged in with the power on, power will reach the cartridge only after all the other pins have made proper contact. This last feature of Tandy's packs provide some extra safety, but it is not very significant.

Computer-Eating ROM Packs

You now have all the information needed to understand why ROM packs can eat your computer. What happens in most cases is that the 12-volt line(s)

gets shorted to a CPU or SAM line, causing one or both of those chips to blow, and at times sending a pulse of 12 volts to the RAM or PIA chips. I learned all this the hard way.

Late one October evening, I unplugged a ROM pack from a well-known CoCo vendor with the power turned on. The screen filled with an orange and green checker-board pattern that would not reset or change when I turned the power on and off.

Swapping chips confirmed that I had burned out my CPU and SAM chips. The replacement cost at the time was \$40. Those who do not do their own work on their computers would face larger bills and much longer down time than the half-hour I experienced.

For months following my nasty experience, I haunted several Color Computer clubs and spent over \$50 on CompuServe collecting information about other similar mishaps. I spoke with a local Radio Shack repair person, and I interviewed salesmen and store managers in three computer centers and numerous Radio Shack retail stores.

I found that in my area alone, almost a dozen CoCo owners destroyed their computers by the careless use of the same brand ROM pack with which I blew my CoCo. There were numerous responses on CompuServe of others who had the same experience. There were reports of similar disasters associated with most other ROM packs as well.

At one Radio Shack store, the sales people routinely plugged in and unplugged their Tandy brand packs with the power on, yet it took a couple of months before they managed to burn out their computer. However, those folks I spoke with who destroyed their computer by abusing the particular pack I was using when I killed my machine, reported that a single careless unplugging of the pack was all it took. I should note here that both Tandy and all other manufacturers of ROM packs clearly warn purchasers never to plug in or remove a pack with the power on.

I collected almost all the existing brands of ROM packs to see what made one brand more dangerous than another. There were a number of construction differences among them.

What Makes One ROM Pack More Dangerous Than Another?

Probably the most common reason ROM-pack insertion or removal can damage your computer is the shorting of the 12-volt lines to the CPU and other chips. The ROM pack with which I

did in my computer had no fewer than three differences from Tandy packs that predisposed them to this problem.

First, the traces for both the 12-volt lines and the adjacent traces were present on my ROM pack. None of these traces were needed, and Tandy omitted them in their ROM packs. Second, the traces (sometimes referred to as pins, or more properly, lands) on the card of the early versions of my ROM pack are wider than the traces on Tandy's packs. Third, the same early versions fit less snugly than Tandy's in the cartridge port, permitting it to wiggle more upon insertion and removal.

The combination of these three differences make that pack more likely to destroy computers when used in violation of the manufacturer's instructions.

This company made two changes in their ROM packs. First, they removed

“...be sure to cover trace 8 completely...”

the 12-volt and adjacent traces on their packs. This was probably the most important change because other companies produced packs identical to this one, but they lacked the traces adjacent to the 12-volt lines. I have no reports of anyone burning out a computer misusing a pack from the other companies.

The manufacturer of the pack that I misused has most recently abandoned its old design in favor of a pack similar to those made by Tandy and Anteco.

Some currently sold packs physically resemble the early versions of the one I misused, but are a little safer because they lack the traces adjacent to the 12-volt line. One other popular ROM pack has the dangerous and unnecessary 12-volt and adjacent lines, but its traces are much narrower. I have heard of no one blowing a computer misusing this ROM pack.

Two unusual ROM packs, the Radio Shack Disk Controller and the Micro Works Microtext Communications packs, require the 12-volt line. The Radio Shack pack needs it to operate the archaic Western Digital disk-controller chip, and Micro Works needs it to operate an internal op amp used in creating an extra on-line printer port.

Most ROM packs have a shortened or cut +5-volt line, though I have found no evidence that this improves the safety of the packs.

How to Improve the Safety of Your ROM Packs

There are three approaches to avoiding trouble from ROM packs. The first is to be so scrupulous in your observance of the manufacturers' instructions that you never plug in or unplug a pack with the power on. If you follow this rule, you are safe. But humans are imperfect, and sooner or later you are likely to get careless.

Also, many folks want to examine the code in the ROM packs, and so need a safe means of disabling the auto-start used on so many packs. Therefore, I will present you with two other approaches to safe use of ROM packs. One relates to modification of the hardware of the ROM pack, and the other to some modifications of the Color Computer itself.

If you own packs that have the 12-volt lines present, physically remove those traces. Doing so will significantly decrease the danger presented by those packs. To identify the traces in question, merely compare the pack to a standard Tandy pack. You'll notice that the Tandy pack is missing a total of 12 traces, three on each side of the card and at each end of the card as well.

Remove all six traces on the left side of the pack (when the pack is viewed from the bottom with the pins pointing up) that aren't present on the Tandy pack. The side in question is the one that has the shortened or cut +5-volt line on the top of the ROM pack card. If your ROM pack does not have such a shortened trace to guide you, look at one from Tandy that does.

To remove the offending traces, you must open your pack. In some cases you will have to pry through glue and in other cases drill through rivets and later replace the rivets with screws. The effort is worth it if you expect to use those packs frequently.

If you wish to examine the code in the ROM pack, *do not* listen to the articles previously published in this and other magazines that invite you to turn off the interrupt with a POKE 65315, 54. This is an invitation to disaster! Turning off the interrupts prior to plugging in a pack *in no way* decreases the chance of burning out the computer.

The correct way to defeat the auto-start is to cover trace number 8 on the ROM pack. Use a narrow piece of magic tape, and be sure to cover trace 8 completely and not cover any other traces.

After preparing the ROM pack in this fashion, insert the pack with the power

off, and then turn the power on. With trace 8 covered, the auto-start will be disabled and the computer will come up in Basic. Now you can safely do whatever you wish by way of looking at the code, transferring the code to low RAM, disassembling the code, or saving the code out to tape, using the same techniques you might use on the Basic ROMs themselves.

To find trace 8, look at the bottom of the pack with the pins pointing up in the air. If the pack has one of those spring-loaded covers, pull the cover down. On most Tandy packs, trace 8 is the first trace on the left. This is because the first six traces are removed from most Tandy packs (three on each side of the card). See Photo 1.

There are currently quite a number of expansion interfaces on the market for the Color Computer. These provide extra system slots for plugging in both ROM packs and a disk-controller card, as well as provisions for extra memory, extra I/O ports, clocks, and so on. Some of these provide switching between the ports using switches. Others (the more sophisticated ones) feature software control of which port is active.

Some of these devices (the better, more expensive ones) provide true buffering on the system port. Those that do provide a truly buffered port offer a tremendous added degree of safety to the user. The buffering protects the expensive chips in your computer from damage even if a ROM pack is inserted or removed from the expansion slot with the power on, though you should avoid this practice, even if you do have such an expansion interface.

If you own a switch box or are planning to buy one, ask the manufacturer about whether or not it is buffered.

Why Use a ROM Pack at All?

The ROM pack data resides in the upper 32K of memory starting at hex C000. With the advent of the 64K Color Computers, a delightful option became available. Why not dump the data in the ROM packs to tape (and perhaps later to disk) and then run them in the upper page of RAM using the map type 1 (all RAM) option of the SAM chip.

Well, it's a little more tricky than that. You've got to load the Basic into high RAM too. Then there is the problem of properly initializing the Basic so that the state of the computer at the time it jumps to the ROM pack data closely resembles the state it is in when it jumps on interrupt to a "real" ROM pack. This last problem is a bit tricky, though most ROM packs (Basic Aid is

an exception) are not very finicky about the state of the machine at the time of their execution.

There is one last problem. The authors of some ROM packs anticipated this approach, and deliberately buried some code in their ROM packs that causes the ROM pack to crash if it is running in RAM. This code either writes over the ROM-pack data itself or flips the map type bit of the SAM back to map type 0 (RAM/ROM mode).

Well, it is possible to run virtually all ROM packs off tape or disk. I have been doing so with essentially every ROM pack ever made for over six months. There are currently three programs on the market (to my knowledge) dedicated to freeing you from the use of ROM packs.

"Whatever measures you choose to take, please do not ignore my warnings."

It would be unfair for me to pretend to provide an objective review of these three products, as I am the author of one of them, so I will just list them:

- ROMBACK is currently being distributed by Skyline Software of Chicago (Soft City, 442 Sunnyside, Wheaton, IL 60187, \$16.95), by Peacock Enterprises (194 Cannongate III Road, Nashua, NH 03063, \$25 for a large package of utilities that includes ROMBACK), and by me (Marty Goodman, 1529 Addison St., Berkeley, CA 94703, \$16.95 for ROMBACK, \$25 for ROMBACK

plus a number of my other utilities). ROMBACK is distributed with patches to most protected ROM packs that remove the offending code put in to defeat their running in RAM. ROMBACK produces runnable versions of ROM packs.

- ROMCRACK, from Spectrum Projects (93-15 86th Drive, Woodhaven, NY 11421), is sold with two other utilities and costs \$21.95. It produces runnable ROM-pack files, but does not provide patches for protected software.

- ROML, from Micro Technical Products (123 N. Serrine, Suite 106-A, Mesa, AZ 85201), sells for \$25 on tape and \$29 on disk. It comes with a circuit for a "high-RAM memory protect" modification, which defeats most current attempts at protection of ROM packs. It does require opening your case and some soldering. ROML does not produce runnable files; you must use ROML whenever you want to run a ROM-pack data file.

Whatever measures you choose to take, please do not ignore my warnings. And remember, you might get away with plugging or unplugging your pack with the power on once, twice, or even 100 or more times. Perhaps you have a very steady hand. Perhaps you are using only the relatively safer Tandy and An-teco ROM packs. Or perhaps you are just lucky.

But sooner or later, if you ignore my warnings and the injunctions of both the manufacturer of your computer and all manufacturers of ROM packs, you *will* burn out your computer. Please don't make the dumb mistake that I made. ■

Address correspondence to Martin Goodman, 1529 Addison St., Berkeley, CA 94703.

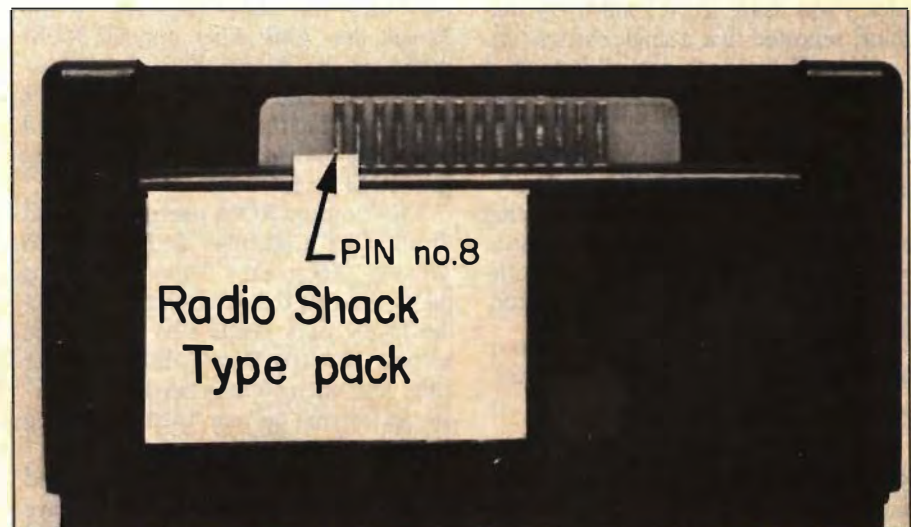


Photo 1. Pin 8 Location in Radio Shack ROM Packs

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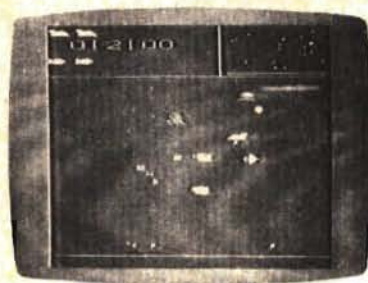


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FOR YOUR TRS-80 COLOR COMPUTER

BY WILFRED H. BARBER

HI-RES SCORING ROUTINE

The Color Computer's inability to display letters and numbers while in the graphics mode is very limiting, particularly while playing a high-resolution game when scoring information is important to game strategy.

Solutions to this problem usually take two forms. The first briefly switches to the text screen to display the score. This technique is distracting and destroys the game effect. The other solution, machine-language subroutines, executes rapidly and can work on a graphics screen. They are, however, sophisticated and can be in-

Even your scoring power in high-resolution Color Computer games with this short scoring subroutine.

timidating to all but seasoned programmers.

Since neither of these solutions pleased me, I developed a short scoring subroutine (Program Listing 1). It is written in Basic, yet executes rapidly. It will display a score in the range

0-999, using PMODE 3 graphics, and will display this score at any specified screen location.

Program Listing 2 supports Listing 1 by providing the necessary data to draw the digits 0-9 using a DRAW command. They are drawn in a 4-by-8-dot grid and end with four blank spaces. These spaces allow proper spacing between numbers in a multiple-digit display. Listing 2 should be placed near the end of the program. It can then be called using a GOSUB command executed early in the program. It generally needs only one call per game, but this must be called

```

100 'SCORING SUBROUTINE
110 LINE (X,Y)-(X+20,Y-8),PRESET,BF
120 IF SCORE < 0 THEN END
130 IF SCORE > 999 THEN END
140 SCORE$ = STR$(SCORE)
150 K1 = VAL(RIGHT$(SCORE$,1))
160 ON LEN(SCORE$) GOTO 270,270,220
165 *** 3 DIGIT SCORE
170 K2 = VAL(RIGHT$(SCORE$,2)) - K1
180 K3 = VAL(SCORE$) - K2 - K1
190 K3 = K3/100 : K2 = K2/10
200 DRAW "BM" + STR$(X) + "," + STR$(Y) + A$(K3)+A$(K2)+A$(K1)
210 RETURN
215 *** TWO DIGIT
220 K2 = VAL(SCORE$) - K1
230 K2 = K2/10
240 K3 = 0
250 DRAW "BM" + STR$(X+8) + "," + STR$(Y) + A$(K2) + A$(K1)
260 RETURN
265 *** SINGLE DIGIT
270 K2 = 0 : K3 = 0
280 DRAW "BM" + STR$(X+16) + "," + STR$(Y) + A$(K1)
290 RETURN

```

Program Listing 1. Scoring Subroutine

```

10000 ***CHARACTERS
10010 A$(1) = "BRRU8NG2D8R2BR4"
10020 A$(2) = "BU8R4D4L4D4R4BR4"
10030 A$(3) =
"BU8R4D4NL4D4NL4BR4"
10040 A$(4) = "BU4NU4R4NU2D4BR4"
10050 A$(5) =
"BU8NR4D4R4D4NL4BR4"
10060 A$(6) = "U8NR4D4R4D4NL4BR4"
10070 A$(7) = "BU8R4D2G4D2BR8"
10080 A$(8) = "U4NR4U4R4D8NL4BR4"
10090 A$(9) =
"BU4U4R4D4NL4D4NL4BR4"
10100 A$(0) = "U8R4D8NL4BR4"
10110 RETURN

```

Program Listing 2. Numbers Subroutine

System Requirements

16K RAM
Extended Color Basic

before the first call to Listing 1.

Program Listing 3 demonstrates the effect of Listings 1 and 2. Notice that prior to calling Listing 1, the demonstration program first updates the score. Listing 1 then takes this updated score and draws it on the graphics screen.

The demonstration program also provides the X and Y coordinates of the score location. These coordinates are used by the three DRAW commands to properly position the score display. The score and X,Y coordinates are the only variables passed

```

1 PMODE 3,1
2 PCLS
3 SCREEN 1,0
4 GOSUB 10000
5 X = 100 : Y = 100
6 FOR SCORE = 0 TO 999
7 GOSUB 100
8 FOR T = 1 TO 25 : NEXT T
9 NEXT SCORE
10 END
    
```

Program Listing 3. Demonstration Program

to Listing 1 by the demonstration program. (See Table 1.)

Listing 1 uses STRING\$ to correctly calculate the individual digits to display. The digit for each position in

"For added viewing clarity, any leading zeros are blanked..."

the score is extracted using both VAL and RIGHT\$ functions. The extracted digit is then used to select the proper A\$ array element from Listing 2. Finally, the selected digit is com-

Variable	Use
SCORE	Game score
SCORES	String conversion of score
K1	1s digit of score
K2	10s digit of score
K3	100s digit of score
X, Y	Coordinates of displayed score
A\$(?)	Array value for each digit 0-9

Table 1. Variable Assignments

combined with any other digits in the three DRAW commands. For added viewing clarity, any leading zeros are blanked, and the complete score is then displayed. ■

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MUSIC \$TRINGER

When I'm developing a new program, I often want to include a few bars of appropriate music to add to the fun. But composing the string variables that produce the music can be a very time-consuming task, especially if you don't have the sheet music or a piano handy.

After going through this tedious process once too often, I decided it was time for some help from the computer. The result was Music \$tringer, a utility program that helps you compose string variables to add a musical touch to your programs.

After I finished it and let the children test it, I found out that it can also be an excellent musical education program. They started out stringing together their favorite tunes by ear and ended up composing their own original works, learning most of the notes of the scale in the process.

Music \$tringer will let you compose strings to go with the Color Computer's Extended Basic Play statement. As you compose a string, you can replay what you have done so far, then try a few notes until you find the one you want to add next.

Special subroutines let you insert substrings (volume, note length, tempo, pauses, exits to other substrings), store up to 10 completed strings, recall any stored string for listening, and make a tape file of the stored strings for later entry into your own program. You make octave changes simply by pressing the appropriate number key at any time.

When I used this utility for my latest

Here are two programs that make it easy to compose, store, and recall music string variables.

project, adding a few bars of the *Star Wars* theme song to a game program, it only took me 10 minutes, a quarter of what the old way would have taken.

Program Details

Music \$tringer (Program Listing 1) should be easy to follow, in spite of the surplus of IF...THEN statements.

Lines 10-110 set up the initial values, play some introductory music, and let you input the tempo and starting octave. Line 120 is the starting point for an endless loop that reads each keyboard entry and reacts through a series of IF...THEN statements according to which key you press. I won't go over all of these, since they should be easy to decipher with your ASCII code table in your reference manual, but I'll help you crack some of the tougher ones.

If you type the numbers 1-5, line 140 quickly changes the temporary octave (OTS) that plays the notes you press. Since you might be just searching for a note with this octave change, it is not made a permanent part of the string until you enter a note in lines 250-270.

Line 150 reads the bottom two rows of the keyboard as piano keys: The Z, X, C, V, B, N, and M keys correspond

to the C through B white piano keys, and the second row keys, S, D, G, H, and J correspond to the black C# through A# piano keys.

After giving the key-arrangement possibilities a lot of thought, I concluded that this would be the easiest to learn. To improve the educational potential for children, you could put a narrow stick-on label below each key to identify the note it plays.

Line 190 erases the last character of the string in response to the left-arrow key, and line 220 stores a completed string as M\$(I).

The subroutines begin with the Add to String on line 240, which adds the last octave and note played to the string in response to the enter key. The subroutine in lines 290-430 converts the touched piano keys to their corresponding notes and then plays them.

The Insert Substring subroutine is next, with some screen prompts and an INPUT I\$ statement to let you add any of the nonmusic strings allowed with the Play statement.

The program enters the Recall String subroutine, lines 540-560, when you key R. It lets you play any stored string and display it at the bottom of the screen.

continued on page 124

System Requirements

16K RAM
Extended Color Basic

CREATIVE TECHNICAL CONSULTANTS
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```

10 DIM M$(10):CLEAR 2000
20 CLS
30 PLAY "T3;O3;L8;C;F;G;A;L4;G;E
;P8;L8;C;F;G;A;L2;G;P8;L8;C;F;G;
A;L4;G;E;L8;E;F;E;C;L1;C"
40 R$="";:I=1
50 INPUT "ENTER TEMPO(T1 TO T255
)";T$
60 INPUT "ENTER STARTING OCTAVE(
O1 TO O5)";O$
70 TT$=T$:OT$=O$:L$="L4"
:V$="V15"
80 M$=T$+R$+O$ 'M$=MUSIC STRING
90 PLAY T$+O$
100 CLS
110 PRINT@0,"M$="M$
120 A$=INKEY$:IF A$="" THEN 120
130 IF A$=CHR$(13) THEN 240 'ENT
140 IF VAL(A$)>0 AND VAL(A$)<6
THEN OT$="O"+A$
:PLAY OT$
:GOTO 120 'CHANGE OCT
150 IFA$="Z" OR A$="X" OR A$="C"
OR A$="V" OR A$="B" OR A$="N"
OR A$="M" OR A$="S" OR A$="D"
OR A$="G" OR A$="H" OR A$="J"
THEN 290
160 IF A$="I" THEN 440 'INSERT
170 IF A$="R" THEN 540 'RECALL
180 IF A$="Q" THEN 620 'QUIT
190 IF A$=CHR$(8) THEN L=LEN('M$)
:M$=LEFT$(M$,L-1)
:PRINT@0,"M$="M$
:GOTO 120 'ERASE CHR
200 IF A$=CHR$(2 1) THEN M$=T$+R$
+O$:CLS
:PRINT@0,"M$="M$
:GOTO 120 'ERASE M$
210 IF A$=CHR$(9) THEN PLAY M$
:GOTO 120
220 IF A$=CHR$(10) THEN M$(I)=M$
:PRINT@480,"M$(I)="
CHR$(34);M$(I);CHR$(34);
:I=I+1:M$=T$+R$+O$
:PRINT@0,"M$="M$
:GOTO 120 'STORE M$
230 GOTO 120
240 'ADD TO STRING SR
250 IF OT$<>O$ THEN O$=OT$
:M$=M$+R$+O$
:PRINT@0,"M$="M$
260 M$=M$+R$+N$
270 PRINT@0,"M$="M$
280 GOTO 120
290 'CONVERT KEY TO NOTE SR
300 IF A$=" Z" THEN N$="C"
310 IF A$="X" THEN N$="D"
320 IF A$=" C" THEN N$="E"

```

```

330 IF A$="V" THEN N$="F"
340 IF A$="B" THEN N$="G"
350 IF A$="N" THEN N$="A"
360 'IF A$="M" THEN N$="B"
370 IF A$="S" THEN N$="C#"
380 IF A$="D" THEN N$="D#"
390 IF A$="G" THEN N$="F#"
400 IF A$="H" THEN N$="G#"
410 IF A$="J" THEN N$="A#"
420 PLAY TT$+V$+L$+N$
430 GOTO 120
440 'INSERT SUBSTRING SR
450 CLS
460 PRINT@0,"M$="M$
470 PRINT@288,"ENTER SUBSTRING T
O BE INSERTED"
480 PRINT@320,"FOR EXAMPLE-L4,V2
,T25,O3,P2,XZ$"
490 INPUT I$
500 M$=M$+R$+I$
510 PRINT@0,"M$="M$
520 PRINT@288:PRINT@320
:PRINT@352
530 GOTO 120
540 'RECALL STRING SR
550 PRINT@288
560 INPUT "RECALL WHICH STRING N
UMBER(1-10)";J
570 CLS
580 PLAY M$(J)
590 PRINT@480,"M$(J)="CHR$(34)
; M$(J);CHR$(34);
600 PRINT@0,"M$="M$
610 GOTO 120
620 'QUIT & RECORD M$(I) SR
630 CLS
640 PRINT@0,"HOW TO SAVE STORED
STRINGS M$(I)"
650 PRINT@65,"1.PUT A TAPE IN RE
CORDER."
660 PRINT@97,"2.POSITION TAPE TO
BLANK SPOT."
670 PRINT@129,"'3.PRESS PLAY AND
RECORD."
680 PRINT@161,"4.PRESS SPACEBAR"
690 PRINT@224,"THIS PROCEDURE ST
ORES STRINGS"
700 PRINT@256,"M(1) THROUGH M(10
) ON TAPE UNDER"
710 PRINT@288,"FILE NAME 'MUSIC'
."
720 B$=INKEY$:IF B$<> CHR$(32)
THEN 720
730 OPEN "O",#-1,"MUSIC"
740 FOR I=1 TO 10
750 PRINT #-1,M$(I)
760 NEXT I
770 CLOSE #-1
780 STOP

```

Finally, the Quit and Record M\$(1) subroutine beginning with line 620 lets you record all your stored strings in a cassette tape file labeled MUSIC. The instructions for this subroutine appear on the screen whenever you press Q.

How to Use Music Stringer

Type in Listing 1 and run it. The computer will ask you for the tempo and the starting octave; both will become the first two characters in your string. The tempo you select here controls how short the notes will be while you are "hunting and pecking," so don't make it too fast. A tempo of T2 or T3 seems to work well.

The octave can be any of the five available. If you are not sure where to start, enter O3 and change it later if you need to.

After you've entered the octave, the string you are composing, M\$, appears at the top of the screen. Key some notes to find the one at which you want to start your melody. When you find it, press the enter key.

The last note played before you hit enter will be added to M\$. Find the next note you want to add and enter it. Re-

member, you must follow a note with the enter key in order to add it to the string.

If you want to go up or down an octave or two, press a number key from 1-5. There's no need to press O first; just the number will do. The notes that follow will sound at the new octave, but you won't add that octave to the string until you enter a note. Any time you want to hear what your unfinished symphony sounds like, press the right-arrow key.

When you come to a place in your song that requires a change in note length, a pause, or a volume change, press I. The program will cycle through the Insert Substring subroutine to let you add the change as I\$. If instead of adding something you want to delete a character or two, press the backspace arrow, just as you would if you were typing a program line. The shifted left-arrow key will erase everything except the original tempo and octave choices.

When your string is complete, or you have 255 characters in it (eight full screen lines of characters), press the down-arrow key. The program will store the string as M\$(1) and display it on the bottom half of the screen.

As you complete and store more strings, they will be stored as M\$(2), M\$(3), and so forth. You can recall and listen to any of these by pressing the R key. The screen will ask you to choose a string, and it will display and play the one you specify. If you cannot get your whole song into one string, put it in successive strings. Then, when you call for it in your program, use PLAY M\$(1)+M\$(2)... .

Now that you have your strings composed and stored, how do you get them into that new space-battle game you are going to write? You start by pressing Q to get into the Quit and Record M\$(1) subroutine. The screen tells you how to put the stored strings on tape.

Getting the strings entered into your own program is a little more cumbersome, but not difficult. If you are beginning a new program, enter Program Listing 2 first and run it.

When the screen asks you to choose the string you want to input from the tape file, enter the number 1 and push the recorder's play button. M\$(1) appears on the screen and the program stops. Now type the line number you will use in your program for defining the first music string and copy M\$(1) exactly as it is printed on the screen.

When you have typed it all, press enter. That line now has become a line in your new program. Enter RUN again and repeat the procedure for M\$(2). Continue until you've entered all your stored strings as program lines.

After deleting lines 1-9, you are left with the beginning lines of your own program that define the music strings you will use. Whenever you want to play one of them in your program, simply add a PLAY statement calling for one of the strings.

If you want to insert the music strings in an existing program, you must temporarily add Listing 2 to that program. (You might have to do a bit of re-numbering to make lines 1-9 available.) Use the same procedure as above, but be sure to use vacant line numbers for defining the music strings.

There you have it! A handy, time-saving utility that you'll have to fight the kids for. I am working on a fully interactive version of Music Stringer with simple on-screen instructions, a string-editing subroutine, and a number of other frills. By the time you read this, I should have it tested and ready to market. If you would like a copy, send \$12.95 to Creative Technical Consultants, P.O. Box 652, Cedar Crest, NM 87008. ■

```

1 'TRANSFER MUSIC FILE
2 INPUT "WHICH M$(1)-ENTER I"; I
3 OPEN "I", #-1, "MUSIC"
4 IF EOF(-1) THEN 8
5 INPUT #-1, M$(I)
6 CLS
7 PRINT "M$( "I ") = "CHR$(34); M$(I)
  ; CHR$(34)
8 CLOSE #-1
9 STOP
    
```

Program Listing 2. Transfer Music File

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ORANGE TRAP

30-100	instructions
110-130	create graphic strings
140-160	print screen display
170	initial conditions
180	determines if player tried to cross orange area
190	prints number of moves
200-230	determine if any arrow pressed on keyboard and if direction is legal
240	flashes current position
260	increases count on number of moves, changes crossed area's color

Table 1. Line Description for Listing 1

30	reserves high memory for instant replay
40-110	instructions
120-140	create graphic strings
170	determines if player tried to cross an orange area
180	prints number of moves
190-220	determine if any arrow pressed on keyboard and if direction legal, record move into high memory
230	flashes current position
250	increases memory location position, increases number of moves, changes color of crossed area to next color
260-360	(instant replay)
270	POKEs color into video PRINT@ positions
280	looks at high memory to determine direction to proceed
290	prints number of moves
300-340	move line in direction recalled from high memory
350	looks at color of graphic at that position, ends game if that area is orange, otherwise increases color of that PRINT@ position to next color
370	initial conditions
380-440	menu
450-480	save playing of last game to tape
490-520	recall of game from tape
530-560	print screen display

Table 2. Line Description for Listing 2

How many moves can you make on this challenging grid game before you are caught in the Orange Trap?

In this game of logic and strategy, you direct your movement along a multi-colored grid.

At the beginning of play, each game grid is green. As you move onto a green position, it changes to yellow. Moving onto a yellow position changes it to blue. This continues until you have exhausted the CoCo's eight possible colors. (As you move over each PRINT @ position, it changes color.)

You can no longer move onto a PRINT@ position after it has turned orange. An attempt to do so immediately ends the game. Your objective then is to move as many times as possible before being trapped by an orange square. Each move earns you one point.

Program Listing 1 allows a 4K Color Computer owner to play the game. Program Listing 2 permits a 16K Extended Color Basic user to watch an instant replay of his last game.

System Requirements

4K RAM
Color Basic

You can also store the moves of a game on tape by the CSAVEM command. Then you can enter this recording into the computer's high memory with CLOADM and watch it later.

Be careful not to execute the instant-replay command unless there has been data entered into high memory by playing or by CLOADM-

ing a game; otherwise, you will cause the game to crash.

I reserved 2,000 bytes of memory (memory locations 14383 to top of memory, 16383) to store the information required for an instant replay. There are 256 graphic positions on the grid. Turning them all orange requires crossing all PRINT@ positions seven

times. Therefore, 1,792 should be the highest possible score.

If you're interested in competing for a trophy, send an Extended Color Basic cassette of your high-score game and \$1 to James W. Wood, 424 N. Missouri, Atwood, IL 61913. Include a self-addressed stamped envelope if you wish your tape to be returned. ■

Program Listing 1. 4K Orange Trap

```
30 CLS:PRINT@11,"COLOR RUN";
40 PRINT@33,"USE THE ARROWS TO M
OVE YOUR COLORED SQUARE. EACH
TIME YOU MOVE OVER AN AREA IT
S COLOR CHANGES. THE COLORS
CHANGE IN THIS ORDER.";:FORA=1
```

```
43TO255STEP16:PRINTCHR$(128)+CHR
$(A);:NEXTA:PRINTCHR$(128)
50 PRINT:PRINT" WHEN YOU CROSS O
VER AN ORANGE AREA THE GAME END
S. HOW FAR CAN YOU TRAVEL BEFORE
```

Listing continued

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TRS-80 EXTENDED COLOR BASIC, by Richard Haskell This is a complete guide to programming the TRS-80 Color Computer in BASIC, with step-by-step instructions and lots of screen photographs. Good for beginning and advanced programmers, this book includes sample programs and information on using the keyboard, cassette tapes, graphics, sound effects, and more. Richard Haskell is also the author of *Apple BASIC* and *PET/CBM BASIC*. BK1285 \$12.95

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```

THE":PRINT@482,"PRESS ANY KEY T
O CONTINUE";
60 PRINT@394,"ORANGE TRAP";
70 FORT=1TO10:NEXTT
80 PRINT@394,"orange trap";
90 FORT=1TO10:NEXTT
100 IF INKEY$<>" THEN110ELSE60
110 CLS:C$=CHR$(143):D$=CHR$(128
)
120 FORA=1TO28:A$=A$+C$:NEXTA
130 B$=C$+D$+D$:FORA=1TO9:E$=E$+
B$:NEXTA:E$=E$+C$
140 CLS0:FORA=65TO385STEP64:PRIN
T@A,A$;:PRINT@A+32,E$;:NEXTA:PRI
NT@449,A$;
150 X=143:FORA=94TO318STEP32:PRI
NT@A,CHR$(X);:X=X+16:NEXTA
160 PRINT@4,"MOVES";
170 P=1089:C=159
180 IFC>255 THEN END ELSE POKEP,
C
190 PRINT@10,N;
200 IFPEEK(341)=247 AND PEEK(P-3
2)<>128THENP=P-32:GOTO260
210 IFPEEK(342)=247 AND PEEK(P+3
2)<>128THENP=P+32:GOTO260
220 IFPEEK(343)=247 AND PEEK(P-1
)<>128THENP=P-1:GOTO260

```

Listing continued

```

230 IFPEEK(344)=247 AND PEEK(P+1
)<>128THENP=P+1:GOTO260
240 POKEP,128:FORT=1TO15:NEXTT:P
OKEP,C
250 GOTO200
260 N=N+1:C=PEEK(P):C=C+16:GOTO1
80

```

```

30 CLEAR200,14383
40 CLS:PRINT@11,"COLOR RUN";
50 PRINT@33,"USE THE ARROWS TO M
OVE YOUR COLORED SQUARE. EACH
TIME YOU MOVE OVER AN AREA IT
S COLOR CHANGES. THE COLORS
CHANGE IN THIS ORDER.":FORA=1
43TO255STEP16:PRINTCHR$(128)+CHR
$(A);:NEXTA:PRINTCHR$(128)
60 PRINT:PRINT" WHEN YOU CROSS O
VER AN ORANGE AREA THE GAME END
S. HOW FAR CAN YOU TRAVEL BEFORE
THE":PRINT@482,"PRESS ANY KEY T
O CONTINUE";
70 PRINT@394,"ORANGE TRAP";
80 FORT=1TO10:NEXTT
90 PRINT@394,"orange trap";
100 FORT=1TO10:NEXTT
110 IF INKEY$<>" THEN120ELSE70
120 CLS:C$=CHR$(143):D$=CHR$(128
)
130 FORA=1TO28:A$=A$+C$:NEXTA
140 B$=C$+D$+D$:FORA=1TO9:E$=E$+
B$:NEXTA:E$=E$+C$
150 GOTO370
160 GOSUB530
170 IFC>255 THENPRINT@45,"GAME O
VER";:GOTO370ELSE POKEP,C
180 PRINT@10,N;
190 IFPEEK(341)=247 AND PEEK(P-3
2)<>128THENP=P-32:POKEML,1:GOTO2
50
200 IFPEEK(342)=247 AND PEEK(P+3
2)<>128THENP=P+32:POKEML,2:GOTO2
50
210 IFPEEK(343)=247 AND PEEK(P-1
)<>128THENP=P-1:POKEML,3:GOTO250
220 IFPEEK(344)=247 AND PEEK(P+1
)<>128THENP=P+1:POKEML,4:GOTO250
230 POKEP,128:FORT=1TO15:NEXTT:P
OKEP,C
240 GOTO190
250 ML=ML+1:N=N+1:C=PEEK(P):C=C+
16:GOTO170
260 GOSUB530
270 POKEP,C
280 M=PEEK(ML)
290 PRINT@10,N;:N=N+1
300 ON M GOTO 310,320,330,340
310 P=P-32:GOTO350
320 P=P+32:GOTO350
330 P=P-1:GOTO350
340 P=P+1
350 C=PEEK(P):IF C=255THENGOTO37

```

Program Listing 2. Instant-Replay Option for 16K Machines

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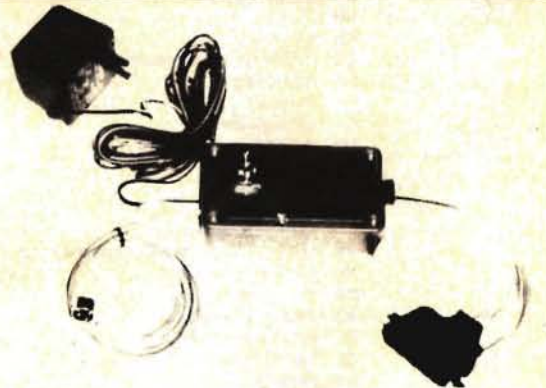
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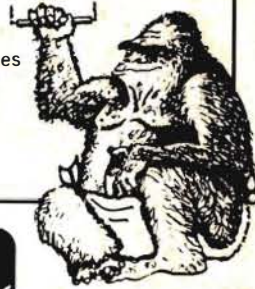
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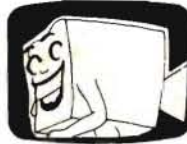
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Reader's Forum

Introducing...

Here's a quick and easy way to produce an on-screen introduction. In Program Listing 1, lines 1-6 are from "Vive le CoCo," *HOT CoCo*, July 1983, p. 104. I've taken the CLS out of line 10, and lines 19 and 20 put the question in a new place on the screen. You could adapt it for almost any program by changing the titles. This routine makes an X across the screen, with music, and lists the topic of the lesson in the lower right.

*Fred Wise
Knox, PA*

```
1 CLS:FOR Z=1 TO 22 STEP 4
2 PRINTTAB(Z) "VIVE LE"
3 PRINTTAB(22-Z) "LE COCO"
4 NEXT Z
5 PRINTTAB(16) ">LET US STUDY<"
6 PRINTTAB(16) ">FRENCH VERBS<"
10 SOUND89,2:SOUND89,2:SOUND133,
4:SOUND133,4:SOUND147,4:SOUND147
,4:SOUND 176,6:SOUND159,2:SOUND1
33,4:CLS
19 PRINT:PRINT:PRINT:PRINT
20 PRINT" COMMENT VOUS APPELEZ
-VOUS? ":INPUT NA$
```

Program Listing 1. A Simple Introduction

Reverse Tab

The CoCo's TAB statement is quite flexible, but a TAB(n) will only move the cursor to column n if the cursor is not already past column n.

For example, the line 100 PRINT"FILENAME?":TAB(8):INPUTN\$ contains a PRINT list ending with a TAB. No line feed or carriage return is generated. The code does not work as hoped; input begins at the end of the field.

The solution is to manually alter the cursor position stored at decimal 136-137. The brute-force way to do this is to PEEK the 2-byte value; subtract 1,024, the start address of text-screen memory; divide by 32, the number of columns on each row, discarding any remainder; multiply by 32; add the desired cursor column number; and PRINT@ the result or POKE the most-significant and least-significant bytes of the result plus 1,024 back into 136 and 137.

There is a better method, since 1,024, 32, and 16 (the number of rows on a text screen) are all powers of two. Considering the cursor address as a 16-bit binary value and reading left to right, bits 15-11 are always zero, bit 10 is always one to specify 1,024, bit 9 is always zero, bits 8-5 spec-

ify row number (4 bits can represent 16 values, 0-15), and bits 4-0 store the cursor column position (5 bits can represent 32 values).

This neat bit arrangement allows the much simpler approach of logical ANDing the least-significant byte of the address with 224 to mask out the current cursor column, ORing the result with the desired column number, and storing the end result in location 137.

The field input example then becomes:

```
100 PRINT"FILENAME?.....":
POKE 137, PEEK (137)AND224OR8:INPUTN$
```

which works as desired.

*Ronny Ong
Arlington, TX*

Doculist for Disks

Program Listing 2 lets James Barbarello's "Doculist" (*HOT CoCo*, June 1983, p. 58) recognize Disk Basic tokens. Replace lines 63100, 63290, and 63370; add lines 63380-63410.

*Glenn Zandstra
Hudsonville, MI*

```
63100 IF C=255 THEN I=I+1:C=PEEK
(I):IF C<128 THEN C=C-3 ELSE C=C
-50 ELSE IF C>205 THEN C=C-88 EL
SE C=C-128
63290 DIM A(136):A(0)=43622:J=1
63370 IF J<112 THEN NEXT
63380 A(112)=49665:J=113:FOR I=4
9665 TO 49683:IF PEEK(I)>128 THE
N A(J)=I+1:J=J+1
63390 IF J<118 THEN NEXT
63400 A(118)=49535:J=119:FOR I=4
9535 TO 49626:IF PEEK(I)>128 THE
N A(J)=I+1:J=J+1
63410 IF J<137 THEN NEXT ELSE RE
TURN
```

Program Listing 2. Disk Basic Doculist Modification

Advice for Adventure Writers

In the June issue of *HOT CoCo*, p. 44, there is an adventure game called "Cavehunt," in which the player fights monsters in a cave. I've learned some things about writing this type of program.

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Reader's Forum

Charles Levinski, Cavehunt's author, uses a die-roll modifier to determine the outcome of a fight. An easier method is to set up a two-dimensional array of numbers, like with the die-roll modifier, but each is a number between zero and 100, which is the percent probability for something to happen. If a random number between one and 100 is less than or equal to this number, the condition is true, otherwise it is false.

Say you want to show that a wizard can't be killed with a knife. If your number is zero, there is a 0-percent chance of killing the wizard with a knife. If you want a 75-percent chance of killing the wizard with a magic wand, the number you use is 75. This uses slightly more memory than the die-roll modifier, but it is easier to use.

Mr. Levinski uses many arrays—a smart thing to do. Try to put every group of related items in an array. The weapons-carried array had only two elements, but still saved much time and memory.

Finally, look in magazines for games similar to what you intend to write. The technique you need might be contained in one of these listings.

Bruce Lewis
Osceola, MO

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If you have many cassettes with different subject classes, you might be interested in my system for picking them out easily.

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When showing off my Color Computer, it's simple to pick out the appropriate subject matter without a great deal of hunting, despite the great number of cassettes on hand.

M.L. Braun
Bellevue, OH

Graphics on Disk or Tape

I've found a better way of storing graphic pictures on tape or disk. Once stored they are easily retrieved by a CLOADM or LOADM command.

To store the graphic pages as a machine-code file, you must know the starting and ending memory locations. The starting location for graphics is 1536 (decimal, page 1) or 3584 (disk). Calculate the ending location with the formula $1536 + (n * 1535) + (n - 1)$, where n is the number of graphic pages used, which depends on the PMODE and PCLEAR used in the program. Refer to the Radio Shack manual *Going Ahead with Extended Color Basic*, p. 24, for the value of n.

To save on tape, use the command CSAVEM"NAME", 1536,7679,0 for a picture drawn in PMODE 3 or PMODE 4 starting at page 1. To start at any other page add 1,536 to the first two numbers. To use this feature with disk add 2,048 to both numbers, and instead of zero as the execution address use the starting address. Example: Use



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SAVEM"NAME",3584,9727,3584 for a picture drawn in PMODE 3 or 4, starting at page 1 for disk.

To use these pictures in programs, put a CLOADM"NAME" or LOADM"NAME" at the appropriate line. The cassette version requires putting the pictures after the program on tape and in the order the program loads them back. The cassette version also requires leaving the play button depressed until the program retrieves the last picture.

Chris Petit
Luling, LA

```

20 PRINT:INPUT"TOP OF RAM";M$
30 CLEAR 100,VAL("&H"+M$)
40 INPUT"START ADDRESS";S$
50 S=VAL("&H"+S$)
100 PRINTEX$(S);:INPUT M$
110 IF M$="DONE"GOTO200
120 FOR I=1 TO LEN(M$) STEP 2
130 B$=MID$(M$,I,2)
140 IF ASC(B$)=32 THEN I=I+1:GOT
O 130
150 POKE S,VAL("&H"+B$)
160 S=S+1:NEXT I
170 GOTO 100
200 INPUT"FILENAME, EXEC ADDRESS";
F$,E
210 CSAVEM F$,VAL("&H"+S$),S,E
    
```

Program Listing 3. CHRFIN D

3FE5	00100	ORG	S3FE6	START PRGM AT S3FE6
3FE6 10AE	02	00110	START LDY	2,X
3FE9 9E	19	00120	LDX	\$19
3FEB A6	84	00130	LOOP1 LDA	,X
3FED A1	A4	00140	CMPA	,Y
3FEF 26	05	00150	BNE	NEXT
3FF1 A6	21	00160	LDA	1,Y
3FF3 A7	84	00170	STA	,X
3FF5 5C		00180	INCB	
3FF6 30	01	00190	NEXT LEAX	1,X
3FF8 9C	1F	00200	CMPX	S1F
3FFA 26	EF	00210	BNE	LOOP1
3FFC 4F		00220	CLRA	D NOW HAS # FND
3FFD 7E	B4F4	00230	JMP	SB4F4
	3FE6	00240	END	START
				START=EXEC ADRS

Program Listing 4. Easy Code

CHRFIN D and Easy Code

CHRFIN D, Program Listing 3, searches through your Basic program for a certain character and changes it to another. For example, USR("!" + CHR\$(13)) will change all exclamation points to carriage returns. This is useful if you have a menu to print and don't want to take eight separate lines to do it.

USR(">" + CHR\$(8)) will change ASCII > signs to backspaces. You can use this to cover program lines.

For changes of your own, send a string of two characters to the USR subroutine. The first one, referred to as "search for" in Listing 3, will be searched for in the program and changed to the second character, referred to as "change to."

Easy Code, Program Listing 4, lets you enter machine-language programs without using an editor/assembler. It first prompts you for the top of RAM. Enter the hex code for the highest address you want Basic to use. Next it prompts you for the start address. Enter the first number on the leftmost column of the Assembly listing that has more numbers after it.

When you have done so, enter the numbers in the second and third columns according to the number the computer prompts you with. If the computer prompts you with BFE6, enter the numbers next to BFE6 in the Assembly listing. You don't have to space exactly as in the listing, but don't abbreviate numbers like 02 to 2.

If there are no numbers next to the number the computer prompts you with, enter 00. When you have entered all of them, type DONE. The computer will ask you for a file name and an execution address. If the machine language does not work with EXEC, enter (file name), 350. Otherwise enter the execution address of the program.

To enter it in hex, precede it with &H. Easy Code should work with most machine-language programs. Easy Code and CHRFIN D require Extended Color Basic.

Bruce Lewis
Osceola, MO



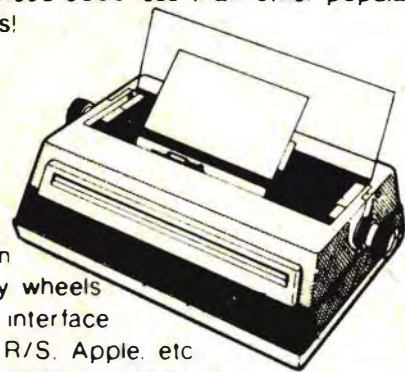
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Q. I am interested in purchasing a spelling-checker program. I am also interested in obtaining a program for marine navigational use, preferably similar to the Texas Instruments one. Can you help me?

*James Moriarty
Washington, PA 15301*

A. If you have a word processor that runs using Radio Shack's Disk Basic, there are a couple of spelling checkers available. They use ASCII files that must first be prepared with your word processor. I am aware of several: Spell 'N Fix by Star-Kits, Box 209-H, Mt. Kisco, NY 10549; Super Color Speller by Nelson Software Systems, 9072 Lyndale Ave. S., Minneapolis, MN 55420; and Spell Rite by Eigen Systems, Box 180006, Austin, TX 78718. If you are using a FLEX word processor, two spelling checkers are also available from Frank Hogg Labs, 770 James St., Syracuse, NY 13202. They are the Stylograph Spelling Check and Dynaspell.

I know of no marine-navigation programs. Has anyone written one?

Q. After having my 16K Extended Basic CoCo upgraded to 64K, I get a 24871 memory indication when I type ?MEM. I know that Extended Basic uses some of the memory, but where is the other 32K and how do I use it?

Can you provide me with the mailing address for the company that manufactures the Tandon disk drives? I bought a Tandon double-sided disk drive complete with cables but without any support literature such as operating instructions and specifications. Also, the disks were labeled 2,3 and I was told to ignore this and relabel them 0,1 as they are controlled by the controller anyway. Will I have problems?

*Brian C. Cassidy
Essex, Ontario N8M 2Y4*

A. A 64K CoCo will respond as a 32K machine on power up. If you run a machine-language program to enable the upper 32K, Basic still uses only the lower 32K, due to the fact that the code for Extended Color Basic starts at address 32768. One way of getting more RAM is to disable Extended Basic (see "40K Basic," *80 Micro*, May 1983, p. 212). Spectrum Projects, 93-15 86th Drive, Woodhaven,

NY 11421, markets a program entitled 40K that relocates Extended Basic above the Disk Basic's code leaving an extra 8K for programs.

On the subject of additional RAM for Basic, if a program does not use graphics, you can PCLEAR0 to gain an extra 6,144 bytes by typing POKE25,6:NEW or with a disk system: POKE25,14:POKE&HE00,0:NEW. Until Radio Shack comes out with new ROMs that use all available RAM, the full power of a 64K machine can only be unleashed with machine-language programs and alternate operating systems such as FLEX and OS-9.

The address of Tandon Corp. is 20320 Prairie St., Chatsworth, CA 91311. You will most likely have to move some jumpers to make your drives respond as 0 and 1 instead of 2 and 3, and you would also need to install a jumper connecting the side select to the drive 3 line of the cable. Only FLEX can use the double-sided feature of your disks.

Q. Several times I have run across references to high-resolution displays for the CoCo such as the statement in the article "64K Modification" of the July 1983 *HOT CoCo*: "When you add the larger high-resolution display options now available, you have an even more impressive machine." I cannot find a supplier that advertises such a device.

The July article describes a very simple process whereby I can turn my 32K Extended Color Basic (E-board) CoCo into a 64K RAM machine. Yet Atomic City would like to sell me a 64K kit consisting of eight RAM chips and an EPROM and card for the tune of \$155. What gives?

*Dave Beck
Plano, TX 75074*

A. The Color Computer uses a Motorola 6847 video-display generator, which displays a screen composed of 256 rows by 192 columns of pixels. This gives the CoCo the inherent capability of displaying 24 rows of 51 characters if a 4-by-8 dot matrix is used to display each character on the screen with a one-pixel space between characters. This configuration gives a nice legible display on a TV in good condition. If the spaces between characters are sacrificed along with some clarity, you can get 64 characters per line, and if you go to a barely legible 3-by-8 dot matrix with no spaces between characters, you can get 85.

There are two software techniques that access these high-resolution displays: utilities that patch the Basic ROM's display routine and programs that have the high-resolution display built in. The utilities might not work with your favorite machine-language program, depending on whether your machine-language program uses the same hooks, whether it resides in the same memory address space, and whether it uses the Basic ROM's screen-display routines.

Some of the Basic utilities (51 by 24) are The Color Expander by Computerware, Box 668, Encinitas, CA 92024;

The Solution and Extender by Snake Mountain Software, Box 5722, Raleigh, NC 27650; Hi-Res Screen Utility by Cer-Comp, 5566 Ricochet Ave., Las Vegas, NV 89110; and Rainbow-Writer Screen Enhancer by Rainbow Connection Software, 3516 6th Place NW, Rochester, MN 55901.

There was a long machine-language program by Steve Odneal published in the April 1983 issue of *The Color Computer Magazine*, p. 15. And the September 1983 issue of *HOT CoCo*, p. 104, featured a machine-language program by Tomas Rokicki giving a 42-by-24 display.

Some programs with built-in high-resolution displays are Telewriter-64 by Cognitec, 704 N. Nob St., Del Mar, CA 92014; The Super Color Library by Nelson Software Systems, 9072 Lyndale Ave. S., Minneapolis, MN 55420; and most versions of the FLEX operating system as adapted to the CoCo. Read Scott Norman's bimonthly column, Re:FLEX, in this magazine for more details on FLEX.

Before you or anyone with a 32K machine does surgery on a genuine Radio Shack 32K CoCo, please be aware of a misprint in *HOT CoCo's* "64K Modification" article (July 1983, p. 44) that directly affects you. Under "Installing E Boards," the first sentence should read, "If you already have an E board with 32K, start with step 1 below," not "start with the next paragraph."

Some early 32K CoCos came with half-good 64K (or 32K) chips. The E board has a jumper that can be set to high or low depending upon which half of your chips are good. These half-good chips were only used for a short time, but if your machine has them, your upper 32K might not be good. Check this by running a memory-testing program after the modification is completed. Apparently Atomic City was playing it safe by asking you to buy certified 64K chips. The EPROM and card contains a machine-language monitor called Wolfbug, which would justify the additional cost if you were in the market for it.

Q. Thank you for answering my questions about the 64K modification in the July 1983 issue of *HOT CoCo*. The modification sounds fairly easy except for one thing, money. How much does one 4164 chip cost?

I don't think I've got enough money to buy eight 4164 memory chips. However, a friend gave me eight 4116 memory chips. Isn't that what you need for a 32K modification? How do you do this process you call "piggy-backing?"

Chris Cope
Central, SC 29630

A. 4164 chips currently retail for about \$5 each. Here is how to do the piggyback modification. It was covered in more detail in the article "Smarten Up, Color Computer!" (80 *Micro*, March 1982, p. 126).

Computer chips are numbered counter-clockwise from the notch. On your eight new 4116 dynamic RAM chips, carefully bend the number 4 pins up about 45 degrees from their normal positions. Remove the old chips. Place the new chips on top of the old 4116 dynamic RAM chips so that the notches are lined up and the legs of the new chips hug against the legs of the old. Carefully solder all the legs of the new chips to the tops of the legs of the old except for the bent number 4 pins.

Solder a wire (about 16 inches long) connecting the bent number 4 pins together leaving enough slack in the wire so that the chips can be returned to their sockets. Next, solder one end of this wire to one end of a 33-ohm, 1/4-watt, 10-percent resistor. Connect the other end of the resistor to pin 35 of the 6883 SAM chip. Make certain that all wires including the resistor leads have sufficient insulation so that no shorts exist. I recommend spaghetti insulation for this purpose. *Do not set the jumpers to 32K.* They must remain in the 16K position for this modification.

Q. With an F board modification with 4164 dynamic RAM chips, is the unit 32K or 64K and what is the needed software? I do not have an assembler. Can you tell me the procedure to get 64K? It was not clear in the "64K Modification" article.

Joe Sabo
Bothell, WA 98012

A. You have a 64K machine, but only 32K is accessible to a Basic program because the Extended Basic portion of the Basic interpreter starts at address 32768. You can use a machine-language program to copy the Basic interpreter into the upper page of RAM and then you have 7.75K of additional free RAM starting with 57344 for PEEKing, POKEing, and EXECing a machine-language program. If yours is a tape system, you would then have 15.75K starting at 49152. Program Listing 1 puts such a machine-language program into memory and then EXECs it.

```
10 FOR I= 32382 TO 32407
20 READ X
30 POKE I,X
40 NEXT I
50 EXEC32382
60 DATA 26, 80, 142, 128, 0, 16
6, 132, 183
70 DATA 255, 223, 167, 128, 183
, 255, 222, 140
80 DATA 255, 0, 38, 241, 183, 2
55, 223, 28
90 DATA 175, 57
```

Program Listing 1. Access more RAM with this routine on a 64K machine.

Q. I read an article in the Fall/Winter issue of *Computer Technology Review* dealing with the use of the Motorola 6800 MPU for "Process Control Methods Effectively Regulating Home Functions." The article (p. 46) references MPL, a software-language compiler similar to PL/1. Would this compiler run on the CoCo? Is it possible to use the CoCo for home process control?

Bob Mackett
Calgary, Alberta

A. The MPL referenced in the article is for a 6800, which is similar but actually inferior to the CoCo's 6809. While Motorola has a 6809 version of MPL, it uses their pro-

Doctor ASCII

proprietary operating system. There is a similar language called PL/9 sold by Frank Hogg Labs that runs under FLEX. There are many other compiled languages that run on the CoCo, including C using Disk Color Basic and Fortran, ABasic, Mumps, C, Pascal, and Forth under FLEX.

The simplest way to have your CoCo run your house is with Radio Shack's Plug n' Power Remote Controller. This device, when hooked up to the CoCo's cassette port, can be used with remote-controller modules to turn appliances on and off, dim lights, and turn any electrical device on or off. There is a series of articles on this very subject by A. B. Trevor entitled "Home Power Control" in *The Rainbow* (February 1983, p. 160; April 1983, p. 20; June 1983, p. 98; August 1983, p. 83).

Q. I need some assistance in understanding the workings of Dugger's C as implemented on the CoCo. Since I do not have a disk system, I could only look through the manual. Help!

Sara Kolbet
Laramie, WY 82070

A. The following assumptions are made by the Dugger's Growing Systems Small C Compiler.

● The compiler must run with a fresh power-up of the machine. In order for your other programs to run correctly, you also must cycle power after the C compiler finishes.

Upon exit the C compiler will appear to have forced Basic to do a cold start. However, do not be fooled by this; cycle power again.

● The recommended editor is Telewriter-64 with the S/ASC disk I/O file saved as S/XXX. This editor has been designed to allow input of C source code. The special characters are as follows.

Back-slash (\): This character is generated by a clear/comma combination. This character is used in many PRINTF commands.

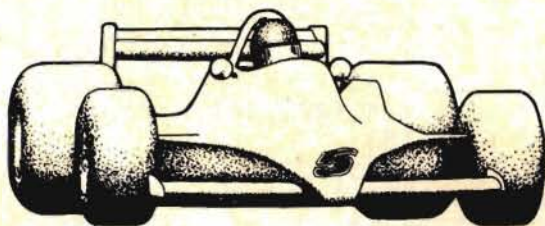
Left square-bracket ([): This character is generated by the shift/@ combination. This character is used in all array references.

Right square-bracket (]): This character is generated by the shift/clear combination. This character is used in all array references.

Note: When using Telewriter start all lines with at least one space so that the source will not be affected by a clear/A. Telewriter does an automatic clear/A any time that the number of characters per line is changed.

● In the C language the data-declaration statements are "DEFINE," "INT," and "CHAR." (FLOAT is currently not supported in DGS C.) Variables consist of both internal and external variables. A C program consists of a group of procedures, including a procedure called MAIN. External variables can be referenced by any procedure and they are placed in the assembler source code by name. Therefore, you *must not* name your variables the same as any labels

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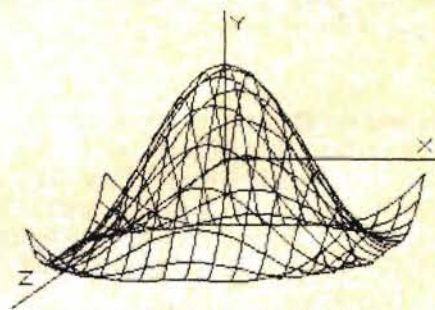
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that the assembler defines—for example, B, PCR, X, Y, and so on.

If you use an incorrect label as an external variable, your assembler code might not be flagged with an error, but it will nevertheless be wrong. External variables are defined at the beginning of the program before the first procedure. Internal variables are defined inside the procedure block itself. Internal variables are allocated from the dynamic storage pool. Internal variables will not retain their values after you RETURN from the routine in which they were defined.

● You must check your assembler output for errors. Remember, just because the assembler has flagged an error does not mean that an error exists. Conversely, just because it did not flag an error does not mean that one does not exist. You must look at all the error messages that the assembler finds. Most of your acceptable errors will be truncated or shortened. When in doubt check the assembler manual.

● Any time C is expecting one statement, you can use multiple statements by enclosing the block of code in braces. On the CoCo, the @ and \$ substitute for the left and right braces, respectively. I have included some skeletal formats below. In these formats the punctuation and uppercase characters are required. The square brackets in the examples are not required; they are used to indicate optional sections of source code. The lowercase words indicate one or more user-supplied C source lines.

Ex1: MAIN()

[definitions];

[statement];

Ex2: procedurename(arg1,...,argN)

definitions for arg1,...,argN;

[statement];

Ex3: WHILE(condition) [statement];

Ex4: IF(condition) [statement]; [ELSE statement];

● The C compiler issues error messages when it determines the error exists. There are times when this could cause the error message to be printed on a statement that is perfectly acceptable. An example of this is when the definitions for arg1,...,argN (see Ex2 above) are incorrectly placed.

● The general form of a C program is as follows. Indentation is optional.

[definitions of external variables]

MAIN()

@

definitions of internal variables
statements

\$

procedure1(arg1,...argN)

definitions of arg1,...argN

@

definitions of internal variables
statements

\$

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```

procedure2(arg1,...argN)
definitions of arg1,...argN
@
definitions of internal variables
statements
$
.
.
.
.
procedureN(arg1,...argN)
definitions of arg1,...argN
@
definitions of internal variables
statements
$

```

● The C compiler has an option that allows deletion of the output file if it exists. *Do not use this feature!* This deletion will remove the file from the directory, but it does not mark the granules free. This very quickly results in a DF error.

Q. Is there any program or sequence that I can feed my CoCo to make it accept a tape program *with errors* instead of giving me an I/O error? If I could get most of the program listed, then I could type in and fix the troubled spot. As it is, one blip and you have nothing.

*Russell M. Hokanson
Covina, CA 91724*

A. You do not have to lose the whole Basic program on the tape if you have the following program and access to a 64K machine. If you have a Basic program that will not load, run Program Listing 2 and then CLOAD the bad tape. When an I/O error is encountered, the code up to the error can be saved to tape as an ASCII file by typing CSAVEM"filename",A. After cycling power, the ASCII file can be loaded and edited.

Program Listing 2. Tape Load with Errors on a 64K CoCo.

```

10 REM ENTER 64K MODE
20 FOR I= 32382 TO 32407
30 READ X
40 POKE I,X
50 NEXT I
60 EXEC32382
70 CLS:PRINT:PRINT"BASIC NOW IN
RAM"
80 DATA 26, 80, 142, 128, 0, 16
6, 132, 183
90 DATA 255, 223, 167, 128, 183
, 255, 222, 140
100 DATA 255, 0, 38, 241, 183,
255, 223, 28
110 DATA 175, 57
120 REM DISABLE TAPE ERROR DETEC
TION
130 POKE&HA639,&H1F
140 POKE&HA63D,&H1B
150 POKE&HA64F,&H9

```

```

160 POKE&HA73F,&H20
170 POKE&HA4F8,&H7F
180 POKE&HA4F9,&HFF
190 POKE&HA4FA,&HDE
200 POKE&HA4FC,&HAC
210 POKE&HA4FD,&HE9
220 POKE&HA68B,&H12
230 POKE&HA68C,&H12
240 POKE&HA68D,&H12
250 PRINT:PRINT"warning:CYCLE PO
WER BEFORE DOING NORMAL TAPE I/O
: THE ROUTINES HAVE BEEN ALTER
ED"
260 PRINT"WHEN YOU GET AN I/O ER
ROR, YOU MAY LIST THE PROGRAM,
BUT DO NOT TRY TO EDIT IT! SAVE
IT TO TAPE AS AN ASCII FILE, CY
CLE POWER, LOAD THE NEW TAPE, T
HEN YOU MAY EDIT IT!"
261 END
270 NEW

```

Q. I am having problems hooking up a Quadram Mic-fazer to my CoCo. Can you get me the necessary DIN four-pin to DB25 pin connections?

*Fred Wagner
Osgoode, Ontario K0A 2W0*

A. It is difficult to answer your question without having either the schematic or the manufacturer's designation of the input/output connector pins of the equipment that you wish to interface. I will, however, cover how the RS-232C is connected to the Color Computer and list the pin designations of the DB25 connector. When you receive the manufacturer's data, in addition to this information, you will be able to properly connect your equipment.

The following are the computer connection and the RS-232C signal level:

Pin 1	not used	
Pin 2	ready from printer	min +3.5V dc to +12V dc max
Pin 3	ground	
Pin 4	data to printer	- 12 to +12V dc

The following are the DB25 designations, but take care because not all manufacturers follow this standard:

Pin	Designation
1	Protective Ground
2	Transmit Data
3	Receive Data
4	Request to Send
5	Clear to Send
6	Data Set Ready
7	Signal Ground
8	Carrier Detect/Receive Signal Detect
9	Positive Test Voltage
10	Negative Test Voltage
11	Unassigned

Doctor ASCII

- 12 Secondary Carrier Detect
- 13 Secondary Clear to Send
- 14 Secondary Transmit Data
- 15 Transmit Signal Clock
- 16 Secondary Receive Data
- 17 Receive Signal Clock
- 18 Unassigned
- 19 Secondary Request to Send
- 20 Data Terminal Ready
- 21 Signal Quality (Error) Detector
- 22 Ring Indicator
- 23 Data Signal Rate Select (Baud Rate)
- 24 Transmit Clock Pulse (Negative Edge)
- 25 Unassigned

Most printers require handshake signals from the computer for them to work. The CoCo does not provide any output signals to the printer except the serial data. Generally it is possible to obtain the necessary handshake signals from the printer. For example, if interfacing to a Texas Instruments Silent 700 Terminal, the terminal requires an input signal on the clear-to-send (5), data-set-ready (6), and carrier-detect (8) pins. This can easily be obtained by jumpering the output from the data-terminal-ready (20) pin to the required pins, and can be accomplished on the DB25 connector.

The results of feeding the data-terminal-ready signal in this manner tell the terminal a carrier is present and that it is connected to the computer. In this case the same signal would be connected to pin 2 of the four-pin DIN connector as the printer-ready signal. In other cases, as with the Heathkit H-14 printer, an additional inverter circuit was installed in the printer to provide the correct polarity of the printer-ready signal.

The only assumed standard when making a four-pin DIN to DB25 connector cable for CoCo is as follows:

DIN	DB25	Designation
2	?	Print Ready/Data Terminal Ready
3	7	Signal Ground
4	3	Serial Data from Computer

Q. I have been looking for a disk-based RTTY program for CoCo, but I have not had much success.

*James Chandler
Abilene, TX 79603*

A. I do not know of a disk-based RTTY program; however, there is an excellent RTTYCW program available on tape that can be converted to operate from disk. This program is available from Clay Abrams Software, 1758 Comstock Lane, San Jose, CA 95124.

I suggest that you contact the above company and inquire if it is now available on disk or if it will be in the future. As I stated above, this is an excellent program and it is worth all the time that it takes to convert it to run from disk. ■

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PRODUCT NEWS

edited by Cynthia Smith

Daisy-Wheel Printer

The DTC 380Z, a new daisy-wheel printer has a 48,000-character buffer memory for high-speed throughput. You can load the printer's buffer within a few seconds and then use your CoCo for other things while the 380Z prints out 24 or more pages at up to 32 characters per second.

DTC 380Z features include full bidirectional printing, proportional spacing, serial and parallel interfaces, 50 to 19.2K baud, and a momentary pause capability for paper, print wheel, and ribbon changing. The print wheel is available in different styles and uses standard ribbons.

The unit has a self-diagnostic test and status lights to indicate error conditions.

Interconnecting cables are available to enable the DTC 380Z to work with all the major personal computers. Optional extras include sheet feeder, forms tractor, and a variety of type fonts.

The DTC 380Z sells for \$1,495. For more information, contact Data Terminals & Communications, 590 Division St., Campbell, CA 95008.

Reader Service ✓ 552

New From Spectrum Projects

Spectrum Projects has released the following programs—and one is for the MC-10.

- Basic Compiler converts Basic programs into machine language. This integer compiler does not require Extended Color Basic and comes in 16K-64K versions. It sells for \$39.95 on tape.

- MDISK lets you use the upper 32K of your 64K CoCo as a "virtual disk" for rapid data storage and retrieval. You can save and load up to 15 programs, view directories, kill unwanted files, and execute programs directly. It comes on tape for \$27.95.

- Backup 64 enables you to use your 64K, single-disk-drive machine to back up your disks by making only six swaps, instead of the usual 12.

- Pritty Printer will disassemble complex, multiple line statements of Basic code. Simple commands control printer baud rates, maximum line length, and lines per page and disable form feeds. It comes on disk or tape for \$19.95.

- Schematic Drafting Processor lets you design professional-looking electronic diagrams using

a 480-by-540-pixel worksheet with six viewing windows. It offers over 30 electronic symbols with 10 user-definable symbols and allows you to print out your display or save the created schematics to disk. This program comes on 64K disk for \$49.95.

- Microterm is a terminal program for the MC-10 that gives you a terminal to access bulletin boards, CompuServe, and other data lines. It comes on tape for \$24.95.

- Mastermail 1200 is a disk mailing-list program that can store up to 1,200 five-line labels per disk, print by code, and sort quickly. It comes on disk for \$49.95.

All of the above orders require \$3 postage. If you purchase any three or more programs, you receive a 15-percent discount. For more information, contact Spectrum Projects, 93-15 86th Drive, Woodhaven, NY 11421, 212-441-2807.

Reader Service ✓ 555

Disk Loader

Disk Loader loads most 16K machine-language programs

from tape to disk and is especially designed for programs that interfere with normal disk operation. It saves multiple copies, allows you to rename the program, and automatically gives program load and execute addresses.

Complete with instructions, Disk Loader works with 32K or 64K CoCo Disk systems, and is available for \$13.95, ppd., from Stuart Hawkinson, 6695 S. W. 203rd Court, Aloha, OR 97007, 503-642-9146.

Reader Service ✓ 550

Valhalla Games

Valhalla Enterprises has two new games for the Color Computer.

- Minefield is a 4K, invisible maze game in which you use your audible mine detector along with your powers of deduction to make your way across an active mine field. Difficulty increases as you add more mines in different patterns. If you step on a mine you will, of course, be blown up and the game ends. Your score depends on the difficulty and the number of moves made. Minefield sells for \$7.29.

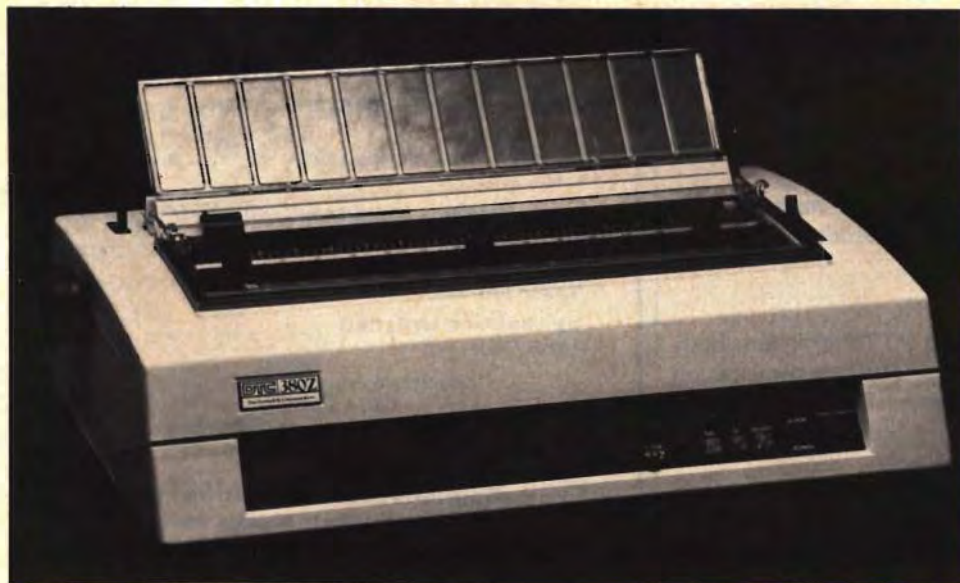
- In the game Wall Street, you are an investor with \$1,000. Use your skills to spot market and stock trends and make your fortune. Wall Street lets you invest in utilities, blue chips, glamors, and high risk; it gives dividends and has all the ups and downs of the real stock market. It also has separate versions for either type of Basic. For one or more players, this 16K game sells for \$12.71.

Neither game requires joysticks or Extended Color Basic. Order one or both from Valhalla Enterprises, Dept. HCR, P.O. Box 243, Sumner, WA 98390.

Reader Service ✓ 551

Computer Contacts

The Computer Media Directory is a reference book for



The DTC 380Z Daisy-Wheel Printer

marketing communications and public-relations personnel in the computer industry. Its three sections include listings of computer media (such as *HOT CoCo*) and allied publications concerned with office automation and equipment, word processing, and data communication.

You'll find names of top editors, bureau chiefs, and correspondents, plus telephone numbers and addresses outside the headquarters. A section lists computer editors or reporters on major daily newspapers, magazines, and feature and news services.

Future editions will expand to list accredited free-lance writers whose computer-related work has appeared in established publications.

You can order the directory for \$99.95, or \$149.95 with quarterly updates, from Computer Media Directory, 2518 Grant St., Houston, TX 77006.

Reader Service ✓ 554

CoCo Clear

Video Clear is an interference rejection cable that replaces the video cable between your computer and the monitor. It eliminates or reduces computer-created video interference.

Video Clear has external connections that require no cutting, splicing, or soldering.

The cable sells for \$14.50 (\$3 shipping and handling) from Computer Associates Inc., 1304 13th Ave. S., Fargo, ND 58103, 701-280-1837.

Reader Service ✓ 560

New From PBJ

PBJ Inc. has announced five new products for the CoCo.



New from PBJ Inc., the Word-Pak Video Board

- The Word-Pak is a video board that plugs into the Color Computer's expansion port and gives a high-quality, 80-column video output. Compatible with most nongraphic Basic programs, the board works with a disk and Y cable. Software provided gives such terminal functions as erase to end of line, erase to end of screen, home cursor, sound bell, and x-y cursor positioning. You can also reprogram the screen format for compatibility with other computers.

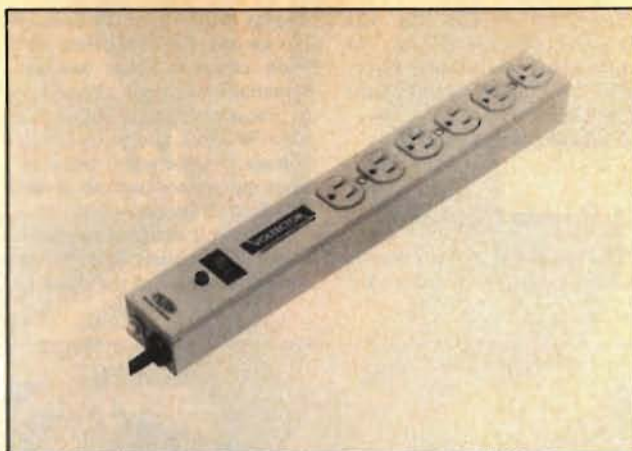
Additional software support includes a FLEX patch that allows you to run all standard FLEX software without modification, and an enhanced version of TEXPROIII. Word-Pak sells for \$139 assembled and tested (a&t) or \$23.95 for the bare board (bb).

- The C-C Bus is an expansion bus that provides six software-selectable expansion ports. It uses a board that automatically senses system size to prevent contention problems and is therefore compatible with any size system. The board also allows you to use a bank-switching scheme to expand memory beyond the 64K limit. A typical system might contain a disk controller, a parallel-printer cartridge, a 16K RAM board, and a Word-Pak all installed and available to the CPU. The C-C Bus offers an optional power supply for the peripheral cartridges/boards. The C-C Bus sells for \$125 (a&t) or \$27.95 (bb).

- Mem-Pak is a 16K RAM/RDM expansion board that sells for \$110 (a&t) or \$17.95 (bb).

- P-C Pak is a Centronics-compatible parallel-printer port (real-time clock available as an option) that sells for \$79.95 (a&t) or \$18.95 (bb).

- Proto CoCo is a prototyping board for \$14.95.



TSA Conditioned Power Strip

For more information, contact PBJ Inc., 911 Columbia Ave., North Bergen, NJ 07047.

Reader Service ✓ 556

Prevent Voltage Glitches

Protect your microprocessor-based equipment against high-voltage spikes, surges, glitches, and transients.

The TSA Conditioned Power Strip provides normal and common mode protection and assures electronic equipment of clean incoming ac power. It also prevents disturbances generated by equipment from being conducted back into the power line.

The TSA comes in three models, offering four (\$45), six (\$47.50), or eight (\$49.95) outlets. These strips are circuit-breaker protected, plug into any 120-volt receptacle, and handle up to 15 amps. They are equipped with a 6-foot, heavy-duty, three-conductor line cord; master on/off switch; and red pilot light.

For more information, contact Pilgrim Electric Company, 29 Cain Drive, Plainview, NY 11803.

Reader Service ✓ 558

American Dragon

The long-awaited, Welsh-made Dragon personal computer with its supporting software and hardware is now being manufactured and distributed in America through agreement with the Tano Corporation.

Tano's Dragon is a 64K home computer with sound and color graphics capabilities. It supports a wide variety of business, educational, and game cartridges and

has the standard connections for joystick controllers, a cassette recorder, a printer, a modem, a disk controller, and drives.

The Dragon is sold in department and computer stores for under \$400.

For further information, contact the Tano Corporation, 4301 Toche Court West, New Orleans, LA 70129, 504-254-3500.

Reader Service ✓ 553

Education for Dragons

Tele-Tutor I is an educational package made up of four programs for the Dragon-32 computer.

- Spelling Test uses the cassette player to produce a standard oral spelling test. The student hears the taped word and types his answer into the computer, which notes and records his accuracy.

You can use this program for any subject that requires a single answer (i.e., capital cities, presidents, or equations).

- Word Drill gives a multiple-choice vocabulary test. You enter words and their definitions onto a cassette data file. The Dragon then randomly selects and displays a definition beside eight possible answers.

- Math Drill lets up to six students at a time practice addition, subtraction, division, and multiplication. It incorporates 10 difficulty levels and makes a full report of each student's performance at the end of the test.

- Estimate helps up to five students practice their mental arithmetic in the four main math areas. The program records the time taken for each estimation and gives a full report at the end of each test.

PRODUCT NEWS

Tele-Tutor I sells for £25 from the Microdeal Ltd., 14 Truro Road, St. Austell, Cornwall PL25 5JE England. Tel.: 0726-67676.

Reader Service ✓ 561

Power Console

The Model 038 Power Console includes two sets of outlets for

display and peripherals. Each set has its own RFI/EMI filter with 55db common mode and differential mode noise rejection in a frequency range from 150 kHz-30 MHz, and its own high-voltage, high-energy transient-surge suppressor that can absorb spikes to 70 Joules.

The unit is designed to protect each set of outlets from the incoming ac line and the other set

of outlets, eliminating component cross talk and interaction problems. It has a shielded ac line cord to prevent reradiation, should you overlap your instrument line cord on the power console, and a main on/off switch, indicator light, and 15-amp resettable circuit breaker.

The Model 038 can be wall, floor, or bench mounted, has a 13-by-4½-inch case, and weighs 4 pounds. Price: \$125 from PCM Industries Inc., 9353 Activity Road, San Diego, CA 92126.

Reader Service ✓ 562

postage) from HJL Products Inc., 955 Buffalo Road, Rochester, NY 14627.

Reader Service ✓ 559

Movable Computer Table

The Model CT-100 is a three-shelf computer table that offers a desk surface; a shelf above for the monitor, disk drive, and printer; and a shelf below for manuals, software, and accessories.

The table is finished in Arcadian hickory vinyl veneer, has casters for easy maneuverability, and sells for \$69.95. For more information, contact Bush Industries Inc., 312 Fair Oak St., Little Valley, NY 14755.

Reader Service ✓ 557

Keyboard Alternative

Improve your typing speed and reduce errors with the HJL-57 Professional Keyboard. It gives sculptured, low-profile keycaps, full-travel switch movement, and four software-definable function keys to your CoCo.

Switch contacts are rated for 100-million cycles minimum, and covered by a protective membrane to guard against dust, dirt, and spills. The keyboard meets FCC Article 15 requirements for RFI/EMI shielding.

The HJL-57 is a user-installed kit complete with keyboard, mounting hardware, and a black plastic bezel. It requires no special tools, soldering, drilling, or gluing, and sells for \$79.95 (\$2

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.

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- OS-9 Level 2 users - contact GIMIX for system requirements and availability.

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- UniFLEX for the GMX 6809 CPU III and Intelligent I/O boards is in development.

OS-9 GMX I; OS-9 GMX II; FLEX; and UniFLEX

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- 9511A \$312.00 9512 \$265.00

#49 64KB GHOST SYSTEM includes: #05 CPU; #19 Classy Chassis; 64KB static RAM; a #43 2 port serial card & cables; #68 DMA Controller; all necessary cables, power regulators, and filler plates; GMXBUG monitor; FLEX; and OS-9 GMX I. You can software select either FLEX or OS-9. The OS-9 Editor, Assembler, Debugger, BASIC-09, and RUNB are also included.

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- #49 with #90 19MB Winchester subsystems & one 80 track DSDD drive \$7398.49

#39 128KB SYSTEM includes: #05 CPU; #19 Classy Chassis; 128KB of static RAM; a #43 2 port serial card & cables; #68 DMA Controller; all necessary cables, power regulators, and filler plates; GMXBUG monitor; FLEX; and OS-9 GMX II. You can software select either FLEX or OS-9. The OS-9 Editor, Assembler, Debugger, BASIC-09, and RUNB, and GMX-VDISK for FLEX are included.

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- #39 with #90 19MB Winchester subsystem & one 80 track DSDD drive \$7998.39

UniFLEX, available at extra cost, requires 8" or Winchester drives. A signed license agreement with TSC is required before shipment.

You can add to any GIMIX system RAM, I/Os and other options, or substitute non-volatile RAM. GIMIX will customize to your needs.

COMING SOON: Contact GIMIX for price and availability on 40MB and 72MB Winchester (5 1/4") drives, removable pack Winchesters, 256KB static RAM boards.

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- Missing cycle detector \$38.23 Filler plates \$14.92
- Back panel connector plates (specify) \$8.60 50 Hz. option \$30.00

MEMORIES (GIMIX uses only Static RAM)

- #67 64KB NMOS STATIC RAM board \$478.67
- #64 64KB CMOS STATIC RAM board w/battery back-up \$568.64
- #34 8K PROM board \$98.34
- #32 16 socket PROM/ROM/RAM board \$238.32

I/O Boards (see above for Intelligent I/Os)

- #41 Single port serial, RS232/20ma. current loop \$88.41
- #43 2 port serial, RS232 \$128.43
- #46 8 port serial, RS232 \$318.46
- #42 2 port parallel \$88.42
- #45 8 port parallel \$198.45
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- Each cable with connectors for back panel mounting (specify board) \$24.95

DISK CONTROLLERS

- #68 DMA (featured in all systems above) \$588.68
- #28 dbl. dens. programmed I/O (5" drives only) \$298.28
- #58 single dens. programmed I/O (5" and/or 8" drives) \$226.58
- #48 same as #58 but for 5" drives only \$198.48
- Cable sets: 8" with Back Panel connector \$29.25
- for two 8" external drives \$44.26
- for two 5" drives \$34.96

SOFTWARE: GIMIX exclusive versions of OS-9/GMX I, II, III & FLEX are for GIMIX hardware only. All versions of OS-9 require the #68 controller. When ordered with any controller, FLEX is \$30.00

- GMXBUG PROMs and manual \$98.65
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- Cable for 4 drives \$87.84 Cable for cabinet to mainframe \$45.81

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- DMA controller.
 - #90: Includes one 19MB drive, interface, and Software \$3588.90
 - #91: includes two 19MB drives, interface and Software \$5288.91
- Contact GIMIX for price and availability of other forthcoming subsystems.

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- #76 GHOST 80x24 VIDEO BOARD \$398.76
- #66 50 pin Protoboards \$56.66 #33 30 pin Protoboards \$38.33
- #03 6800 CPU \$224.03
- #06 6800 CPU with timers \$288.06 Baud rate option, add \$30.00
- #08 RELAY DRIVER (board, bracket, transformer, and 31 relays) \$1128.08
- #86 - #08 (board, bracket, transformer, without relays) \$538.86
- #85 OPTO board \$348.85
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