

THE Color^{*} Computer

MAGAZINE

May 1983 \$2.95

For TRS-80 @Color Computer & TDP-100™ Users

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Computer
Space Trek
Barden On
Animation
Custom Color
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Projects, Reviews
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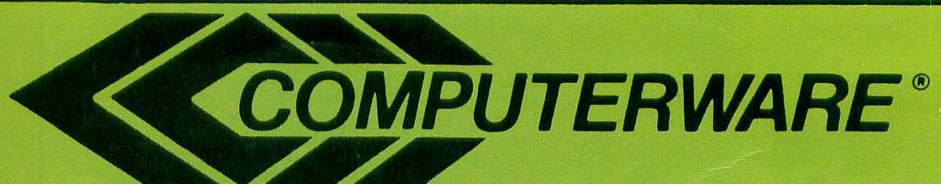
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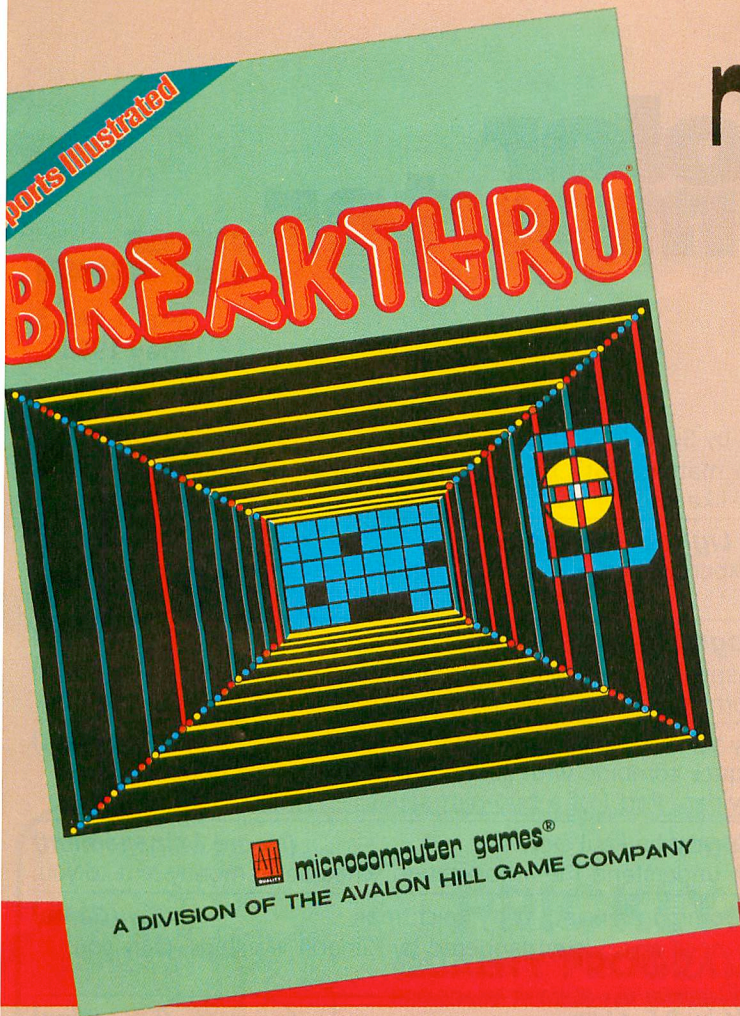
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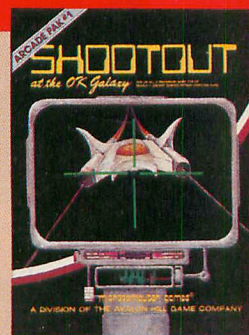
A fast-action, three-dimensional, high-resolution, machine language ARCADE GAME that's really a whole lot more than a mere game. Actually, it's like racquetball will be played someday in space, with realistic graphics and sound providing an exciting simulation of motion and perspective. BREAKTHRU is as much fun to watch as it is to play. The object is to knock out five consecutive walls at the opposite end of the racquetball court using a joystick paddle to strike or deflect the lively ball!

Solitaire Sci-Fi . . .



VOYAGER challenges the human player to explore the four levels of an alien spacecraft's maze-like corridors and rooms in 3-D simulated graphics, while avoiding robots programmed to blast any intruders. In order to win, the human must destroy all power generators and escape or hunt out and annihilate the killer robots. With sound and color animated graphics.

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Gangbusters

If you've ever wanted to live a life of crime, this is the game for you.



THE Color Computer... MAGAZINE

Vol. 1, No. 3
May 1983



FEATURES

10/Language Teacher by Scott L. Norman

(Education)

Parlez-vous Basic? Doesn't matter, that's not the language we have in mind. French, Spanish, German are more like it.

16/Install a Power-on Light by Tom Garcia

(Hardware)

Complete this easy and inexpensive project and you'll never accidentally leave your computer on overnight again.

19/Condense Your Programs by D.E. Wood

(Utility)

By using multi-line statements, you can increase program execution speed and conserve memory. COMLINE will combine certain Basic lines into multi-line statements.

PEEK (05,83)



he very first computer game I couldn't walk away from was Star Trek 4.0 by Jake Commander. Written originally for the TRS-80 Models I and III, the game had it all...well almost all. It had the maneuverability of a good simulation, the decision making of adventures, and the shoot 'em up action of arcade play. What Star Trek 4.0 didn't have, CC Space Trek does: sound and color graphics.

GOTO 40 and strap yourself into the Captain's chair on the bridge of the Federation's mightiest starship. Because of the cinematic rebirth of the Star Trek series, all sorts of copyrights to character names and such must be protected. So we didn't give a name to the starship in Space Trek, but leave it to your imagination. Whether you call it the Enterprise or The Good Ship Lollipop doesn't matter. What does matter is that you save the galaxy from the evil Klingons.

Dennis Kitz finishes the electrical interface project in month's Custom Color (GOTO 55). William Barden Jr. returns this month with Color Animation. GOTO 25 for a lesson in simple techniques for creating moving graphics. Bill put a lot of physical work into the programs as you'll see in the article.

We get a bit specific this month in the education department. Scott Norman (GOTO 10) presents a program for teaching folks how to speak a foreign language. Now people from the Bronx will be able to speak and understand people from Nashville. Or people from Maine will be able to communicate with Californians — oh like wow. Still, none of us will be able to understand much of the jibberish spoken in Washington D.C. But realizing that no language is as universally understood as is music, GOTO 48 for a lesson in that too. R.F. Miller offers a Color Computer alternative to learning how to read musical notes and recognize their sounds.

Tom Garcia's article, Install a Power-on Light, came too

late to help me. Not only did I accidentally leave my computer on during a weekend, but I also had papers, magazines, and countless other things stacked on top and all around it. Overheated seems too meek a phrase to describe the condition my poor computer was in. GOTO 16 for a simple way to avoid a similar disaster.

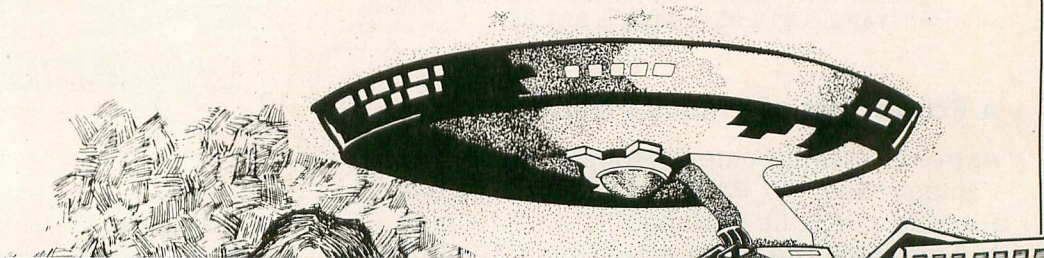
Look at program listings written by people used to a 32-column screen, and then look at listings by people used to larger screen widths. The most common difference between the two is that the latter generally use more multiple-line statements within their programs. Using only one program line per command wastes a lot of memory and can slow down the execution speed of your program. D.E. Wood's article, Condense Your Programs, (GOTO 19), features a utility called COMLINE that you can use to automatically combine lines of a program.

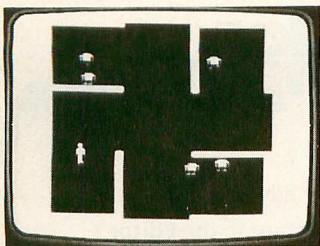
GOTO 36 for some tips in financial planning. Paul Detwiler's Loans program will help you understand how a loan matures.

We kick off REVIEW\$ with an overview of smart terminal packages. As usual with comparative reviews, just when you think you've got all the bases covered someone comes out with a new package, or you find out about an existing one a day before deadline. So consider this overview as just a start. Next month we'll cover the remaining (as of now) smart terminal packages. Of course, there are more reviews, GOTO 64 where the department starts.

Speaking of departments, GOTO 74 for the debut appearance of NEW:PRODUCT\$. These pages offer edited versions of press releases sent to us. The descriptive paragraph following the product's heading is not a review of the product's performance, they are the stated claims of the manufacturers. Many of the items listed will be reviewed in future issues.

— K.L. Editor

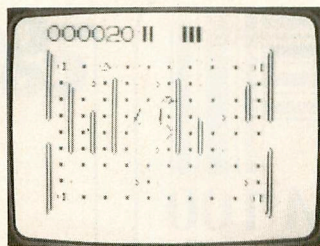




HAYWIRE

This is Mark Data's version of Berserk.™ Super Colors and dynamic sound effects in this fast paced arcade game for one or two players. The exciting combination of angry robots and the Indestructible Menace will provide hours of action filled fun.

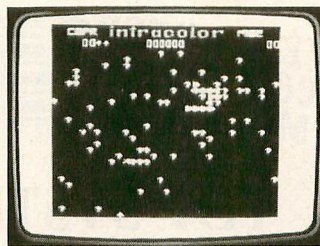
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PACDROIDS

With its space theme, the Super Saucer lays destructomines and the Super Bomb that disintegrates everything in your path, right up to the wall. The maze changes every 10,000 points as the difficulty escalates. 1-4 players. 16K extended basic.

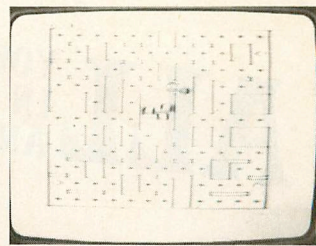
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COLORPEDE

Colorpede has a variety of bugs ranging from a tiny beetle to the gigantic colorpede. Colorpede has better graphics than Katerpillar but the sound is not as good. Colorpede also has a more varied and complicated play routine. 16K.

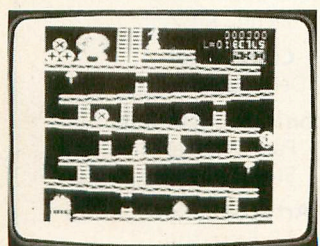
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GHOST GOBBLER

Ghost Gobbler is an excellent version of Pac-Man.™ You must gobble all the food dots while avoiding the ghosts. There are four energizer dots which will make the ghosts turn blue and become scared. This is the best copy of the arcade game. 16K.

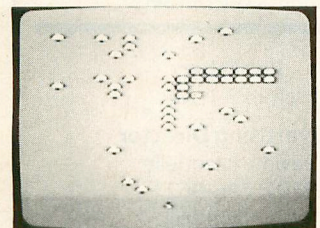
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DONKEY KING

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

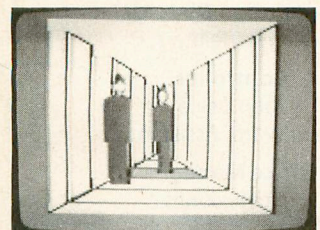
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Katterpillar Attack

Modeled after the popular arcade game, Centipede. This is a well written game. It has slightly larger graphics and better sound than Colorpede. It is also simpler to play than Colorpede. 16K.

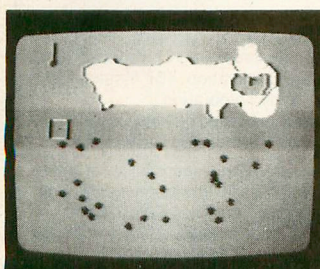
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PHANTOM SLAYER

You must chase the phantoms and kill them with your assortment of weapons. This is a graphics type maze/adventure game with full screen three dimensional graphics. You are armed with a laser pistol, and proximity detector. 16K.

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GOLF

Aardvark has brought this age old game to your Color Computer. With sandtraps, trees, water holes, and a great sound track you just might mistake it for the real thing. Choose your club and select a swing, if you make it to the green, you can even putt. 16K extended color basic.

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By Bob Withers

Now a program for the Color Computer that allows you to download basic programs from Bullet-80 systems. It will also send and receive programs from other Color Computers. Model I's and Model III's. Direct File Transfer (DFT) is a modem program which will handle the direct uploading and downloading of machine language, work processors files, text files, and basic programs directly to tape with no conversion necessary. It is the program you must have to download from any Bullet 80 system. DFT also has a chat mode, and has software controlled half and/or full duplex. For modem use only.

VENTURER

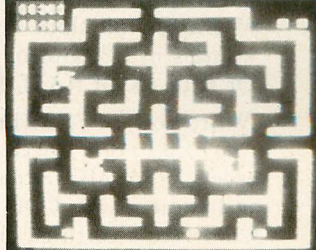
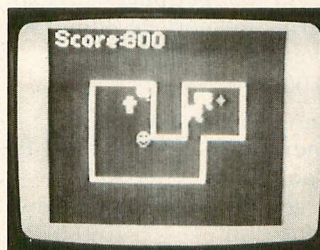
Fantastic arcade game comes to life on your Color Computer screen. Upon entering each room you'll find new treasures and new challenges. Using your joystick, get the treasure while fending off the attacking creatures. This great new adaptation by Aardvark will put excitement back into your Color Computer. 16K.

Tape \$19.95

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With skill and technique, you must guide your hunter robot through the maze of caverns in search of treasure. But watch out, the cave is possessed with spooky creatures that'll feast upon your robot. You can destroy them by supercharging your robot with energy or just try to outrun them. Written by Mark Data. Uses Joysticks. 16K.

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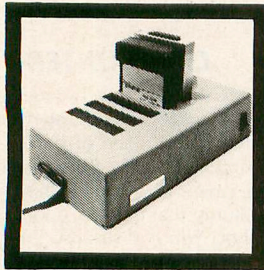
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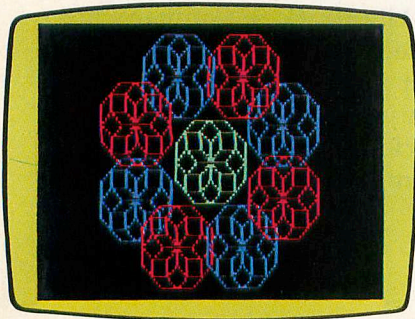
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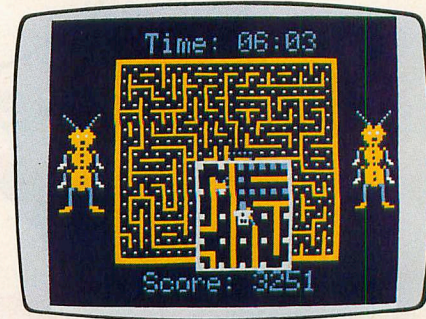
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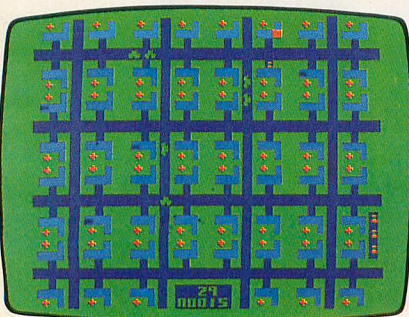
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Discover Color LOGO

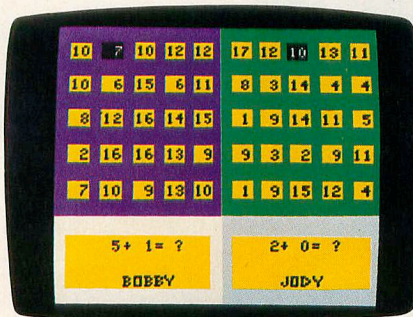
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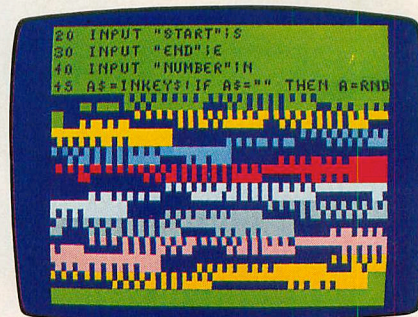
Mega-Bug. It's a maze of fun as you run from the little "buggers" hot on your trail. You eat white dots, leaving a trail of dots behind you. Win by leaving false trails and eating all the dots. 26-3076 **34⁹⁵**



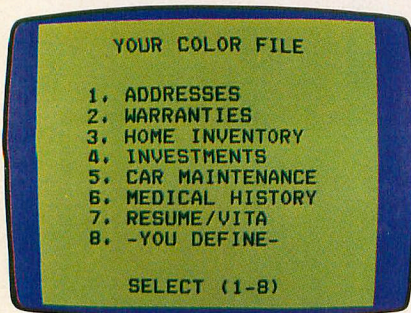
Poltergeist*. Based on Steven Spielberg's hit movie! To have a "ghost" of a chance of saving Carol Anne, you must find the clues, climb the stairs, and destroy the poltergeist. 26-3073 **34⁹⁵**



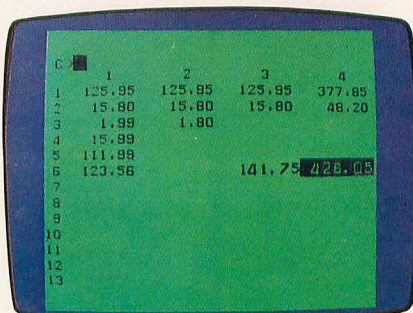
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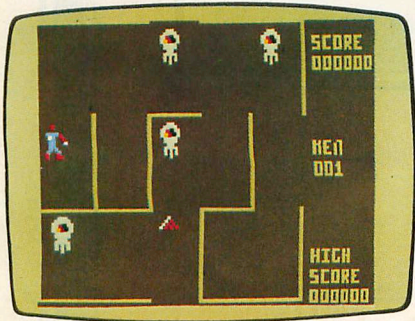
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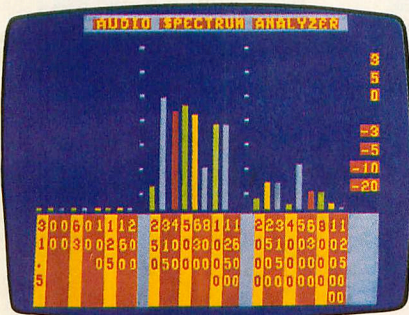
Monster Maze. Thread your way through the evil dungeon in search of gold. Take care—laser-firing monsters could be around! By the way, they can shoot *through* the walls! 26-3081 **29⁹⁵**



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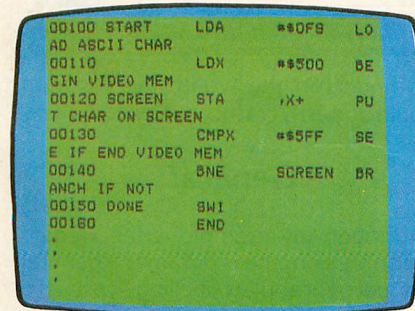
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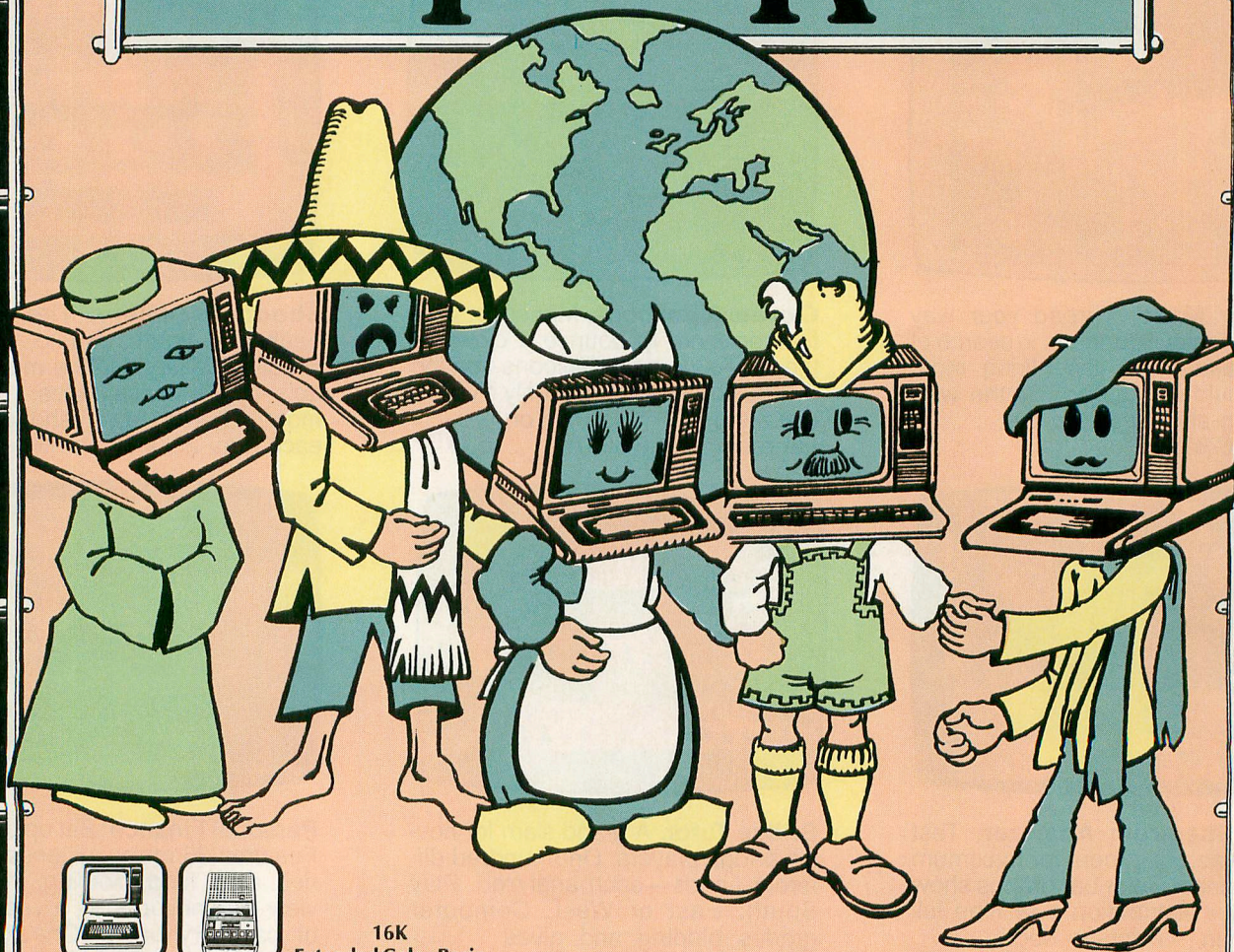
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LANGUAGE TEACHER



16K
Extended Color Basic

by Scott L. Norman

ONE OF THE ARGUMENTS often used to justify the purchase of a computer to a dubious spouse is the "It's important for the kids' education" gambit. Computers have unlimited patience, perfect accuracy, and instant availability. The argument has a degree of validity; computers may not be essential, but they do have a role to play in drill.

My program is a flexible program for foreign language study. It will fit in a 16K Color Computer, and can be run by the individual student. I wrote the program for my daughter when she was beginning French studies in sixth grade; she

has used it for nearly two years now. The vocabulary lists take the form of DATA statements that merge with the main program at run time. As a result, it is simple for Beth to build her lists from her textbook or class lessons. In other words, no program maintenance for me. Another benefit of this simplicity is ruggedness; since kids are the greatest

bug-finders in the world, the program should be partly crashproof by now.

General

Although my example is the French/English version, the program is a general bilingual vocabulary/spelling test. To adapt it to other languages, change the opening and closing graphics, and some of the text on the instruction screens. I hope that some of the ideas presented here will find their way into instructional programs for other subjects.

For the vocabulary quiz, the student specifies the English or the French half of

a bilingual word pair. He or she then recites the matching word (honor system!), and presses any key to verify the answer. For the more challenging spelling test, the computer gives the English and the student types the French word. You get two chances before the machine presents the correct spelling. The program keeps track of the total number of words and the number of wrong answers, and reports at the end of the test.

At the end of a spelling test, the student can go through the word list again, or try only those words that were misspelled at least once. If the student elects to work with just the troublesome words, a similar option will be presented at the end of that test. This time, only words misspelled during the re-test are counted. This process continues as long as the student chooses. Also included in the program are options for switching from spelling test to vocabulary drill and vice versa.

Appropriate audio responses abound in this program: cheery rising notes for a correct answer, descending notes for the first incorrect spelling of a given word, and a mournful low tone for the second successive wrong spelling. When the student finally selects the Quit option, an appropriate farewell message appears in tri-color (well, actually red/buff/blue) low-resolution graphics, and the computer plays the opening bars of the Marseillaise. This use of the PLAY command and a couple of occurrences of STRING\$ are the only requirements for Extended Color Basic in the entire program.

Details and Operation

I did not provide a line-by-line description of the program; the program flow is easy to follow from the listing. A few comments, mostly relevant to the spelling test may be in order, however.

Listing 1 presents the main program, with a sample set of DATA statements in Listing 2. Notice the order: English word, French word. If you want to reverse the order for any reason, change program lines 640 and 1020 to ensure the proper string variable names are assigned.

All vocabulary sets begin with line 5000 and end with a DATA 0,0, which provides a convenient way to test for the end of the valid items. Both program segments must be saved in ASCII format to be chained together at run time. The techniques for this are pretty well known by now, but I'll cover them once more for newcomers in the audience.

I'll assume the main program has been saved under the filename LANGTEST,

and the vocabulary list under the filename VOCAB. If you have a disk system, you can merge the two with the instructions:

```
LOAD "LANGTEST"
MERGE "VOCAB/BAS"
```

For cassette systems, there's a little more to it:

```
CLOAD "LANGTEST"
POKE 25, PEEK(27)
POKE 26, PEEK(28)-2
CLOAD "VOCAB"
POKE 25, 30
POKE 26, 1
```

When we had a cassette-only system, I made up an instruction sheet (mentioned in the listing) detailing all the PEEKs and POKEs.

The rationale for using DATA statements and a simple READ EN\$, FR\$ instruction was my desire for a system that would handle vocabulary lists of variable and unpredictable length. That's why I avoided setting up a string array of fixed dimensionality to hold the data. There are two of these arrays for misspelled words, however. They are named E\$(M) and F\$(M), and are set to blanks when you give the RUN command (lines 200-220). Notice that this is done explicitly, without a DIM statement; I used the Color Basic default, which is a dimensionality of 11 (subscripts 0-10). Most student vocabulary lists are short enough so that it's unlikely more than 11 words will be misspelled. If this happens, the error message in line 1420 expresses the computer's opinion!

String arrays provide a convenient method of separating the words the student is having trouble with. It's simple to set up a review loop if you select the appropriate program option.

One unfortunate byproduct of using DATA statements is the program's inability to accept commas within phrases. (Although I've been talking about individual vocabulary words, the program does handle phrases as well.) French, however, has other markings, such as accents and the cedilla, which the program can't handle either.

There are a few counters in the program whose use may not be clear from the listing. Table 1 may explain these.

When the student finishes one word list, he or she can elect to continue with another. In that case, delete the DATA statements beginning at line 5000 and merge another set with the main program already in memory. That is, for a disk system (where NEWLIST is the second set of vocabulary words)

```
DEL 5000-
MERGE "NEWLIST/BAS"
```

and away you go. Cassette users have to

use the PEEKs and POKEs again, I'm afraid.

That's about all there is to it. Nothing brilliant, but fun to write and a program that seems to fill a genuine need. ■ ■ ■

Table 1.

TW — Total number of words read from either a complete vocabulary list or an array of misspelled words.

WR — Number of words misspelled during any pass through such a list.

XX — Value of WR at the end of a pass; used when WR is reset to 0 before further review can take place.

N — Number of attempts made to spell a given word.

Program Listing 1

```
50 ' DRILL PROGRAM
60 ' EXAMPLE: FRENCH VOCABULARY

70 ' BY SCOTT L. NORMAN
100 CLS:PRINT
110 FOR N=1 TO 7
120 PRINT TAB(2)"FRENCH TEST"
130 SOUND RND(255),1
140 FOR T=1 TO 100: NEXT
150 PRINT TAB(16)"ESSAI FRANCAIS
"
160 SOUND RND(255),1
170 FOR T=1 TO 100: NEXT
180 NEXT N
190 FOR T=1 TO 1500: NEXT
200 FOR M=0 TO 10
210 E$(M)="": F$(M)=" "
220 NEXT
230 M=0
240 CLS
250 PRINT @ 34,"THIS PROGRAM WIL
L LET YOU USE"
260 PRINT "THE COMPUTER TO TEST
YOUR KNOW-"
270 PRINT "LEDGE OF FRENCH VOCAB
ULARY AND"
280 PRINT "SPELLING. IN THE VOC
ABULARY"
290 PRINT "TEST, YOU JUST SAY TH
E FRENCH "
300 PRINT "OR ENGLISH WORD NEEDE
D TO YOUR-"
310 PRINT "SELF AND PRESS A KEY
TO SEE IF"
320 PRINT "YOU'RE RIGHT. IN THE
SPELLING"
330 PRINT "TEST, YOU HAVE TO SPE
LL THE RE-"
340 PRINT "QUIRED FRENCH WORD."
350 PRINT TAB(2)"ENTER V FOR VOC
ABULARY, S FOR"
360 PRINT "THE SPELLING TEST."
370 PRINT
380 INPUT "YOUR CHOICE";A$
390 IF A$="S" THEN 900
400 IF A$="V" THEN 500 ELSE CLS
410 PRINT @ 66,"SORRY, I DON'T U
NDERSTAND!": PRINT
420 GOTO 350
499 '*** VOCABULARY TEST ***
```

Listing continued on page 14

Continued from page 11

```
500 CLS: PRINT @ 7, STRING$(2, "*"
); "VOCABULARY TEST"; STRING$(2, "*"
)
510 PRINT: PRINT TAB(2) "ENTER E I
F YOU WANT THE COM-"
520 PRINT "PUTER TO GIVE YOU THE
ENGLISH"
530 PRINT "WORDS, ENTER F IF IT
SHOULD"
540 PRINT "GIVE THE FRENCH. AFT
ER YOU'VE"
550 PRINT "SAID THE MATCHING WOR
D TO YOUR-"
560 PRINT "SELF, PRESS ANY KEY E
XCEPT THE"
570 PRINT "RED <BREAK> KEY TO SE
E IF YOU"
580 PRINT "WERE RIGHT."
590 PRINT: INPUT "YOUR CHOICE"; B
$
600 IF B$="E" OR B$="F" THEN 630
ELSE CLS
610 PRINT @ 34, "SORRY, I DON'T U
NDERSTAND!"
620 GOTO 510
630 CLS
640 READ EN$, FR$
650 IF EN$="0" THEN 710
660 IF B$="E" THEN PRINT @ 96, "E
NGLISH: "; EN$ ELSE PRINT @ 96, "F
RENCH: "; FR$
670 IF INKEY$="" THEN 670
680 IF B$="E" THEN PRINT @ 160, "
FRENCH: "; FR$ ELSE PRINT @ 160, "
ENGLISH: "; EN$
690 PRINT @ 256, "PRESS ANY KEY
FOR THE NEXT WORD"
700 IF INKEY$="" THEN 700 ELSE 6
30
710 RESTORE: CLS
720 PRINT @ 34, "FINISHED WITH TH
IS WORD LIST."
730 PRINT "ENTER YOUR CHOICE OF
WHAT TO"
740 PRINT "DO NEXT:"
750 PRINT: PRINT TAB(2) "(1) QUIT"
760 PRINT: PRINT TAB(2) "(2) REPEA
T THIS LIST"
770 PRINT: PRINT TAB(2) "(3) GO TO
THE SPELLING TEST"
780 PRINT: PRINT TAB(2) "(4) START
OVER WITH NEW WORDS"
790 PRINT: INPUT "YOUR CHOICE"; A
800 ON A GOTO 1600, 500, 900, 1800
899 '*** SPELLING TEST ***
900 CLS
910 PRINT @ 36, STRING$(2, "*" ); "
SPELLING IN FRENCH"; STRING$(2, "*"
); PRINT
920 PRINT TAB(2) "THE COMPUTER WI
LL GIVE YOU AN"
930 PRINT "ENGLISH WORD OR PHRAS
E; SEE IF"
940 PRINT "YOU CAN SPELL IT IN F
RENCH."
950 PRINT "REMEMBER, THE COMPUTE
R CAN'T"
960 PRINT "HANDLE ACCENTS, COMMA
S, OR"
970 PRINT "CEDILLAS. APOSTROPHE
S ARE OK,"
980 PRINT "THOUGH. PRESS ANY KEY
TO BEGIN."
990 IF INKEY$="" THEN 990
999 '*** ENTIRE WORD LIST ***
1000 TW=0: WR=0
1010 CLS
```

```
1020 READ EN$, FR$
1030 IF EN$="0" THEN 1270
1040 N=0
1050 TW=TW+1
1060 PRINT @ 128, "ENGLISH: "; EN$
1070 PRINT
1080 INPUT "FRENCH"; FX$
1090 IF FX$=FR$ THEN PRINT @ 297
, STRING$(3, "*"); "RIGHT!"; STRING$(
3, "*") ELSE 1130
1100 SOUND 150, 1: SOUND 180, 2
1110 FOR T=1 TO 1500: NEXT
1120 IF A=2 THEN 1490 ELSE 1010
1130 N=N+1: IF N>1 THEN 1200
1140 E$(M)=EN$: F$(M)=FR$
1150 M=M+1
1160 CLS: WR=WR+1
1170 PRINT @ 70, "SORRY, TRY AGA
IN:"
1180 SOUND 180, 1: SOUND 120, 2
1190 GOTO 1060
1200 CLS
1210 SOUND 1, 5
1220 PRINT @ 128, "SORRY, BUT THE
FRENCH WORD FOR"
1230 PRINT EN$; " IS "; FR$
1240 PRINT: PRINT "LET'S GO ON..."
1250 FOR T=1 TO 2000: NEXT
1260 IF A=2 THEN 1490 ELSE 1010
1270 CLS: RESTORE
1280 PRINT @ 66, "FINISHED WITH T
HIS WORD LIST."
1290 PRINT "YOU SPELLED "; TW-WR;
" OUT OF "
1300 PRINT TW; " CORRECTLY ON THE
FIRST TRY!"
1310 PRINT "WHAT DO YOU WANT TO
DO NOW?"
1320 PRINT TAB(2) "(1) QUIT"
1330 PRINT TAB(2) "(2) REPEAT ONL
Y THE WORDS YOU MISSED AT
LEAST ONCE"
1340 PRINT TAB(2) "(3) REPEAT THE
WHOLE WORD LIST";
1350 PRINT TAB(2) "(4) GO TO THE
VOCABULARY TEST"
1360 PRINT TAB(2) "(5) START OVER
WITH NEW WORDS"
1370 PRINT
1380 INPUT "YOUR CHOICE"; A
1390 ON A GOTO 1600, 1400, 1000, 50
0, 1800
1399 '*** SETUP TO TEST ON ERRORS *
1400 CLS: TW=0: XX=WR-1
1410 WR=0: M=0
1420 IF XX>10 THEN PRINT @ 32, "WA
RNING! YOU HAD MORE THAN 11 WO
RDS WRONG, AND I CAN ONLY RE-TE
ST YOU ON THE FIRST 11. YOU'D BE
TTER STUDY!" ELSE 1440
1430 FOR T=1 TO 1000: NEXT
1440 PRINT @ 32, " LET'S TRY AGA
IN!"
1450 FOR K=0 TO XX
1460 CLS
1470 EN$=E$(K): FR$=F$(K)
1480 GOTO 1040
1490 NEXT K
1500 GOTO 1270
1599 '*** CLOSING GRAPHIC ***
1600 CLS 0
1610 PRINT @ 43, CHR$(198)+CHR$(2
04)+CHR$(201);: PRINT @ 48, CHR$(2
02);: PRINT @ 50, CHR$(197);
1620 PRINT @ 75, CHR$(203)+CHR$(1
95)+CHR$(199);: PRINT @ 80, CHR$(2
02);: PRINT @ 82, CHR$(197);
```

```
1630 PRINT @ 107, CHR$(202);: PRIN
T @ 109, CHR$(197);: PRINT @ 112, C
HR$(201)+CHR$(195)+CHR$(198);
1640 PRINT @ 192, CHR$(190)+CHR$(
188)+CHR$(188)+CHR$(185);: PRINT
@ 197, CHR$(190)+CHR$(188)+CHR$(1
88)+CHR$(184);
1650 PRINT @ 201, CHR$(197);: PRIN
T @ 207, CHR$(197);: PRINT @ 209, C
HR$(198)+CHR$(204)+CHR$(204)+CHR
$(201);
1660 PRINT @ 214, CHR$(164)+CHR$(
174);: PRINT @ 217, CHR$(174)+CHR$(
172)+CHR$(172)+CHR$(169);
1670 PRINT @ 224, CHR$(187)+CHR$(
179)+CHR$(179)+CHR$(182);: PRINT
@ 229, CHR$(187)+CHR$(179)+CHR$(1
78);
1680 PRINT @ 234, CHR$(201);: PRIN
T @ 238, CHR$(193)+CHR$(200)+CHR$(
197);: PRINT @ 245, CHR$(202);
1690 PRINT @ 247, CHR$(170);: PRIN
T @ 249, CHR$(171)+CHR$(163)+CHR$(
163)+CHR$(166);
1700 PRINT @ 256, CHR$(186);: PRIN
T @ 258, CHR$(185);: PRINT @ 261, C
HR$(186);
1710 PRINT @ 267, CHR$(201);: PRIN
T @ 269, CHR$(193)+CHR$(200);: PRI
NT @ 272, CHR$(197);: PRINT @ 277,
CHR$(202);
1720 PRINT @ 279, CHR$(170);: PRIN
T @ 281, CHR$(170);: PRINT @ 283, C
HR$(169);
1730 PRINT @ 288, CHR$(186);: PRIN
T @ 291, CHR$(185);: PRINT @ 293, C
HR$(187)+CHR$(179)+CHR$(179)+CHR
$(178);
1740 PRINT @ 300, CHR$(201)+CHR$(
200);: PRINT @ 305, CHR$(201)+CHR$(
195)+CHR$(195)+CHR$(198);
1750 PRINT @ 310, CHR$(161)+CHR$(
171);: PRINT @ 313, CHR$(170);: PRI
NT @ 316, CHR$(169);
1760 FOR T=1 TO 500: NEXT
1770 PLAY "O2;L8;G;P64;G;P64;G;O
3;L8.;C;P64;CD;P64;D;L4;G;L8;EC;
P16;CEC;O2;A;O3;L2;F;L8.;D;O2;L8
;B;O3;L4;C"
1780 GOTO 1780
1800 CLS
1810 PRINT @ 34, "TO USE ANOTHER
WORD LIST,"
1820 PRINT "YOU'LL HAVE TO DELET
E PART OF"
1830 PRINT "THIS PROGRAM AND LOA
D ANOTHER"
1840 PRINT "SET OF DATA STATEMEN
TS. PLEASE"
1850 PRINT "CHECK THE INSTRUCTIO
N SHEET"
1860 PRINT "FOR DETAILS. SO LON
G!"
1870 PRINT: PRINT: END
```

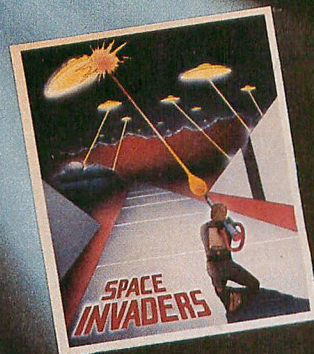
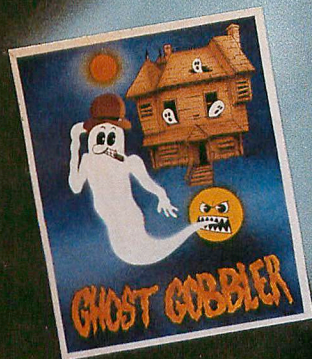
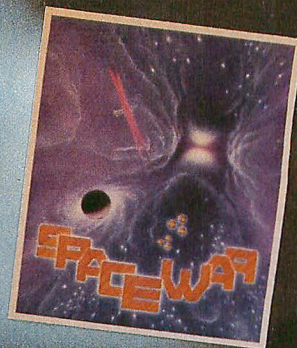
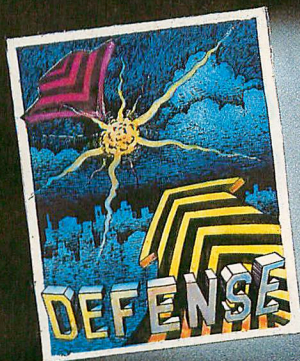
Program Listing 2

```
5000 DATA HOUSE, LA MAISON
5002 DATA MOTHER, LA MERE
5004 DATA FATHER, LE PERE
5006 DATA UNCLE, L'ONCLE
5008 DATA AUNT, LA TANTE
5010 DATA SISTER, LA SOEUR
5012 DATA BROTHER, LE FRERE
5014 DATA DAUGHTER, LA FILLE
5016 DATA SON, LE FILS
10000 DATA 0,0
```


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Install a Power-On Light

by Tom Garcia

A good hardware mod for beginners and old timers alike. If the power indicator light is off, so is your computer.

HAVE YOU EVER left your Color Computer on all night? The last time I did, it had the plastic dust cover and three or four magazines on top. When I discovered what had happened, things were mighty warm in ROM-land!

That's when I decided to install a power-on indicator. This fix requires two parts: one 12-volt LED (Light Emitting Diode) and one 560 ohm resistor. You'll also need two 12-inch pieces of light duty wire, and a low power soldering iron (I use a 15 Watt iron).

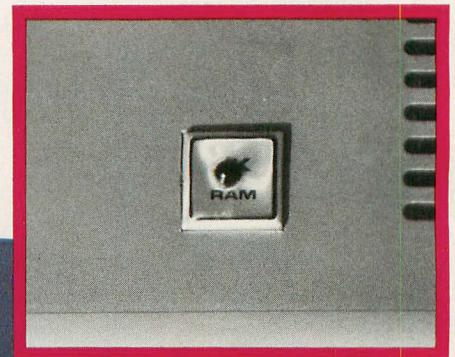
I picked the 560 ohm resistor as it gave a 17 mA current draw. Try and keep the power consumption of the LED to 20 mA or less; the higher the resistor's value, the less power draw and the dimmer the LED's light.

The resistor's color code is: green blue, brown. The green band is closest to the end of the resistor; the brown band might be followed by a gold or silver band. Don't worry about that one, it's a tolerance designator. For this job any tolerance will do.

Unplug the computer and turn it upside-down (put a towel on the work table so you don't scratch the computer case). Remove the seven screws holding the two parts of the case together. One of the screws is under the warranty sticker. I take my computer apart so often that the warranty sticker screw is the only one I use (I've thrown the rest away). The screws are recessed and you may have to turn the computer right-side up and shake it a little until they fall out.

With the computer right-side up, lift off the top part of the case and set it aside. Decide where you want to install the LED (I picked the 32K RAM button for mine). With the case off you can see the

Right: a closeup view of the LED power indicator installed on the Color Computer's RAM ID Button. Below: the finished project, neatly installed, and useful too!



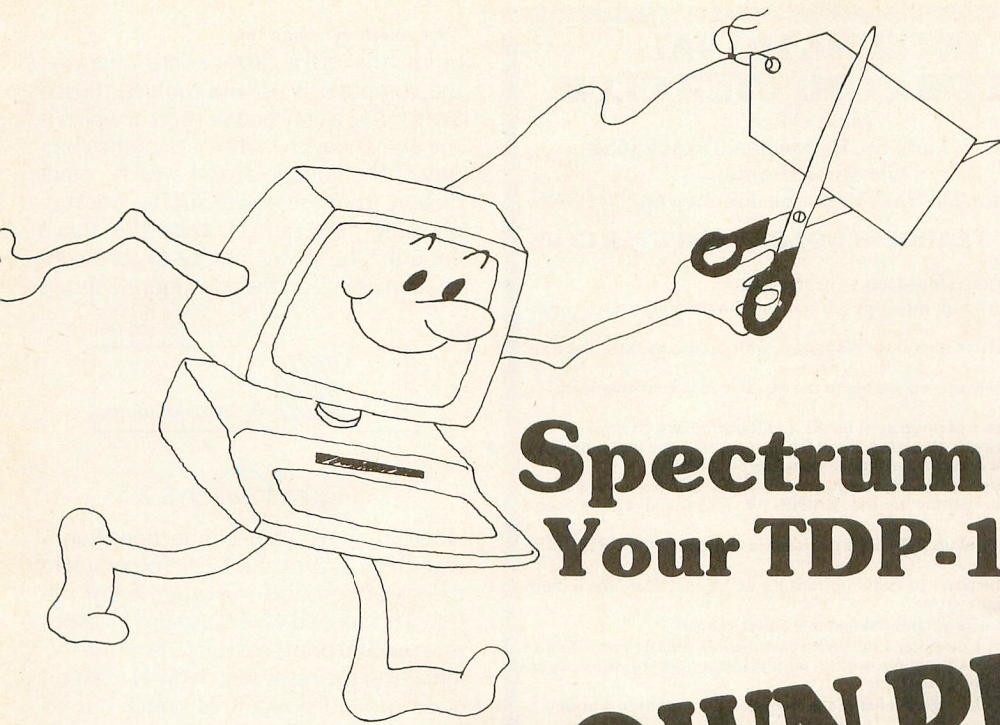
button held in by two bent tabs; it's easy to remove. After you take out the button, drive a little mark in the center of it (on the inside) with an awl. Then use the mark as guide and drill a hole in the button about the size of the LED. Insert the LED and glue it in place with epoxy or SuperGlue.

If you want to put the LED somewhere else, try halfway between the Break key

and the RAM ID button. That way, putting things on top of the computer won't interfere with the protruding plastic LED device. Recent Color Computer and TDP-100 models don't have RAM ID buttons. Any location on top or along the front ridge is fine.

You now have to provide the LED with 12 volts. That voltage is available at vari-

Text continued on page 18



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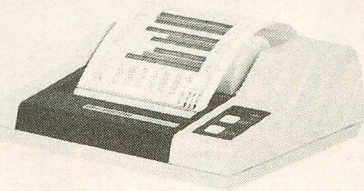
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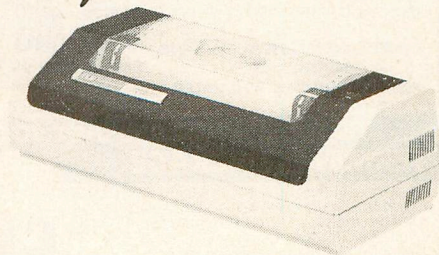
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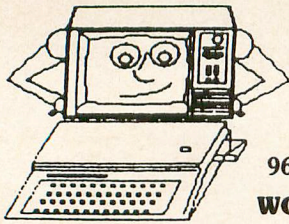


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Continued from page 16

ous points on the circuit board whenever the computer is up and running. I used Switch S-2 as my power source, which is the on/off switch in the back of the computer. The voltage at the switch comes directly from the power supply. My supply only puts out 11 volts but that's enough. The switch has 12 unused connection points on the top. Figure 1 shows

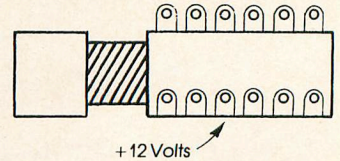


Figure 1 Switch S-2

where to make your connection. Run a wire from S-2 to the LED. To complete the circuit, ground the other leg of the LED. This second wire must also incorporate the 560 ohm resistor. One of the terminals on the reset switch (S-1) makes a good ground point. This switch has six unused connection points on it's top. Solder the resistor to the terminal and the wire to the resistor, then run the wire to the LED. See Figure 2 for the proper tie point.

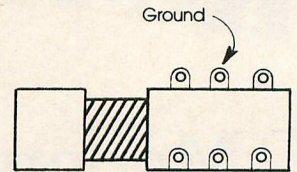


Figure 2 Switch S-1

One last problem; the diode has to be installed a particular way (correct polarity) or it won't work. The LED I used had no polarity markings so I had to try it both ways. Installing it wrong won't hurt anything, but the light won't work if it's wired wrong. The LED's I used were of the "ten for a dollar" variety, and the first two I tried were duds.

You can test wire it up using clip-leads before doing the hard wiring, to get the LED polarity right. How you dress the wires and connections is up to you. I used spaghetti (stripped from #18 wire) at the LED, bent the LED legs flat against the computer case, and put a piece of electrical tape over those connections.

Put the case top back on, turn the computer over and re-install the screw(s). The two 7/8-inch screws go in the front (keyboard) holes and the longer 1 1/4-inch screws go in the other five holes. Take care when laying the computer upside-down if your installation is such that the LED protrudes above the top of the case. Now, plug in the computer, turn on the power, and see the friendly glow.



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Condense Your Programs

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with this handy little routine.*

EACH LINE OF A Basic program has a five-byte overhead — two for the pointers to the next line, two for the line number and one for the zero that marks the end of the line. The colon that separates statements on multi-statement lines takes only one byte. You can save four bytes every time you eliminate a line by combining its text with that of the preceding line. In other words

```
10 PRINT "HELLO" : PRINT "GOODBYE"
```

takes four bytes less memory than

```
10 PRINT "HELLO"  
20 PRINT "GOODBYE"
```

Also, the one-liner executes faster.

Most program lines are more complex than the lines above, so compressing an existing program by combining lines is usually a tedious task that requires a lot of retyping. In addition, you run the risk of introducing bugs by making a typing error.

With COMLINE you can combine two lines without retyping either line's text. You input a line number, and your computer combines that line with the next. The resulting multi-statement line will have four extra spaces in it. These can be removed by editing or with a utility designed to remove unnecessary spaces.

COMLINE also offers a means of hiding part of a Basic program. The hidden part executes normally but won't show up when you list the program. You can also use this feature to protect part of your program from unauthorized tampering.

Program Operation

I designed COMLINE to append to the end of another Basic program. (See Table

by D.E. Wood

1 for instructions on how to do this.) Then LIST your program and find a pair of lines you would like to combine. Enter RUN 59000 and respond to the First Line query with the number of the first of the pair.

COMLINE starts at the beginning of your program and uses the pointers at the beginning of each line to skip from

line to line, reading the line numbers. When 59030 finds the line you entered as your First Line, the routine branches to 59050 that reads the pointers of that line to find where the next (the second) line begins. Then 59100 changes the first line's pointers so that they point to the line following the second line. The zero at the end of the first line is replaced with a colon (ASCII 58) and the pointer and line number bytes of the second line are replaced with spaces (ASCII 32).

This last step creates the four unnecessary spaces referred to earlier. It would be nice to eliminate these spaces by mov-

Please turn the page

Table 1

- Type PRINT PEEK 25, PEEK 26 and press ENTER. Make a note of the two numbers printed.
- Type PRINT PEEK 27, PEEK 28 and press ENTER. If PEEK (28) is greater than 1, go to step 5.
- Type POKE 25, PEEK (27) - 1 : POKE 26, PEEK (28) + 254
- Type POKE 25, PEEK (27) : POKE 26, PEEK (28) - 2 and press ENTER.
- CLOAD the second program. If the first line of this program does not have a higher number than the last line of the program loaded in step 1, use the renumber function to give it higher line numbers. The first program will not be affected by a renumber at this point.
- Type POKE 25, the first value noted in step 2
POKE 26, the second value noted in step 2
and press ENTER.

Text continued from page 19

ing the rest of the program forward and overwriting these four bytes. Unfortunately, doing this in Basic would be a slow process since it involves PEEKing and POKEing every byte through to the end of program memory, changing pointers along the way.

When the two lines have been combined, COMLINE returns to the First Line query. You can either enter another line number, or Break and LIST to find another pair.

Safety Features

Lines 59010 and 59030 contain tests that branch to 59700 and abort the process if you enter a non-existent line number. Without this safeguard, the routine would continue searching past the end of COMLINE, into the variable storage area. Depending on what it finds there, it can destroy your program.

Hidden Text

Normally you can't create a line that has more than 250 characters. COMLINE, by POKEing changes directly into memory, bypasses the normal controls and creates lines of unlimited length. Only the first 250 characters are printed

when you list a line. This deliberate creation of extra-long lines offers a means of hiding part of a program. Suppose you have the following line in a program

```
1000 INPUT "ENTER PASSWORD" ; X$ :
      IF X$ <> "HELLO"
      THEN RUN
```

As this stands, anyone can LIST your program and discover the password. To prevent this, use COMLINE to combine line 1000 with one or more preceding lines so that at least the part from HELLO on, is after the 250th character of the resulting line.

Quite often your program logic won't let you do this. If one of the preceding lines contains a GOTO or REM, you can't add line 1000 to the end of it. In this situation, create a dummy line such as

```
999 X = 7 : IF X = 5 PRINT " NOTE :
      put as many spaces between these
      quotes as you can so that this line is as
      long as possible. Don't leave out the
      closing quotes."
```

LIST 999 and make sure the closing quotes are there. Next, edit 1000 to insert an ELSE at the beginning. Now RUN 59000 and respond to the First Line prompt by entering 999. When the

prompt appears again, hit Break and LIST 999-1000. The password request will appear to have disappeared, but if you run the program you'll see it's still there.

To ensure that the password request can't be bypassed by Breaking and re-entering the program at a later point, I usually include some essential information just after the password, on the same line. In the above example, the end of the original line 1000 would be something like

```
THEN RUN ELSE A=4 : B=9 :
A$="WHATEVER"
```

These values assigned to A, B, and A\$ are essential to the program's proper operation. If the operator attempts to edit this extra long line, the computer's normal controls on line length come into effect, and everything in excess of 250 characters gets deleted. Even if the operator shortened the line by deleting characters at the beginning of the line, everything past the original first 250 characters would be lost.

Take the same approach to protect a message (such as a copyright notice), from being deleted. Put your message in a 250-character line. On the following line, put some essential information, such as variable definitions. Then com-

Text continued on page 22

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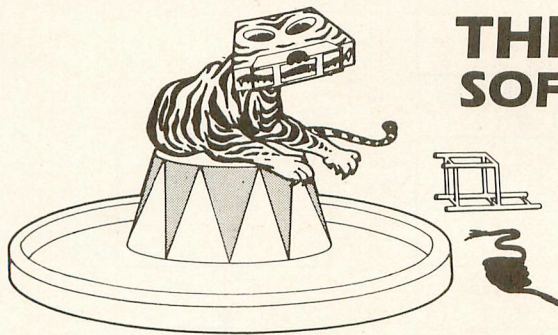
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COMPUTERS

Program Listing

```
59000 REM COMLINE - COCO
59001 REM D. E. WOOD , R. I. A.
59002 REM MEL SEDER , R. I. A.
59010 INPUT " FIRST LINE ";A1 : IF A1 > 58999 THEN 59700
59015 B1 = PEEK ( 25 ) * 256 + PEEK ( 26 )
59020 AC = PEEK ( B1 + 2 ) * 256 + PEEK ( B1 + 3 )
59030 IF AC > A1 THEN 59700 ELSE IF AC = A1 THEN 59050
59040 GOSUB 59600 : B1= B : GOTO 59020
59050 GOSUB 59600 : B2 = B
59100 POKE B1 , PEEK ( B2 ) : POKE B1 + 1 , PEEK ( B2 + 1 )
59110 POKE B2 - 1 , 58 : FOR X = B2 TO B2 + 3 : POKE X , 32 : NEX
T X : GOTO 59010
59600 B = PEEK ( B1 ) * 256 + PEEK ( B1 + 1 ) : RETURN
59700 PRINT " INVALID LINE NUMBER " : GOTO 59010
```



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Text continued from page 20

bine the two lines. Now, if anyone deletes your message, the essential information hidden at the end of the line will automatically be deleted and the program won't work.

Warnings

COMLINE was designed to perform the mechanics of joining two lines. It's up to you to ensure the lines can be combined without destroying the program logic. Any line that gets called should not be eliminated by adding its text to the end of the preceding line. Your first step should be to LIST your program and note all lines that are called by GOTO's, GOSUB's and so on. These lines can be your First Line choice, but should not be the line following a First Line.

You should also ensure that your First Line doesn't include anything, such as a GOTO, REMark or IF statement, which precludes joining the two lines.

Watch out for missing closing quotation marks in print statements. The TRS-80 lets you leave out closing quotes if they are at the end of a line, so a line such as

```
10 PRINT "HELLO
```

is valid. Before you add anything to the end of such a line, insert the missing quotes.

As with any program involving POKEs, you should save a copy of COMLINE before you run it. Otherwise a typo could wipe out all your work.

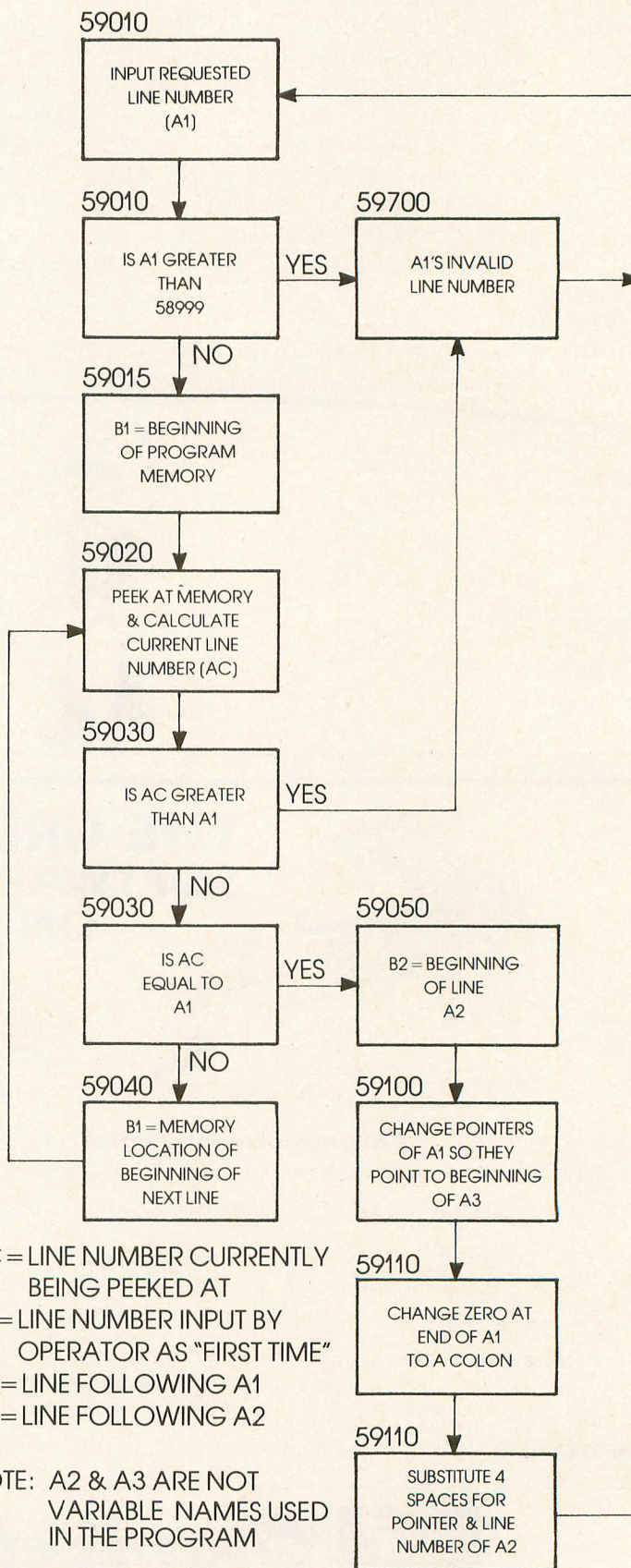
Watch your line lengths. Remember, if you create a line with more than 250 characters, you won't be able to edit without losing part of it. Unless you want to hide something, keep your line lengths within the computer's usual limit. If you do want to create extra-long lines, make sure you have an uncompressed backup copy of the program, just in case you want to edit it someday.

Closing Comments

Rather than type RUN 59000 umpteen times while combining, I usually add a temporary first line, 0 GOTO 59000 to the program I'm working on. Then I just have to enter RUN.

It's easier to write and debug a program if you liberally use single-statement lines. This means sacrificing memory and execution speed. With COMLINE, you can have your cake and eat it too. You can use single-statement lines when writing a program, and use COMLINE to tighten things up. ■ ■ ■

Flow Chart



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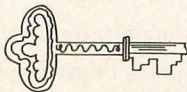
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From DataSoft

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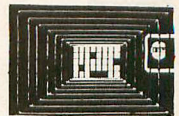


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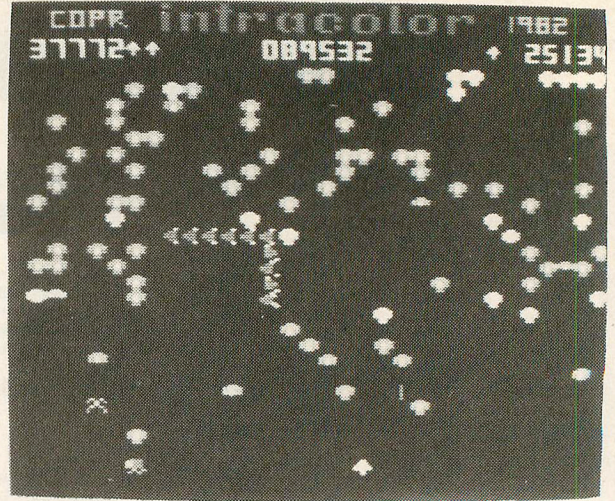
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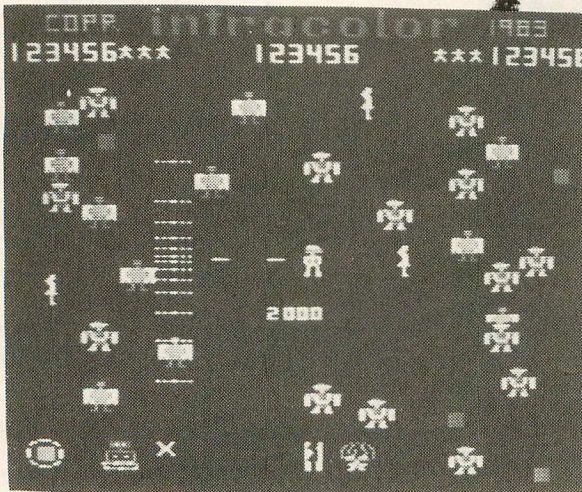
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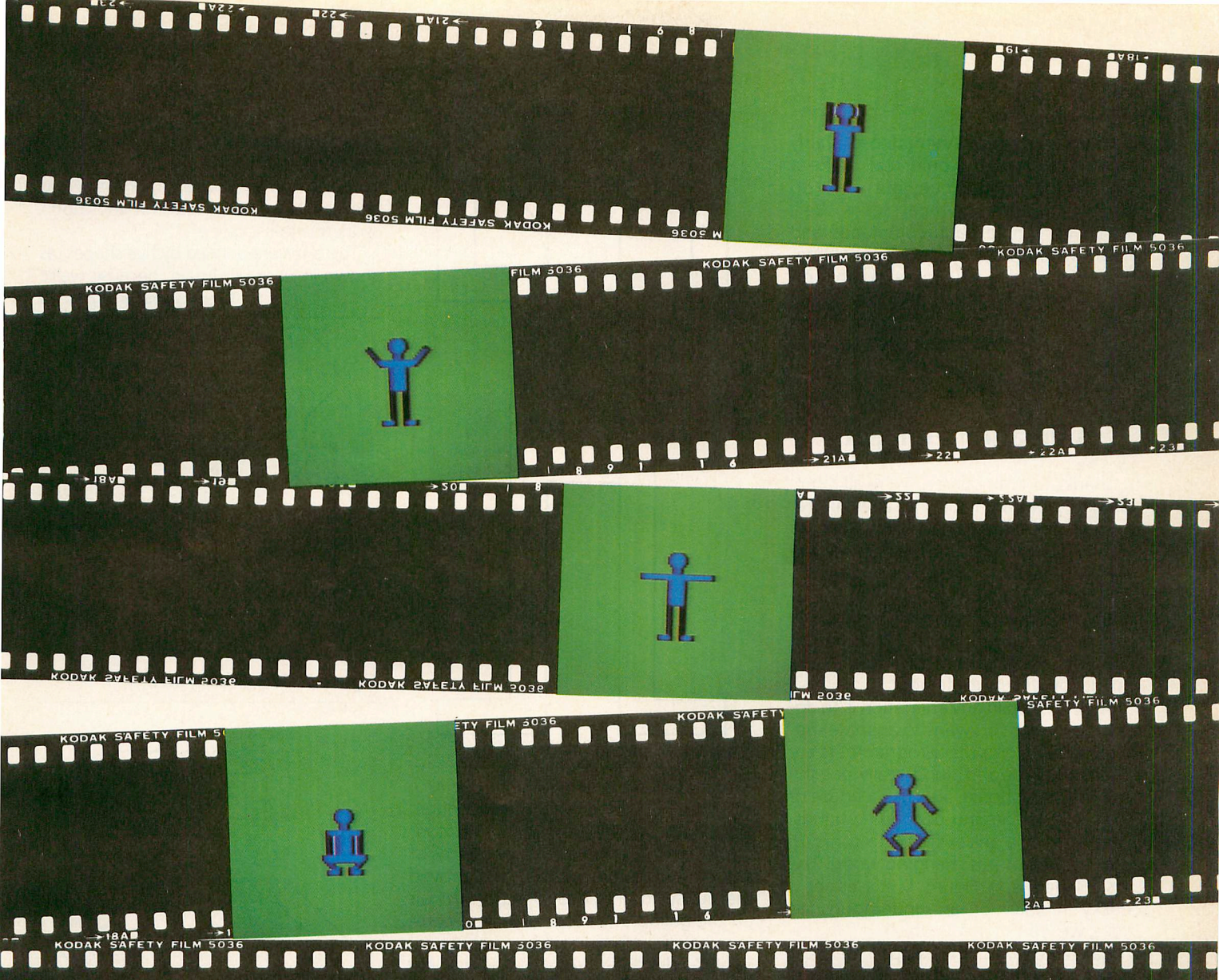
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programmer (reputedly worth 1.2 million)" — interviews with Carson...

In this article we'll look at some of the rudimentary concepts involved in computer animation, one of the most necessary components of games and other Color

Please turn the page...

Continued from page 25

Computer graphics. Animation is a fairly broad subject and would really take a whole book to describe, but we'll do what we can in this two-part series. We'll start with simple Basic commands and finish with assembly-language animation. It may give you some insights on how graphics are done, and also lay the groundwork for doing some things on your own in Color Computer animation and graphics.

Animation Concepts

Thanks to Walt Disney, we're all familiar with what animation is: a serial presentation of images, each one having a slightly different position. When the images are viewed rapidly in succession, they become animated. The eye integrates the series of "frames" and you see continuous motion. Twenty-four frames per second is a good rate, although you can get by with much fewer.

The first step in any animation is to define the figure you want to animate. Because Color Computer programmers are a sedentary lot and don't really get the exercise they should, let's use a figure of someone performing deep knee bends. We'll make it a unisex figure to conform with the rest of this changing world. The basic shape is in Figure 1. It's either a stocky female, or an undernourished male, we won't tell you which.

Having defined the shape, the next step is to define the motion. This isn't as easy as it looks. One way to do it is to actually observe the motion. This technique doesn't work well when defining animation for such things as burning buildings and exploding bodies. In this case, I have a full-length mirror in my computer room and could (grunt!) actually see the deep knee bend motion.

After sweating profusely, I came up with the basic movements shown in Figure 2.

By the way, if you intend to do much animation, you may want to pick up a Dover publication entitled *The Human*

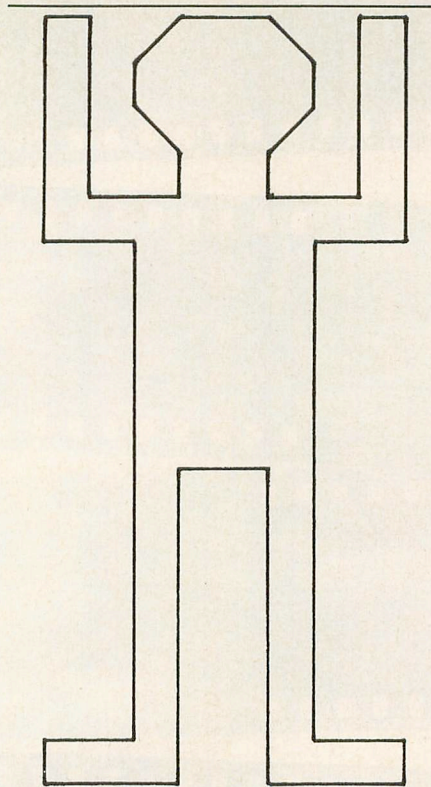


Figure 1. Animation figure

Figure in Motion, and *Animals in Motion*, by Eadweard (sic) Muybridge. Muybridge was a 19th-century photographer who did stop action sequences of animal and human motion (he proved that horses don't have all legs in the air on the gallop at the same time, a common belief up to his study). His photo sequences define figure positions that are helpful in defining animation frames.

Drawing the Figures

One of the keys to efficient animation is to avoid redefining the figure for each frame. Having to draw a completely new figure for each frame is expensive in time and labor costs. That's why there aren't too many *Snow Whites* these days.

We can get by with a central body area for our exercise as shown in Figure 3. This central body area will never change. The head is defined by an octagonal-like line

sequence as shown in the figure. We could have used a CIRCLE command for the head, but we'll be using the DRAW command in Extended Color Basic and the CIRCLE and DRAW commands don't work too well together.

The arms are defined by five shapes, as shown in Figure 4. Again, because we're

Text continued on page 30

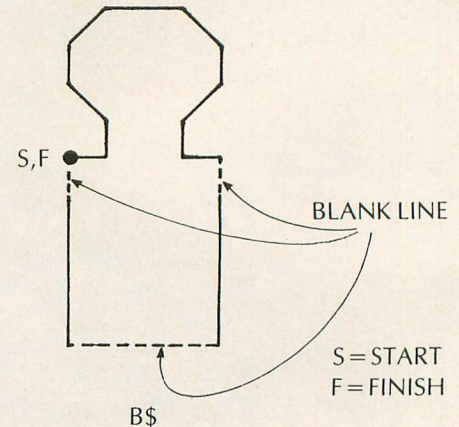


Figure 3. Central body area

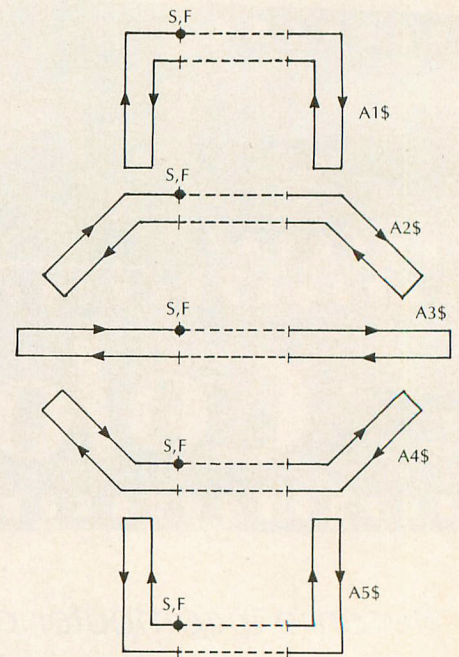


Figure 4. Arm shapes

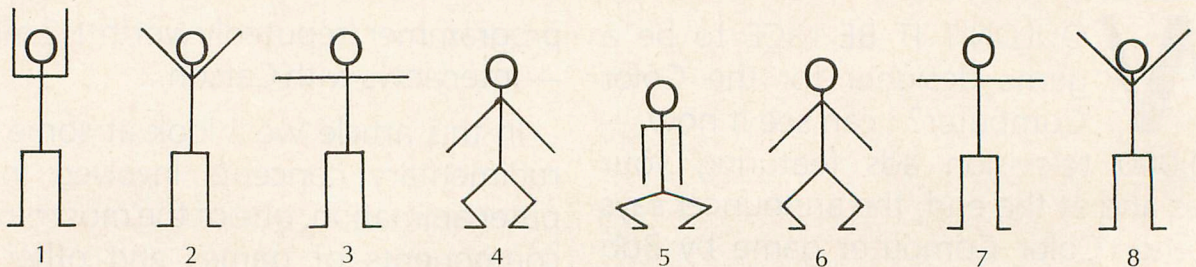
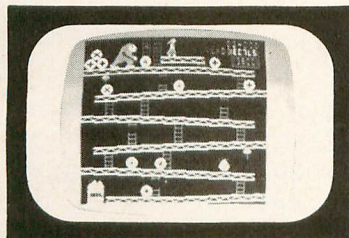


Figure 2. Basic positions for deep knee bends. Positions 2 and 8 are the same. Positions 3 and 7 are the same and positions 4 and 6 are the same.

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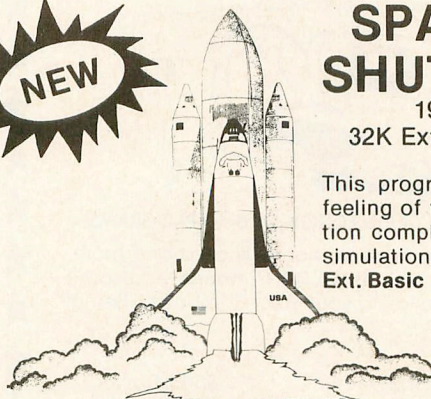
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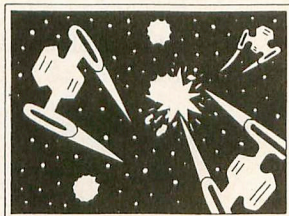
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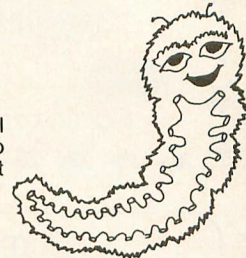
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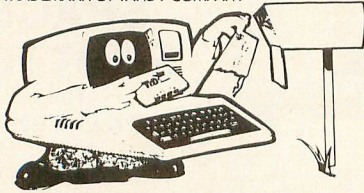
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- 100 'ANIMATION PROGRAM NUMBER 1
- 110 CLEAR400
- 120 PMODE3,1
- 130 SCREEN1,0
- 140 PCLS
- 150 B\$="R4;U4;H4;U4;E4;R8;F4;G4;D4;R4;BD4;D16;BL16;U16;BU4;"
- 160 A\$="BR16;R8;D20;L4;U16;L4;BL16;L4;D16;L4;U20;R8;"
- 170 A2\$="BR16;R8;F12;G3;H10;L7;BL16;L7;G10;H3;E12;R8;"
- 180 A3\$="BR16;R24;D4;L24;BL16;L24;U4;R24;"
- 190 A4\$="BR16;R7;E10;F3;G12;L8;BL16;L8;H12;E3;F10;R7;"
- 200 A5\$="BR16;R4;U16;R4;D20;L8;BL16;L8;U20;R4;D16;R4;"
- 210 L1\$="BD20;BR16;D28;R8;D4;L12;U28;L8;D28;L12;U4;R8;U28;BU20;"
- 220 L2\$="BD20;BR16;F12;G12;R8;D4;L12;U6;E8;H4;L16;G4;F8;D6;L12;U4;R8;H12;E12;BU20;"
- 230 L3\$="BD20;BR16;R12;D4;G8;R4;D4;L12;U6;R4;E4;L24;F4;R4;D6;L12;U4;R4;H8;U4;R12;BU20;"
- 240 DRAWB\$+A5\$+L1\$
- 250 PCLS
- 260 DRAWB\$+A4\$+L1\$
- 270 PCLS
- 280 DRAWB\$+A3\$+L1\$
- 290 PCLS
- 300 DRAW"BM+0,+4;" +B\$+A2\$+L2\$+"BM+0,-4"
- 310 PCLS
- 320 DRAW"BM+0,+16;" +B\$+A1\$+L3\$+"BM+0,-16;"
- 330 PCLS
- 340 DRAW"BM+0,+4;" +B\$+A2\$+L2\$+"BM+0,-4;"
- 350 PCLS
- 360 DRAWB\$+A3\$+L1\$
- 370 PCLS
- 380 DRAWB\$+A4\$+L1\$
- 390 PCLS
- 400 GOTO240

Program Listing 2

- 100 'ANIMATION PROGRAM 2
- 110 CLEAR400
- 120 DIM F1(0,160)
- 130 DIM F2(0,160)
- 140 DIM F3(0,160)
- 150 DIM F4(0,160)
- 160 DIM F5(0,160)
- 170 PMODE 3,1
- 180 SCREEN 1,0
- 190 PCLS
- 200 B\$="R4;U4;H4;U4;E4;R8;F4;D4;"

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```
G4;D4;R4;BD4;D16;BL16;U16;BU4;"
210 A1$="BR16;R8;D20;L4;U16;L4;B
L16;L4;D16;L4;U20;R8;"
220 A2$="BR16;R8;F12;G3;H10;L7;B
L16;L7;G10;H3;E12;R8;"
230 A3$="BR16;R24;D4;L24;BL16;L2
4;U4;R24;"
240 A4$="BR16;R7;E10;F3;G12;L8;B
L16;L8;H12;E3;F10;R7;"
250 A5$="BR16;R4;U16;R4;D20;L8;B
L16;L8;U20;R4;D16;R4;"
260 L1$="BD20;BR16;D28;R8;D4;L12
;U28;L8;D28;L12;U4;R8;U28;BU20;"
```

```
270 L2$="BD20;BR16;F12;G12;R8;D4
;L12;U6;E8;H4;L16;G4;F8;D6;L12;U
4;R8;H12;E12;BU20;"
280 L3$="BD20;BR16;R12;D4;G8;R4;
D4;L12;U6;R4;E4;L24;F4;R4;D6;L12
;U4;R4;H8;U4;R12;BU20;"
```

```
290 DRAW"BM128,96;"
300 DRAW B$+A5$+L1$
310 PAINT (136,106),3,4:GET (101
,76)-(172,151),F1
```

```
320 PCLS
330 DRAW B$+A4$+L1$
340 PAINT (136,106),3,4:GET (101
,76)-(172,151),F2
```

```
350 PCLS
360 DRAW B$+A3$+L1$
370 PAINT (136,106),3,4:GET (101
,76)-(172,151),F3
```

```
380 PCLS
390 DRAW "BM+0,+4;"+"B$+A2$+L2$+"
BM+0,-4"
400 PAINT (136,106),3,4:GET (101
,76)-(172,151),F4
```

```
410 PCLS
420 DRAW "BM+0,+16;"+"B$+A1$+L3$+"
"BM+0,-16;"
430 PAINT (136,106),3,4:GET (101
,76)-(172,151),F5
```

```
440 PCLS
450 GOSUB 540
460 GOSUB 560
470 GOSUB 580
480 GOSUB 600
490 GOSUB 620
```

```
500 GOSUB 600
510 GOSUB 580
520 GOSUB 560
530 GO'LO 450
```

```
540 PUT(101,76)-(172,151),F1
550 RETURN
560 PUT(101,76)-(172,151),F2
570 RETURN
580 PUT(101,76)-(172,151),F3
590 RETURN
600 PUT(101,76)-(172,151),F4
610 RETURN
620 PUT(101,76)-(172,151),F5
630 RETURN
```

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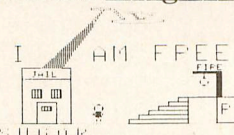
Also you may record a vocal or musical introduction preceding your program. The Auto Run loader will control the audio on/off.

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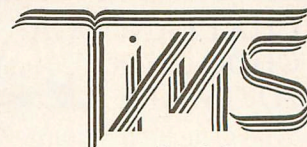
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Text continued from page 26

using the DRAW command, these shapes are limited to 45 degree line segments.

The legs are defined by three shapes, as shown in Figure 5. Here again, the shapes are defined by 45 degree line segments.

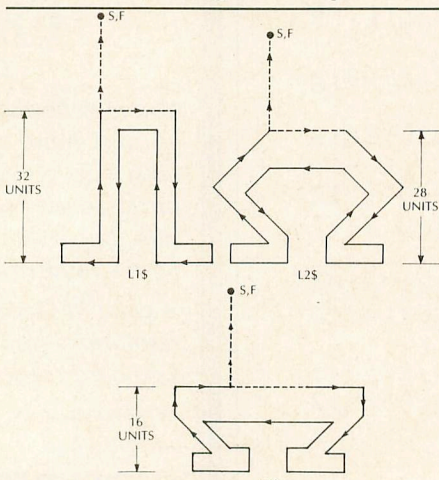


Figure 5. Leg shapes

Why'd You Do It This Way?

At this point, I've gotten somewhat ahead of myself. We're talking about using only 45 degree line segments, generated by the DRAW command. Why couldn't we have used another method of generating the figures, one that would have resulted in finer resolution? We could have. Let's look at some of the alternatives:

- We could have used the LINE, CIRCLE, and other Extended Color Basic commands to draw lines, squares, rectangles, circular arcs, ellipses, elliptical arcs, and other shapes to create the figure. However, this would have been more tedious than using the DRAW command. Also, these commands are not commands that can be easily integrated into command strings as in the DRAW.
- We could have taken a series of frames defining the motion and digitized the figures, essentially creating the picture a dot (or graphics element) at a time. This is very time consuming, but can be done. You've probably all seen the Apple displays of dollar bills and other subjects using this technique. If we had enough of these images stored on disk or even in memory, we could rapidly display them to create a very fine resolution animation, but it would take a great deal of time to build up the database of digitized graphics data.
- Given a data base of digitized figures, we could have dynamically drawn the figure. For example, we might have the same exercise freak defined by a series of

plane surfaces, and then use the processing power of the computer to view the figure from different angles and construct the figure by PSETs. This technique is used, but involves a great deal of number crunching and is too complex and time consuming to do here.

The DRAW Command

So, we're left with the DRAW technique. The DRAW command lets us draw any length line segment in one of eight directions, as shown in Figure 6. It also

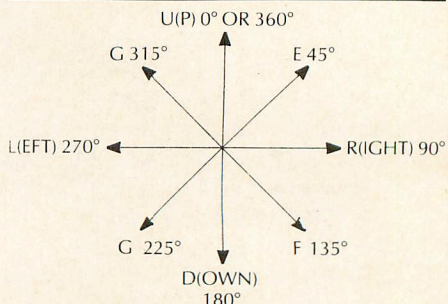


Figure 6. Draw command directions

lets us do other things, such as moving to a given position on the screen, drawing a blank line, rotations, scaling, substring use, and many other options. If you're not familiar with DRAW, read up on it in my Radio Shack book *Color Computer Graphics* (excerpted in *The Color Computer Magazine* — March 1983).

We'll define each of the shapes — the body, five arm positions, and three leg positions by a separate DRAW string, as shown in the previous figures. The body is defined by the variable B\$, the arm positions by A1\$ through A5\$, and the leg positions by L1\$ through L3\$.

Notice that each shape — body, arms, and legs — starts from the same point and ends in the same point. The S stands for start and the F for finish in the figures. We've used blank lines in the case of the leg strings to get back to the starting point.

A complete figure is made up of B\$, one of the arm strings, and one of the leg strings. For example, B\$ = A5\$ = L1\$, makes up a figure with upraised arms and straight legs.

Animation Program 1

The following lines are DRAW strings that define the body, arm positions, and leg positions. We'll use the same shapes in each of the three programs, so these strings won't change.

Having defined the shapes, we now have to draw combinations of them to define the deep knee bend positions

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shown in Figure 2. The remainder of the program does this, drawing each of the eight positions, from upright to crouch. After drawing the last position, the program loops back to the original. The result is a continuous display of our stocky female jock or our undernourished male jock performing deep knee bends.

About the only kicker in the program is that certain deep knee bend positions result in a shorter figure. Since we're starting from the shoulder, we have to compensate for this by moving slightly downward. This is done for the fourth and fifth positions by doing a BM+0,+4; or BM+0,+16, which draws a blank line, effectively starting at a lower position on the screen to compensate for the shorter body. Remember that the feet are always in the same position — everything else moves.

When you run this program, you'll notice a figure doing deep knee bends at the rate of about...let me get out my Seiko Pulsemeter Chronograph, here... 32 deep knee bends per minute. That corresponds to 256 frames per minute, or about four frames per second.

Notice that it is necessary to clear the screen after each DRAW command. An alternative to this would be an identical DRAW with the background color, essentially resetting the figure. A PCLS in this graphics mode takes about 1/10 second, while the DRAW takes about 1/4 second, so you can see that changing the PCLS to a DRAW doesn't affect the speed greatly.

By the way, the technique we used here of moving to a new position could be used to move the figure around the screen. We could have put him/her on a trampoline, for example, and used a BM command to move the figure up and down fairly easily.

To get a more realistic effect, add FOR I=0 TO 60:NEXT I

after the first DRAW and after the fifth DRAW. It will look like the figure is pausing to catch it's breath. Use a *timing loop* such as this to change the display time as required. If you're using the figure on the trampoline, for example, you'd want it to gradually decrease in speed near the top of the jump.

Animation Program 2

Isn't there a way to speed up this program? After all, performing a DRAW four times per second is a far cry from 24 frames per second, and we're only changing one figure, not a whole scene of many figures.

We could take the first animation program and make it more efficient by combining the strings before the DRAW command, by combining statements into a single line, and by other techniques, but let's look at a different approach.

The GET/PUT commands in Extended Color Basic let us define an area of the

Text continued on page 34

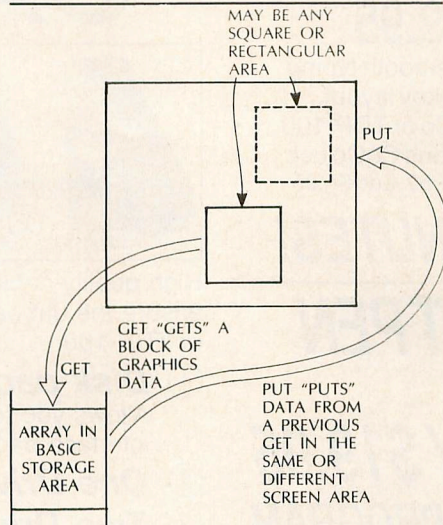


Figure 7. GET/PUT action

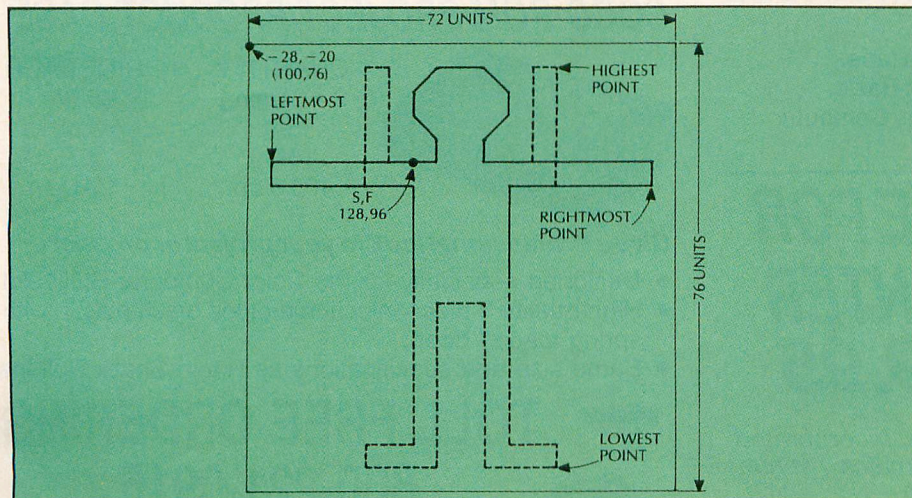


Figure 8. Rectangle for GET/PUT Action

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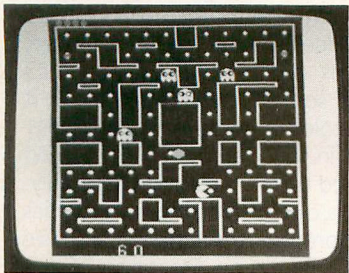
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Color Computer/31

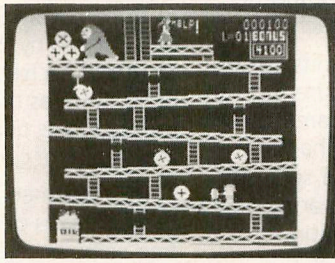
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GHOST GOBBLER

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

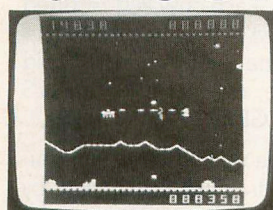
DONKEY KING



DONKEY KING

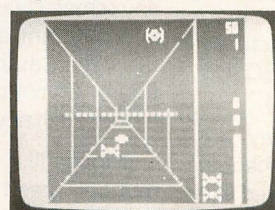
You simply can not buy a more impressive game for your color computer than this new wonder from Tom Mix. The graphics, sound, and animation are all just astonishing! There are four different graphic screens and each is endless fun. Requires 32K. Tape: \$24.95, Disk: \$27.95

GHOST GOBBLER



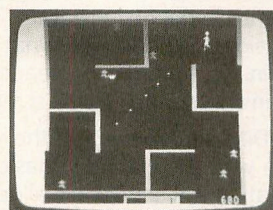
PROTECTORS

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



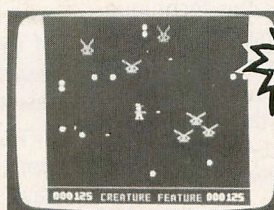
INTERGALACTIC FORCE

Your space fighter roars into the Death Corridor. Lock-on and blast the enemy fighter from the sky. Now try dropping one into Death Star's narrow exhaust vent. It takes skill and guts. Good luck! With "Star Wars" theme song. From Anteco. Tape: \$24.95



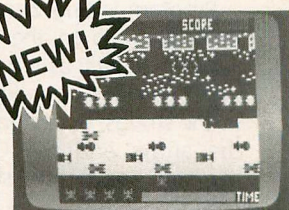
ANDROID ATTACK

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



CREATURE FEATURE

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



FROGGER

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



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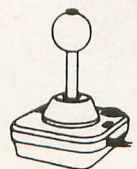


This one has received outstanding reviews. Its unique design fits the hand beautifully and it has the truly fast and positive response needed for high speed play. Actually out-performs some joysticks that cost \$50 or more.

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Text continued from page 32

screen, store it into an array, and then write it out to a new screen area, as shown in Figure 7. We can do the GET command as many times as we want and for as many different areas of the screen as we want. GET/PUT is useful for moving odd shapes around on the screen by doing a series of PUTs, one after another, without redrawing the figure each time.

Our figure is basically 72 units by 76 units in area, as shown in Figure 8. We can do GETs on this screen area after doing each DRAW, and we'll have captured the deep knee bends in separate arrays. We can then PUT each array one at a time to perform the animation.

Program Listing 2 uses this technique. Everything up to the first DRAW command is exactly as it was in the first program, screen preparation and a definition of the strings, except for the allocation of the arrays and the CLEAR command. We'll talk about those shortly.

The next section, however, does five DRAWS, with a corresponding GET for each draw. Only five sets are done because there are really only five separate positions - three are repeated twice in one deep knee bend.

The five DRAW/GETs store each of the five positions in one of five arrays, desig-

nated F1 through F5. Before the GET is done, the figure is PAINTed blue.

At this point, the five positions have been stored in arrays F1 through F5, ready for use in a subsequent animation. (As each figure is drawn, you'll see it appear on the screen, for reference.)

The five short subroutines at the end of the program PUT each of the rectangles defined by the GET onto the screen. Note that each PUT uses exactly the same dimensions as the GET. If this isn't done, the data gets mixed up, and you'll see a mish-mash of colors.

The intermediate section of the program consists of a series of eight subroutine calls, analogous to the eight DRAW commands in the first program. The loop of the eight GOSUBs are what actually results in the animation, as each GOSUB results in another PUT to the screen.

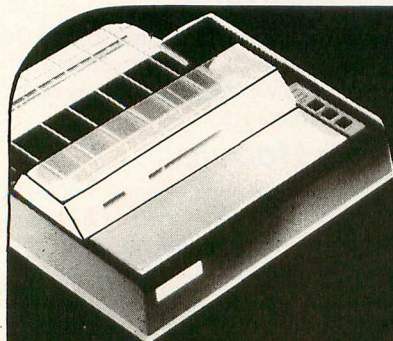
The DIM statements, by the way, are not the way the Extended Basic manual says that arrays should be allocated for GETs and PUTs. If you were to allocate the same dimensions in the array as in the GET/PUT screen area, you'd be out of memory space almost immediately. Use a zero dimension for the first dimension, and the smallest possible value for the second dimension that will work. The second value is dependent upon the graphics

mode, the size of the GET/PUT area, and the G option in the GET statement. You'll quickly determine this value if you start using the GET and PUT statements.

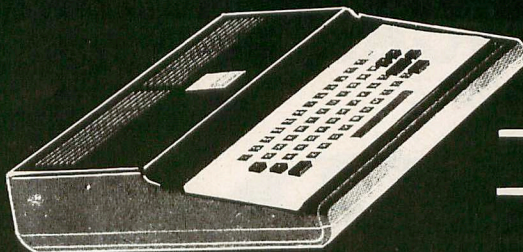
If you run this program, you'll note that the figure now (grunt, groan...) does about 96 deep knee bends per minute, 768 frames per minute, or about 13 frames per second. More importantly, it does it in color. If we had tried to PAINT the figure in the first program, it would have slowed the frame rate considerably. PAINTing is one of the slowest graphics actions. Moreover, the action looks quite improved. There's no "tearing" of the figure as there was in the first program.

Also, note that we didn't have to do any screen clears. Each new PUT resulted in a different area being written out to the screen, automatically clearing the old figure. Of course, we had to do a PCLS before each new GET.

It looks like we've improved the animation speed dramatically, then, by doing all of the graphics work before the GET, and then PUTting the graphics area to the screen as required. Is there a faster method? Ah, you Color Computer programmers - always looking for improvements. Stay tuned for next month's exciting conclusion to Color Animation.



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How to Borrow Money

Know what borrowing money will cost you by using this program and doing comparative shopping on loan rates.

by Paul Detwiler

WITH BORROWING RATES rising and falling on an almost daily basis, understanding how your loan matures can save you money. For example, taking out an auto loan for \$6000 at 16% interest spread over three years of 12 payments a year would cost you \$1593.92 in interest payments alone. If you could arrange for 13% financing on the same loan and payment schedule, your interest cost would be less by \$316.03, or a total of \$1277.89.

These calculations don't require a computer, but would if you wanted to

$$P = \frac{Mp[(1 + \frac{r}{m})^n] - 1}{\frac{r}{m}(1 + \frac{r}{m})^n}$$

where m = months/period
 n = total number of payments

see how that total interest charge affects your monthly payments. The Color Computer's ability to handle exponential numbers makes it ideal to accurately (to the penny) figure out the amortization of your loans. To calculate your loan schedule as accurately as your computer, you would have to use the formula in Figure 1.

The program, Loans, begins by asking you the following questions: principal

amount; rate in decimal; total number of payments; and number of payments per year. The computer will instantly calculate what your monthly payment will be, and what the total payback on the loan will come to.

Going back to our earlier example of the auto loan, suppose one bank offered 16% financing, another offered 14.75%, and the car dealer is offering hurry-up-and-buy-now financing at 11.5% if you repay the loan over a two-year period rather than three years as the banks allow. The first bank (16%) would require a \$210.94 monthly payment

with a repayment total of \$7593.92. The second bank will charge \$207.26 monthly and \$7461.29 in total payments, a difference of \$132.63. You could have easily assumed that from 1.25% difference in financing charges.

But the car dealer's repayment schedule of two years would mean monthly payments of \$281.04, with total payback of \$6745.01. If you could swing the larger monthly payment you would save \$848.91 over the first bank and \$716.28 over the second bank, by financing through the dealer.

To break the difference down press the A key for an amortization of the repayment schedule. In the beginning of any standard installment loan a greater portion of your monthly payment goes toward the paying of interest than it does to paying the principal loan monies. On the car dealer's offer, the first payment of your \$281.04 monthly total breaks down to \$223.54 paid toward the actual \$6000 loan, and the remaining \$57.50 goes toward the interest. In contrast, your final payment goes \$278.37 for principal and only \$2.67 for interest.

The upward proportion of payment against principal as opposed to the downward trend of interest payments make for some fancy figuring if you decide to pay the loan off early. On the car dealer's loan agreement, if you happened into a windfall and wanted to pay the loan off after eight monthly installments, according to the program your balance would be \$3909.25. Your interest payment would only come to \$398.85 over the loan's shortened life.

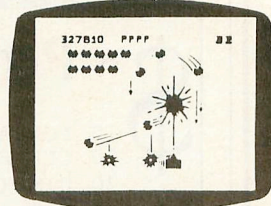
What if you wanted to set-up a quarterly payment schedule? All you would have to do is input the number 8 at the total number of payments question and 4 at the payments per year question. Now that same two-year loan will cost you \$0190 in total interest, and \$850.24 every three months.

Two- and three-year loans are relatively simple arrangements and, while they serve as good examples for explaining how to use the program, they don't do justice to the program's capabilities. Try it on what-if situations with 30-year mortgages and other similarly complicated loan arrangements. Pennies can add up to quite a bit of paper money when spread over many years.

Loans is intended to be flexible and easy to use. It gives the option of printing out your findings to file for later reference or to compare with other printouts. But most importantly, it helps you know more about how you are spending your money.

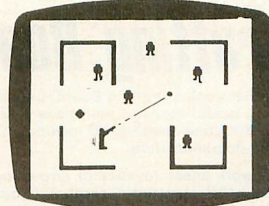
Listing begins page 39

Circle No. 66 on Reader Service Card



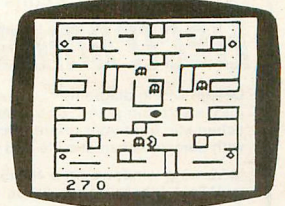
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SPACE WAR

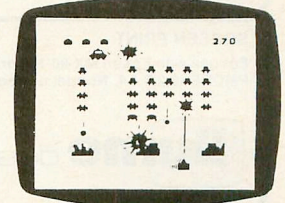
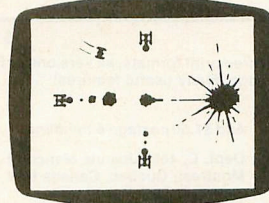
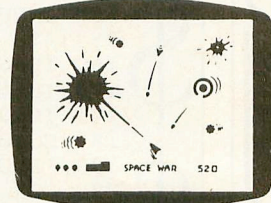
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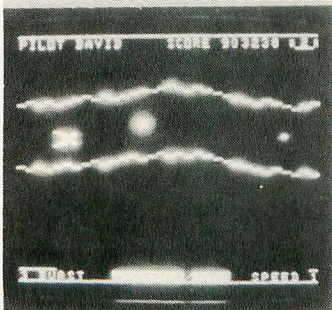
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by John Bobst

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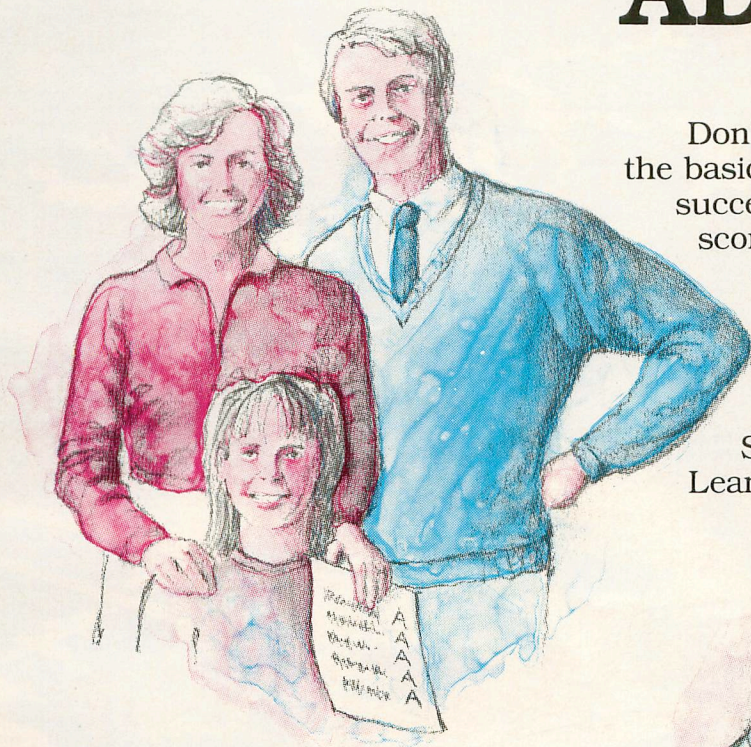
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Program Listing

```

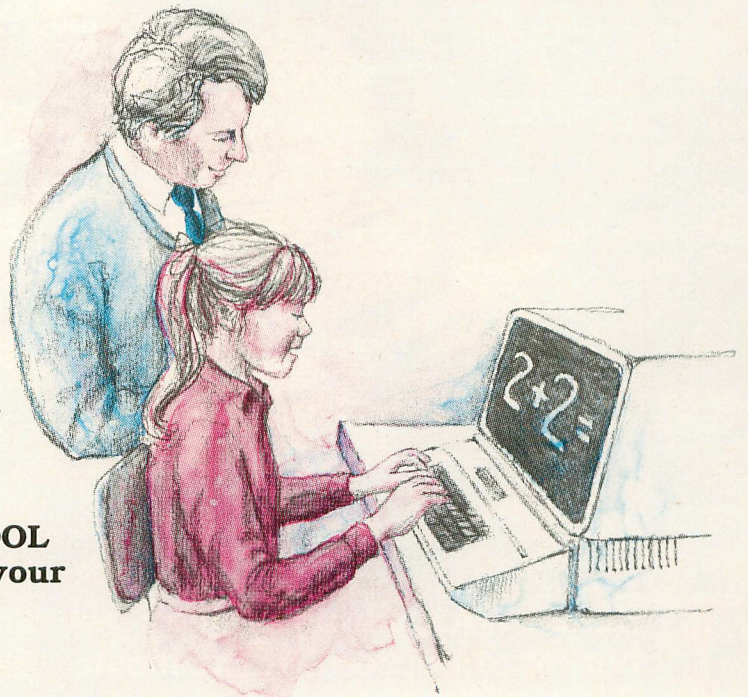
10 PCLEAR1
20 CLEAR3000
30 DIMI(500),B(500)
40 CLS
50 PRINT@10,"LOANS/MORTGAGES"
60 PRINT;INPUT" INPUT-PRINCIPAL
AMOUNT";P
70 PRINT:INPUT" INPUT-RATE IN DE
CIMAL";R
80 PRINT:INPUT" INPUT-TOTAL # OF
PAYMENTS";N
90 PRINT:INPUT" INPUT- # OF PAYM
ENTS/YEAR";M
100 X=R/M:Y=R/M+1:Z=Y^N
110 MP=P*X*Z/(Z-1)
120 PRINT:PRINTUSING" MONTHLY PA
YMENT =$###.##";MP
130 PRINT:PRINTUSING" TOTAL PAYB
ACK =$#####.##";N*MP
140 PRINT:PRINT" PRESS <ENTER> F
OR NEW LOAN"
150 PRINT" PRESS <A> FOR AMORTIZ
ATION"
155 INPUT" PRESS <HC> FOR HARDCO
PY";A$
160 IFA$="" THEN 40
170 IFA$="A" THEN GOSUB190
175 IFA$="HC" THEN GOSUB350
180 GOTO 40
190 'AMORT SCHEDULE
200 FOR Y=1 TO N STEP 12
210 PRINT" PRIN INT
BAL"
220 FOR Z=Y TO Y+11
230 B(0)=P
240 I(Z)=R/M*B(Z-1)
250 B(Z)=B(Z-1)-(MP-I(Z))
260 PRINTUSING"### ####.## ####
.## #####.##";Z;MP-I(Z);I(Z);B
(Z)
270 NEXT Z
280 PRINT:INPUT"PRESS <C>=CONTIN
UE,<X> TO EXIT";Q$
290 IF Q$="C" THEN 330
300 IF Q$="X" THEN 40
310 PRINT"REDO"
320 GOTO 280
330 NEXTY
340 GOTO 40
350 'LPRINT ROUTINE
360 PRINT#-2,"PRINCIPAL AMOUNT $
"P RATE"R" TOTAL
# OF PAYMENTS"N
370 PRINT#-2,USING"MONTHLY PAYME
NT $#####.## TOTAL PAYB
ACK $#####.##";MP;N*MP
380 PRINT#-2," PRIN
INT BAL"
390 FOR Z=1 TO N
400 B(0)=P
410 I(Z)=R/M*B(Z-1)
420 B(Z)=B(Z-1)-(MP-I(Z))
430 PRINT#-2,USING"### ####.##
###.## #####.##";Z;MP-I(Z)
);I(Z);B(Z)
440 NEXTZ
450 RETURN
    
```


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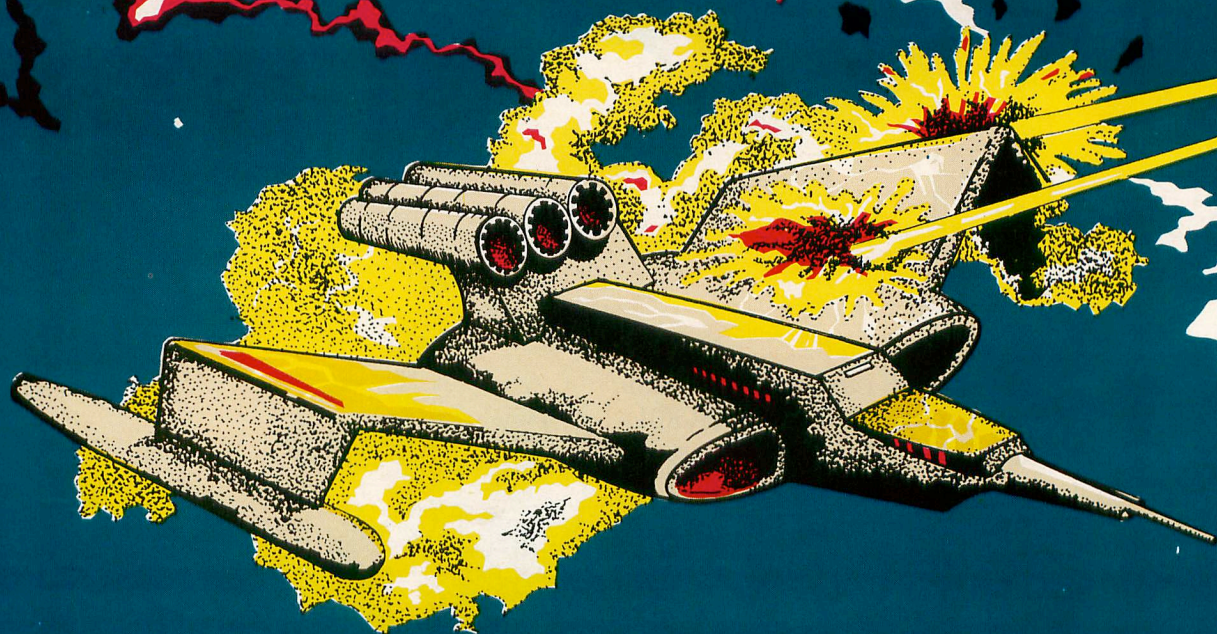
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SPACE



16K
Extended
Color
Basic



THERE I WAS, sitting with a bucket of popcorn, at the movie theater. The lights dimmed, the music began, and the audience quieted. *Star Trek II* had just begun.

Seconds into the opening reel, the crew of the Enterprise was battling Klingon attackers. The Enterprise was getting badly hit. Lights inside the

greatest Federation starship were flashing danger messages and damage reports. Sirens and bells buzzed and clanged. I never felt so helpless. It took all the restraint I could muster to keep from yelling, "Get those shields up!" And, "Phasers, all you can give her Mr. Scott!" Or, as a last resort, "Warp drive Mr. Sulu. Get us out of here!"

TREK



Program by Jake Commander
Article by Kerry Leichtman

Shields up, phasers locked on, fire phasers. Space Trek combines the excitements of arcade, adventure, and simulation games into an unequaled galactic experience.

It may seem that my barely controlled impulse to scream commands at the crew of the endangered Enterprise were those of an avid Trekkie who, after waiting so long for the series' continuation, was afraid the starship Enterprise would get trashed in the first five minutes of the film. But that wasn't the case. I am

not merely a Trekkie, but an experienced Starship Commander.

Yes, it's true. Not many people know this as modesty keeps me from attending formal functions in Federation habit. I did flight training on a TRS-80 Model I, and later advanced to Model III flight. Years

Please turn the page...



Photo 1

Screen Samplings: After program initialization, you receive your orders (Photo 1). To complete docking in Photo 2, choose Command 1 to set course, course direction 7, and warp Factor .1. In Photo 3 Klingons have just entered the quadrant. Uh oh, better raise the shields. Shields are up in Photo 4. The message screen lets you know how much energy the shields will use. Photo 5 is not a pretty picture.



Photo 2



Photo 3



Photo 4



Photo 5

of practice has made me ready for the ultimate in space adventure, Color Computer Space Trek.

Setting the Scene

You are on the ship's bridge, sitting in the Captain's control chair. In front of you are your scan and message screens. Your control panel, a silver grey or bright white keyboard instrument, connects you to all the ship's functions.

The current stardate, your position in the galaxy, and photon torpedo stockpile information is listed to the left of your scan screen. You begin each mission with 10 photon torpedoes.

To the right of your scan screen is a color bar. During calm moments the bar is green. When you enter a quadrant containing Klingons, the bar flashes red as the call to battle stations is sounded. Under the bar are readings for fuel supply and power to shields, followed by your current command choice. You begin the mission with 5000 units of power.

To start, Starfleet command displays your orders on the message screen (see Photo 1). The number of Klingons and starbases will vary from mission to mission, but you will always have 32 starbases to rid the galaxy of Klingons.

There are two types of commands you can issue from the helm: direct or via your ship's onboard computer. They are listed in Tables 1 and 2, respectively.

**Table 1.
Direct Commands**

Command Function	
1	Set Course
2	Local Scanner
3	Remote Scanner
4	Fire Phasers
5	Photon Torpedo
6	Shield Control
7	Damage Report
8	Onboard Computer

**Table 2.
Computer Commands**

Command Function	
1	Computer Guidance
2	Status Report
3	Torpedo Data
4	Computer Course
5	Guided Torpedo
6	Mission Record

The galaxy is divided into an eight by eight grid, totaling 64 quadrants (see Figure 1). Each quadrant is divided into 64 sectors using an identical eight by eight

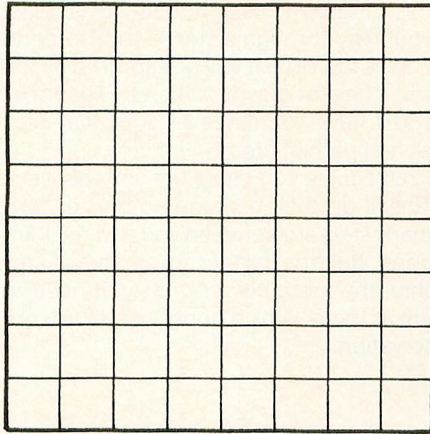


Figure 1

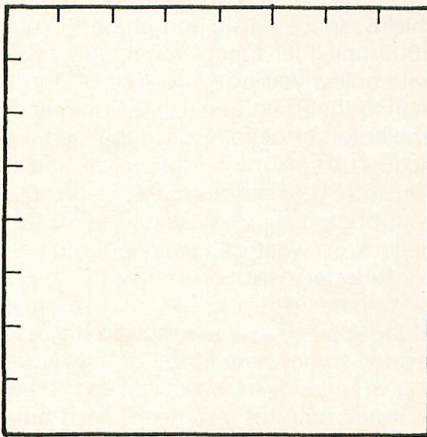


Figure 2

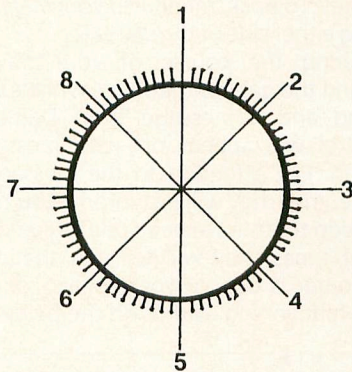


Figure 3

grid, as in Figure 2. To set your ship's course and aim photon torpedoes use the compass in Figure 3. Commands are not acted upon until you press Enter. Let's run through all of your command options by going on mission.

Battle Stations

We receive orders from Starfleet Command and are ready for combat. Our

scan screen is in Local Scanner mode giving us a view of the quadrant we are in. We begin our test mission in Quadrant 4,2. Starfleet Command reports 32 Klingons in the galaxy and three starbases. We have 32 stardates to complete our mission.

The ship's whistle sounds to signal a message from Damage Control. The message board reads, "Damage Control Report: Remote Scanner — Upgraded." A harmless message, but nice to know. There are no Klingons in our quadrant so we press Command 3 for a Remote Scan. Remember, commands are not activated until you press Enter.

The Remote Scan in Figure 4 shows that the quadrants immediately surround-

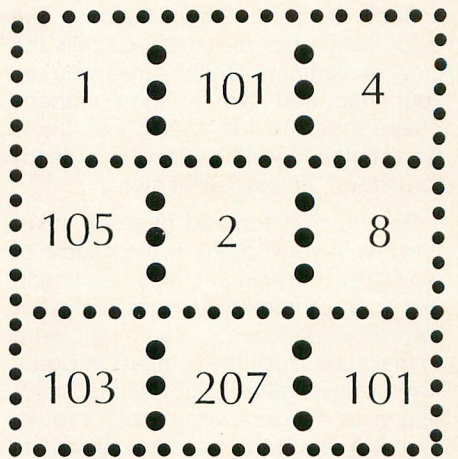


Figure 4

ing us are full of Klingons. Our quadrant is shown in the center of the scan. All adjacent quadrants are also shown. The number in the ones column represents stars. The tens column is for starbases, and the hundreds column is Klingons. Immediately above us, in Quadrant 4,1 the scan shows 101. This means, reading right to left, that the quadrant has one star, no starbases and one Klingon. Now look at the quadrant below us. There are seven stars, and two Klingons. Time then for a little warp travel.

Press Command 1 and Enter. Set Course appears on our command line under the shield and fuel gauges. That reminds me, we'd better power-up the shields. To get out of Set Course, enter zero at the Course Direction prompt. Then press Command 6 for Shield Control. 250 units is usually a safe amount for inter-galactic Klingon cruising, so enter the amount and prepare yourself for warp drive.

Quadrant 4,2 is located at the middle of the X axis and one quadrant down on

Please turn the page


```

40 L$(1)=LOADCONTPAINTLOADCONTP
AINTLOADCLOADPCOPYLOADCLOADPAINT
RSETCONTPCOPYLOADCLOADPAINTRSETC
ONTPCOPYLOADCLOADPAINTUNLOADCONTP
AINTLOADCONTPAINTLOADCONTP
50 L$(2)=CONTPAINTLOADCONTPAINT
LOADCONTPCOPYRSETCONTPCOPYLOADCL
OADPAINTRSETCONTPCOPYLOADCLOADPA
INTRSETCONTPCOPYLOADLLISTPAINTLO
ADCONTPAINTLOADCONTPAINT
60 L$(3)=PAINTLOADCONTPAINTLOAD
CONTPAINTRSETCLOADPAINTRSETCONTP
COPYLOADCLOADPAINTRSETCONTPCOPYL
OADCLOADPAINTRSETCONTRENUMLOADCO
NTPAINTLOADCONTPAINTLOAD
70 POKE280,TIMER/256:DIMS(8,8),G
(8,8),Z(8,8),C(9,2),K(3,3),D$(8
),B$(30),C$(3)
80 Z$=STRING$(16,""):Y$=".....
.....":X$=STRING$(7,""):V$
="ENTERPRISE":U$="FEDERATION":CO
$="##,##"
90 CLS:PRINT@458,"CC SPACE TREK"
TAB(40)"BY JAKE COMMANDER";
100 C$(0)="DOCKED":C$(1)=CHR$(1
32)+STRING$(5,140)+CHR$(136):C$(
2)=CHR$(148)+STRING$(5,156)+CHR$(
152):C$(3)=CHR$(180)+STRING$(5,
188)+CHR$(184)
110 A$(0)=STRING$(2,192):A$(1)=C
HR$(237)+CHR$(232):A$(2)=STRING$(
2,192):A$(3)=CHR$(220)+CHR$(214
):A$(4)=CHR$(192)+CHR$(146):A$(5
)=CHR$(166)+CHR$(169)
120 FORY=1TO2:FORX=1TO9:READC(X,
Y):NEXTX,Y:FORX=1TO8:READD$(X):N
EXT:FORX=1TO30:READB$(X):NEXT
130 GOSUB1370:GOSUB1570:T=(RND(2
0)+19)*100+RND(100):T0=T+1:TT=32
:GOSUB1520:L=RND(8):M=RND(8):U=R
ND(8):V=RND(8):PRINT@320,"AWAIT
FURTHER ORDERS."
140 DATA,1,1,1,-1,-1,-1,-1,-1,
,1,1,1,-1,-1
150 DATAWARP ENGINES,LOCAL SCANN
ER,REMOTE SCANNER,PHASER CONTROL
,PHOTON TUBES,SHIELD CONTROL,DAM
AGE CONTROL,COMPUTER,SET,COURSE,
LOCAL,SCANNER
160 DATAREMOTE,SCANNER,FIRE,PHAS
ERS,PHOTON,TORPEDO,SHIELD,CONTRO
L,DAMAGE,REPORT,ONBOARD,CMPTUER,
COMMAND,MODE,CMPTUER,GUIDNCE,STA
TUS,REPORT,TORPEDO,DATA,COMPUTE,
COURSE,GUIDED,TORPEDO,MISSION,RE
CORD
170 FORJ=1TO8:FORI=1TO8:GOSUB170
0:R=RND(100):IFR>96THENK=3ELSEIF
R>90THENK=2ELSEIFR>75THENK=1ELSE
K=0
180 KT=KT+K:R=RND(100):IFR<98THE
NB=0ELSEB=1:BT=BT+1
190 S=RND(8):G(I,J)=K*100+B*10+S
:Z(I,J)=0:NEXTI,J:K7=KT:IFB=0TH
ENI=RND(8):J=RND(8):G(I,J)=G(I,J
)+10:BT=1
200 IFKT=0THEN170ELSEGOSUB520:PR
INT@320,USING"YOU HAVE 32 STARDA
TES TO DESTROYFLEET OF ## KLINGO
NS: THERE ARE ## STARBASES IN TH
IS GALAXY";KT:BT:GOSUB1350
210 CL=0:K=0:B=0:S=0:(U,V)=3:IF
L<LORL>8ORM<LORM>8THEN300
220 X=G(L,M):K=INT(X/100):X=X-K*
100:B=INT(X/10):S=X-B*10
230 IFK=0THEN270ELSEIFG>200THEN2
60ELSEIFZ9=1ORZ7=1THEN250
240 PRINT"YOU HAVE ENTERED A COM
BAT AREA WITH YOUR SHIELDS LOW.

```

```

THIS TIMETHEY DIDN'T SHOOT. BE
WARNED!";Z9=1:GOTO260
250 PRINT"COMBAT AREA .. CONDI
TION RED - SHIELDS ARE DANGEROUSL
Y LOW.
260 GOSUB1330
270 IFB<>0THENFORI=1TOB:GOSUB131
0:S(X,Y)=5:NEXT
280 IFS<>0THENFORI=1TOS:GOSUB131
0:S(X,Y)=4:NEXT
290 ST=4:GOSUB1420
300 PRINT@128,USINGCOS;L;M;;PRIN
T@192,USINGCOS;U;V;;IFCL=1THENPR
INT@320,"SENSORS DETECT KLINGONS
CLOAKING - PHASERS NECESSARY":G
OSUB1640
310 IFD(2)<0THENO=0:A=2:GOTO370E
LSEO=1:Z=38:FORY=1TO8:FORX=1TO8:
PRINT@X*2+Z,A$(S(X,Y));NEXTX:Z=
Z+32:NEXTY
320 IFK<>0THENIFZ7=1THENIFRND(2)
>LGOSUB1020ELSEELSEZ7=1
330 A=0:GOSUB380:PRINT@217,"CMD?
";M2=0
340 H=0
350 GOSUB390:IFA$(CHR$(13))THENI
FA=0ORA>8THEN350ELSEPRINT@249,B$(
A*2-1);:PRINT@281,B$(A*2);:GOTO
350
360 PRINT@320,;:IFA<3ORD(A)>=0TH
ENONA+LGOTO330,450,300,710,770,8
50,980,1000,1100,330
370 PRINT@320,D$(A);" - INOPERAT
IVE":GOSUB1640:IFA=4ANDCL=1THENP
RINT"ILLOGICAL TO REMAIN HERE,":
PRINT"KLINGONS CLOAKING":GOTO330
ELSE330
380 PRINT@249,X$;:PRINT@281,X$;:
RETURN
390 A$=INKEY$:IFA$=""THEN420
400 IFA$=CHR$(13)THENPRINT@320,;
:GOTO1640
410 A=VAL(A$):GOSUB380:PRINT@221
,A;:RETURN
420 GOSUB1650:H=H+1:IFH<280THEN3
90
430 H=0:GOSUB1520:PRINT@320,;:GO
SUB490:IFK<>0THENIFRND(2)>1THENG
OSUB1020:GOTO340ELSE340ELSEIFRND
(10)<9THEN340ELSEGOSUB1520:IFL<1
ORL>8ORM<LORM>8THEN340ELSEFORM=1
TO8:FORQ=1TO8:X=INT(G(N,Q)/100):
IFX=0THENNEXTQ,N
440 G(N,Q)=G(N,Q)-X*100:G(L,M)=G
(L,M)+X*100:K=X:PRINT"KLINGONS H
AVE JUST ENTERED THIS QUADRANT":
GOSUB1640:GOSUB1330:GOSUB1420:GO
TO300
450 PRINT@320,;:INPUT"COURSE(1-9
)" :C:IFC=0THEN330ELSEIFC<LORC>9
THEN450ELSEPRINT@253,USING"#.#";
C;:IFC=9THENC=1
460 PRINT@320,;:INPUT"WARP FACTO
R(0-8)":W:IFW=0THEN330ELSEIFW<0
ORW>8THEN460
470 IFD(1)<0ANDW>.2THENPRINTD$(1
);" DAMAGED, MAX. SPEED IS WARP
0.2":W=.25ELSEIFW<.9THENW=W*.125
480 GOSUB490:GOTO560
490 IFST=0THENRETURNELSER=0:FORI
=1TO8:IFD(I)>=0THENNEXTELSED(I)=
D(I)+1:IFD(I)=0THENR=I:I=8:NEXTE
LSENEXT
500 IFD(7)<0THENRETURNELSERPRINT@
320,;:IFR<>0THENGOSUB520:PRINTD$(
R);"- NOW FUNCTIONAL.";:GOTO550

```

```

510 IFRND(10)<9THENRETURNELSER=R
ND(8):ONRND(2)GOTO530,540
520 SOUND240,9:SOUND236,7:RETURN
530 D(R)=D(R)-RND(5):IFD(R)<0THE
NGOSUB520:PRINTD$(7);" REPORT:":
PRINTD$(R);" OUT";:GOTO550ELSERE
TURN
540 D(R)=D(R)+RND(5):GOSUB520:PR
INTD$(7);" REPORT:":PRINTD$(R);"
- UPGRADED"
550 GOSUB1640:GOSUB1350:GOTO1500
560 GOSUB1020:N=W*8:F=E/(5*(G/10
0+1)):IFN<=F THENF=0ELSEN=F:F=1
570 X=U:Y=V:S(X,Y)=0
580 GOSUB650:FORH=1TON:GOSUB660:
ONZ GOTO590,600,680
590 NEXT:IFF=0THEN640ELSEH=H-1:G
OTO620
600 IFM2<>0THENPRINT"SHIP HAS SU
STAINED DAMAGE":FORI=1TO8:D(I)=D
(I)-RND(M2+1)+1:NEXT:IFM2=5THEN6
30
610 PRINT"NAVIGATIONAL ERROR: ";
:GOTO630
620 GOSUB1460:PRINT"ENERGY DEPLE
TED - ";
630 X=X-X1:Y=Y-Y1:N=H-1:PRINTUSI
NGD$(1)+"SHUT DOWN AT SECTOR"+CO
$;X;Y:GOSUB1640:GOSUB1350
640 U=INT(X+.5):V=INT(Y+.5):S(U,
V)=3:GOSUB1390:IFW<1THEN300ELSEG
OSUB1520:GOTO300
650 D=INT(C):X1=C(D,1)+(C(D+1,1)
-C(D,1))*(C-D):Y1=C(D,2)+(C(D+1,
2)-C(D,2))*(C-D):RETURN
660 X=X+X1:Y=Y+Y1:C=INT(X+.5):D=
INT(Y+.5):IFC<LORC>8ORD<LORD>8TH
ENZ=3ELSEIFC(C,D)<>0THENZ=2:M2=R
ND(2)-LESEZ=1
670 RETURN
680 FORJ=1TO8:FORI=1TO8:S(I,J)=0
:NEXTI,J:U=L*8+U+X1*N:V=M*8+V+Y1
*N:L=INT(U/8):M=INT(V/8):U=INT(U
-L*8+.5):V=INT(V-M*8+.5):IFU=0TH
ENL=L-1:U=8
690 IFV=0THENM=M-1:V=8
700 GOSUB1520:GOSUB1390:GOTO210
710 O=0:A=40:PRINT@A,Y$;:FORJ=M-
1TOM+1:FORZ=1TO3:N(Z)=0:NEXT
720 FORI=L-1TOL+1:IFI<LORI>8ORJ<
LORJ>8THEN750
730 N(I-L+2)=G(I,J):IFD(8)<0THEN
750
740 Z(I,J)=G(I,J)
750 NEXT
760 A=A+32:PRINT@A,USING"###:#
###:#";N(1);N(2);N(3);:A=A+3
2:PRINT@A,Y$,;:NEXT:A=A+32:PRINT@
A,Z$;:GOTO330
770 IFST=0THENPRINTC$(0);" - ";:
GOTO370ELSEIFK=0GOSUB1620:GOTO33
0
780 GOSUB1500:Z7=1:IFD(8)<0THENP
RINTD$(8);" FAILURE-MANUALLY ";
790 PRINT"LOCKED ON. ENERGY=";E
800 INPUT"UNITS TO FIRE";F:IFF<=
0THEN330ELSEIFF>E THEN780
810 PRINT@320,;:E=B-F:GOSUB1400:
IFD(8)<0THENF=RND(F)
820 R=320:FORI=1TO3:IFK(I,3)<0TH
EN840
830 H=F/K:J=.98:GOSUB1320:K(I,3)
=K(I,3)-H:PRINT"KLINGON - ";:GO
SUB1640:IFK(I,3)<0THENX=K(I,1):Y
=K(I,2):GOSUB1560ELSEPRINTUSING"
AT SECTOR"+CO$+"(### LEFT)";K(I

```

Listing continued on page 46

Listing continued from page 45

```
,1);K(I,2);K(I,3);:GOSUB1350
840 NEXT:GOSUB1020:GOTO330
850 IFP>0THEN860ELSEPRINT"ALL PH
OTON TORPEDOES EXPENDED.":GOTO33
0
860 IFCL<>0THENGOSUB1630:GOTO330

870 PRINT@320,B$(10);:INPUT" COU
RSE (1-9)";C:IFC=0THEN330ELSEIFC
<LORC>9THEN870ELSEIFC=9THENC=1
880 Z7=1:GOSUB1530:GOSUB650:X=U-
X1:Y=V-Y1:GOSUB1690:GOTO910
890 PRINT@Q,CHR$(214);:GOTO910
900 PRINT@Q,CHR$(128);
910 GOSUB660:IFZ=3THEN960ELSEIFY
=INT(Y)AND0=1 THENGOSUB1600:PRIN
T@Q,CHR$(159);:ONS(C,D)+1GOTO900
,920,900,890,940,950ELSEONS(C,D)
+1GOTO910,920,910,910,940,950
920 FORI=1TO3:IFC=K(I,1)ANDD=K(I
,2)THENK(I,3)=-1:X=C:Y=D:R=320:G
OSUB1560
930 NEXT:GOTO970
940 PRINT@352,USINGB$(10)+" CAPT
URED BY STAR GRAVITYAT SECTOR "+
CO$;X;Y:GOTO970
950 GOSUB1580:PRINT@320,"WELL DO
NE! STAR BASE DESTROYED!":B=B-1:
BT=BT-1:M2=4:X=C:Y=D:GOSUB1550:P
RINT@352,"DAMAGE HAS THROWN YOU
OFF COURSE";:C=RND(8):W=RND(8)/2
:GOTO560
960 PRINT@352,B$(10);" MISSED."
970 GOSUB1020:GOTO300
980 IFST=0THENPRINTC$(0);" - ";:
GOTO370
990 PRINT@320,;:INPUT"TOTAL UNIT
S ON SHIELDS";X:IFX<0ORX>E+G THE
N990ELSEE=E+G-X:G=X:GOSUB1400:GO
SUB1410:PRINT@352,"ENERGY CONSUM
PTION IS NOW";5*(G/100+1):PRINT
UNITS PER SECTOR":GOSUB1640:GOTO
330
1000 R=0:PRINT@320,"NEXT...HIT '
^ ' ";
1010 A$=INKEY$:IFA$=""THEN1010EL
SEIFASC(A$)=13THEN330ELSEIFA$<>
^"THEN1010ELSER=R+1:IFR>8THEN330
ELSEGOSUB1510:GOTO1010
1020 IFK=0THENRETURNELSEIFST=0TH
ENZ7=0:PRINT@384,"STAR-BASE SHIE
LDS PROTECT THE ";V$;:RETURNELSE
R=320:FORI=1TO3:H=K(I,3):IFH<1TH
ENNEXTELSEJ=1:GOSUB1320:PRINTUSI
NGV$+" FROM SECTOR"+CO$;K(I,1);K
(I,2);:GOSUB1640:G=G-H:GOSUB1360
:NEXT
1030 GOTO1410
1040 PRINT"THE "V$;" IS DEAD IN
SPACE.YOU ARE AT THE KLINGONS' M
ERCY":FORZ=1TO6:GOSUB1350:NEXT
1050 IFK=0THEN1080ELSEGOSUB1020:
GOTO1050
1060 PRINT"IT IS STARDATE ";T:GO
SUB1640:GOTO1080
1070 PRINT@320,"THE "+V$+" WAS D
ESTROYED":PRINT"THE ";U$;" WILL
BE CONQUERED";
1080 PRINT"THESE ARE STILL";KT;"
KLINGON":PRINT"BATTLE-CRUISERS S
URVIVING.":END
1090 PRINT"LAST BATTLE-CRUISER D
ESTROYED!":PRINT"THE ";U$;" IS
SAVED !!":PRINT"YOUR EFFICIENCY
RATING =";K7/(T-T0)*1000:END
1100 CD=0
1110 A=0:GOSUB380:PRINT@217,"OPT
";
```

```
1120 GOSUB390:IFA>6THEN1120
1130 IFA$=CHR$(13)THENONA+1GOTO3
30,1290,1150,1160,1170,1280,1140
ELSEPRINT@249,B$(A*2+17);:PRINT@
281,B$(A*2+18);:GOTO1120ELSE1120

1140 A=0:FORJ=1TO8:FORI=1TO8:CC=
INT(Z(I,J)/100):O=INT((Z(I,J)-CC
*100)/10):POKE1064+A+(I-1)*2,CC+
112:POKE1065+A+(I-1)*2,Z(I,J)-CC
*100-O*10+112-64*O:NEXT:A=A+32:N
EXT:O=0:GOTO1110

1150 O=0:FORA=40TO266STEP32:PRIN
T@A,Y$;:NEXT:PRINT@41,"STATUS RE
PORT";:PRINT@105,"# ";:PRINTUSI
NG"KLINGONS =##";KT;:PRINT@137,"
# ";:PRINTUSING"STARDATES=##";T0
+TT-T;:PRINT@169,"# ";:PRINTUSI
NG"STARBASES=##";BT;:GOTO1110

1160 IFK=0THENGOSUB1620:GOTO1110
ELSECC=U:A=V:FORF=1TO3:IFK(F,3)<
0THEN1270ELSEW=K(F,1):X=K(F,2):G
OTO1180

1170 PRINT@384,"ENTER START AND
END CO-ORDINATES":PRINT@320,;:IN
PUT"(X,Y,X,Y)";CC,A,W,X:IFCC-W=0
ANDA-X=0THENC=0:X=0:A=0:GOTO126
0
1180 PRINT@352,;:X=X-A:A=CC-W:IF
X<0THEN1220ELSEIFA<0THEN1240ELSE
IFX>0THEN1190ELSEIFA=0THEN1230
1190 CC=5
1200 IFABS(A)<=ABS(X)THEN1210ELS
ECC=CC+((ABS(A)-ABS(X))+ABS(A))
/ABS(A):GOTO1260
1210 CC=CC+ABS(A)/ABS(X):GOTO126
0
1220 IFA>0THENC=7:GOTO1250ELSEI
FX=0THEN1240
1230 CC=1:GOTO1200
1240 CC=3
1250 IFABS(A)>=ABS(X)THENC=CC+A
BS(X)/ABS(A)ELSECC=CC+((ABS(X)-
ABS(A))+ABS(X))/ABS(X)
1260 PRINT@352,"COURSE =";CC;:CD
=INT(SQR(X^2+A^2)):PRINT", DISTA
NCE =";CD:GOTO1110
1270 NEXT:GOTO1110
1280 IFD(5)<0THEN370ELSEIFP<LORC
L=1THEN850ELSEIFCD<>0THENC=CC:GO
TO880ELSE1300
1290 IFCD<>0THENC=CC:W=CD:GOTO47
0
1300 PRINT"NO DATA AVAILABLE FOR
GUIDANCE SYSTEM":GOTO1110
1310 X=RND(8):Y=RND(8):IFS(X,Y)<
>0THEN1310ELSERETURN
1320 H=(H*2/SQR((K(I,1)-U)^2+(K(
I,2)-V)^2))*(J*RND(0)+.2):PRINT@
R,USING"### UNIT HIT ON ";H;:GOS
UB1640:R=R+32:RETURN
1330 IFK<>3THENIFRND(10)>7THENC=
1
1340 FORI=1TO3:K(I,3)=-1:NEXT:FO
RI=1TOK:GOSUB1310:S(X,Y)=CL+1:K(
I,1)=X:K(I,2)=Y:K(I,3)=200:NEXT:
RETURN
1350 FORZZ=1E3 TO1.8E3:NEXT:RETU
RN
1360 FORZZ=H*.25+1TO1STEP-1:SCRE
EN0,1:PLAY"25501,12":SOUND255,1
:SCREEN0,0:NEXT:RETURN
1370 PRINT@A,$;:FORX=1TO8:PRINT
TAB(7)B$:NEXT:PRINTL$(1);
1380 PRINT@33,"DATE";:PRINT@97,"
QUAD";:PRINT@90,"FUEL";:PRINT@16
1,"SECT";:PRINT@154,"SHLD";:PRIN
T@225,"TORP";:GOTO1500
```

```
1390 E=E-((N*5)*(G/100+1))
1400 PRINT@122,USING"####";E;:GO
SUB1420
1410 PRINT@186,USING"####";G;:GO
SUB1500:IFG<0THEN1070ELSERETURN
1420 FORZ=U-1TOU+1:IFZ<LORZ>8THE
NNEXTELSEIFS(Z,V)=5THENZ=U+1:GOS
UB1610:NEXT:GOTO1470ELSENEXT
1430 IFK=0THEN1450
1440 IFST<>3THENST=3:GOTO1480ELS
E1470
1450 IFE>300THENST=1:GOTO1470ELS
EIFE>5*(G/100+1)THENIFST<>2THENS
T=2:GOTO1480ELSE1470
1460 PRINT@320,;:IFG=0THEN1040EL
SEPRINT"YOU HAVE";E;"UNITS OF EN
ERGY. SHIELDS ARE TAKING";G;"UNI
TS":GOSUB1350:IFD(6)<0THENPRINT"
BUT, ";D$(6);" IS OUT.SITUATION
IRRECOVERABLE.":GOTO1040ELSE1440

1470 PRINT@57,C$(ST);:GOTO1500
1480 FORFL=1TO5:PRINT@57,C$(ST);
:FORZZ=1TO50:NEXT:PRINT@57,C$(1)
;:FORZZ=10TO50STEP-4:SOUNDZZ,1:
NEXTZZ:IFST=0THENSOUND200,1ELSE
SOUND1,1
1490 NEXTFL:GOTO1470
1500 PRINT@320,;:RETURN
1510 GOSUB1640:PRINT@320,D$(R);
TAB(14);D(R);:GOTO1500
1520 T=T+1:PRINT@64,T;:GOSUB1500
:IFT>T0+TT THEN1060ELSERETURN
1530 IFST=0THENP=10ELSEP=P-1
1540 PRINT@257,P;:GOTO1500
1550 GOSUB1580:S(X,Y)=0:G(L,M)=K
*100+B*10+S:RETURN
1560 K=K-1:GOSUB1550:GOSUB1420:P
RINT@R,USING"KLINGON AT"+CO$+" D
ESTROYED";X;Y:R=R+32:GOSUB1640:K
T=KT-1:IFKT=0THEN1090ELSEGOSUB13
50:IFK=0THENC=0:RETURNELSERETUR
N
1570 ST=0:FORZ=1TO8:D(Z)=0:NEXT:
E=5000:PRINT@121,E;:GOSUB1530:G=
0:GOTO1410

1580 IFO<>1THENRETURNELSEGOSUB16
00:FORZ=1TO40:ZZ=RND(10):PLAY"T2
5501=ZZ";:PRINT@Q+RND(2)-2,CHR$(
128+RND(62));:NEXT
1590 PRINT@Q-1,CHR$(128);CHR$(12
8);:GOTO1500
1600 Q=7.5+X*2+32*Y:RETURN
1610 IFST=0THENRETURNELSEPRINT@3
20,"SHIELDS DROPPED FOR DOCKING"
:GOSUB1640:GOSUB1570:GOTO1480
1620 PRINT"SENSORS DETECT NO KLI
NGONS IN THIS QUADRANT":RETURN

1630 PRINTD$(5);" WILL BE OF NO
USE -USE ";B$(8):GOTO1640
1640 ZZ=PEEK(137):PRINTSTRING$(1
535-(PEEK(136)*256+PEEK(137)),32
);:POKE137,ZZ:RETURN
1650 SC=SC+1:IFSC>3THENS=1
1660 PRINT@288,L$(SC);:IFST>1THE
N1680ELSEIFSO=0THENIFRND(20)>19T
HENS=16ELSERETURN
1670 SO=SO-2:IFSO<2THENS=0:RETU
RNELSEPLAY"V=SO;L32T205G":RETURN

1680 PLAY"L32T2V801A":RETURN
1690 PLAY"V27":FORZO=5TO3STEP-1:
FORZN=12TO1STEP-1:PLAY"L2550=ZO;
=ZN";:NEXTZN,ZO:RETURN
1700 O=RND(5):N=RND(12):FORX=10T
O30STEP10:PLAY"V=X;P255L2550=O;=
N";:NEXT:RETURN
```




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Musical Flash Cards

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illustration by Karen Searls

COMPUTERS CAN TURN an unpleasant lesson into an enjoyable game. When my 8-year old started piano lessons, his teacher gave him a pack of flash cards with various notes on them. We were to drill him with the cards every day. He didn't like it and neither did we. I decided this was a job for the Color Computer.

My program, Notecard, makes the drill fun. Besides assisting in music education, studying the program may give you some Extended Color Basic programming techniques.

All the instructions appear on the screen, so just key in the program and

by R.F. Miller

run it. Notes are randomly selected between C below, and C above, middle C. It's easy to extend the range upward; taking it lower requires a bit more effort.

Using subroutines for the more complicated steps makes the program easy to follow. I'll explain the steps that are not obvious.

In lines 32-38, data to print the letters A-G on the PMODE 4 graphics screen is

read into a table. The second part of line 34 flashes colors on the screen while the computer reads the data.

Line 230 calls the subroutine at line 2000, which draws the staff and clefs in memory while the text screen is displayed. Later, line 430 switches the display from text to graphics. Line 390 picks random numbers while the program waits for you to press a key. It's unlikely you'll hit a key after exactly the same amount of time each play, so the random number generator will be at a different place in its sequence and you'll get a different sequence of notes.

The FOR...NEXT loop from lines 450 to 690 controls the action, repeating for the number of notes you've chosen to try. The computer picks a random note and draws it on the screen using the subroutine at 3000 and plays it by the subroutine at line 5000. TIMER is set to zero and all the strings are set to null (empty). The POKE 135,0 statement ensures INKEY\$ is empty when you get a new note. Without this POKE, any key you hit after your time is up for each note will still be in INKEY\$ and will be your guess for the next note. The LO value is the first location in graphics screen memory into which the data from line 32 will be POKEd to put letters on the screen.

Lines 510-560 respond to the keys you press. Line 530 jumps to the scorekeeping section when you press Enter, or any key except backspace. If you press backspace, line 540 empties the string (A\$) containing your guess, erases any characters from the screen, and resets LO to its original value. Line 550 ensures that the letter you enter is between A and G, adds it to your guess, uses the subroutine at 6000 to print it on the screen, and sets LO to the proper location to start the next letter.

Subroutines

The rest of the main program is not complicated, so let's look at the next sub-

Text continued on page 50

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Text continued from page 48

routine starting at line 2000. The LINE statements make quick work of the staff. DRAW statements form the clefs. I split the treble clef into two sections, T1\$ and T2\$, to make it easier to find mistakes, but it's actually one continuous line. When using DRAW for complicated shapes like these, sketch the shapes on graph paper — 10 or 12 squares per inch is usually good. Then fill in the squares that best fit the curve. To build the strings, start at one end and move along the curve in order. Some shapes require several starting points, but the clefs require only one.

The subroutine starting at line 6000 shows a different way to put shapes on the screen. This approach is most useful for small, complex shapes — letters fit that description. In PMODE 4, a single byte of graphics screen memory controls eight X,Y points, with each bit controlling one point. To find out which location must be POKEd to set the point you want, use the equation

$$\text{Location} = 1536 + \text{INT}(X/8) + 32 * Y$$

For example, location 1536 controls the points from X=0, Y=0 to X=7, Y=0

while, at the lower-right corner of the screen, location 7679 controls from X=248, Y=191 to X=255, Y=191.

The number you POKE into the location determines which of the eight points will be set. A zero sets no points while 255 sets all eight. Each of the numbers between zero and 255 sets one particular pattern. To see what these patterns are, and to find the one you want, turn to page 184 of *Going Ahead With Extended Color Basic*. The binary numbers show the patterns, where the 1's are the points that will be set. Look up the binary equivalent for the first seven values in line 32 and write them down, each one just below the last. You should see the letter A. As before, I suggest you lay out your shapes on graph paper and then use the table to look up the necessary POKE values.

In line 6020, I subtracted each of the values from 255, which exactly reverses the pattern given by the original value. I did this because because I wanted my screen black-on-white (instead of white-on-black) after I had already looked up all the values. Rather than look up a whole new set, I reversed them arithmetically. If you want to experiment, try taking the

255— out of line 6020 after you get the program running.

I hope Notecard gives you some ideas for your own combinations of music and graphics. It's not very long and even a mediocre typist should be able to enter it in less than two hours. ■ ■ ■

Line By Line

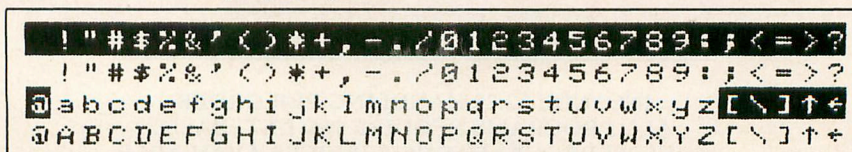
Lines	Functions
10-810	Main Program
10-50	Initialization
60-400	User Instructions
430-560	Display notes and wait for answer
570-690	Keep score
700-810	Choice of end or play again
2000-2140	Subroutine to draw staff and clefs
3000-3050	Subroutine to draw the notes
4000-4100	Subroutine to erase notes and letters
5000-5040	Subroutine to play the notes
6000-6040	Subroutine to print letters on the screen

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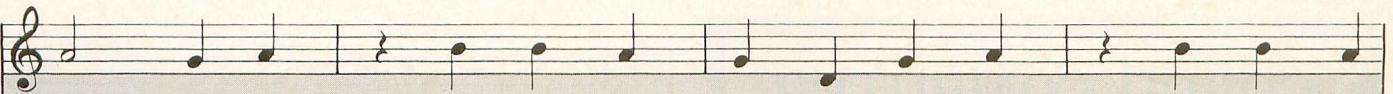
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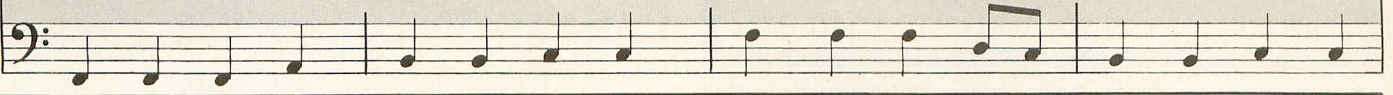


Program Listing 1

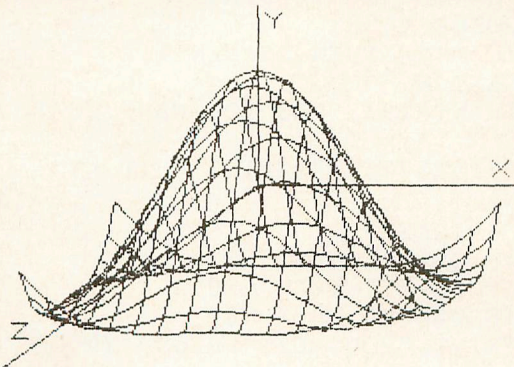
```

1 ' NOTECARD
2 ' BY R.F.MILLER,JR.
3 '
10 CLS
20 PCLEAR 4:Pmode 4,1:COLOR 4,1:
PCLS
30 DIM N$(14),B(6,6)
32 DATA 8,20,34,34,62,34,34,60,1
8,18,28,18,18,60,28,34,32,32,32,
34,28,60,18,18,18,18,18,60,62,32
,32,60,32,32,62,62,32,32,60,32,3
2,32,30,32,32,38,34,34,28
34 FOR I=0 TO 6:CLS I+2
36 FOR J=0 TO 6:READ B(I,J):NEXT
J
38 NEXT I
40 DATA CB,DB,EB,FB,GB,AB,BB,C,D
,E,F,G,A,B,CA
50 FOR I = 0 TO 14: READ N$(I):
NEXT I
60 CLS:PRINT@39, STRING$(17,"*")
70 PRINT@103, "MUSIC FLASH CARDS
"
75 PRINT@135, "BY R.F.MILLER,JR.
"
80 PRINT@199, STRING$(17,"*")
90 PRINT@261, "THE COMPUTER WILL
SHOW"
100 PRINT@293, "YOU NOTES. YOU
MUST"
110 PRINT@325, "ENTER THE CORREC
T NOTE"
120 PRINT@357, "IN THE TIME ALLO
WED."
130 PRINT@421, "HIT ANY KEY TO C
ONTINUE":Q$=INKEY$:IF Q$="" THEN
130
140 CLS:PRINT@101, "FOR THE NOTE
S c TO b,"
150 PRINT@133, "JUST TYPE THE LE
TTER AND"
160 PRINT@165, "HIT <ENTER>. FO
R NOTES"
170 PRINT@197, "BELOW c, TYPE TH
E LETTER"
180 PRINT@229, "AND <B> FOR 'BEL
OW'."
190 PRINT@261, "FOR HIGH c, TYPE
<CA>."
200 PRINT@293, "IF YOU WANT TO E
RASE, HIT"
210 PRINT@325, "<BACKSPACE>. IT
WILL"
220 PRINT@357, "ERASE ALL THE LE
TTERS"
230 PRINT@389, "YOU HAVE TYPED."
:GOSUB 2000
240 PRINT@453, "HIT ANY KEY TO C
ONTINUE":Q$=INKEY$:IF Q$="" THEN
240
250 CLS: AC=0
260 PRINT@37, "HOW MANY NOTES DO
YOU"
270 PRINT@69, "WANT TO TRY? ENT
ER THE"
280 PRINT@101, "NUMBER."
290 INPUT MX
300 PRINT@197, "YOU HAVE 5 SECON
DS FOR"
310 PRINT@229, "EACH ANSWER, UNL
ESS YOU"
320 PRINT@261, "WANT A DIFFERENT
TIME."
330 PRINT@293, "IF SO, ENTER THA
T TIME."
340 PRINT@325, "IF 5 SECONDS IS
OK,"
345 PRINT@357, "JUST HIT <ENTER>."
350 INPUT IT
360 IF IT>0 THEN T=IT*60 ELSE T=
300
370 PRINT@453, "READY?"
380 PRINT@485, "TO START, PRESS
ANY KEY"
390 S$=INKEY$:N=RND(15)
400 IF S$="" THEN 390
430 SCREEN 1,1
450 FOR M = 1 TO MX
460 N = RND(15)-1
480 GOSUB 3000:GOSUB 5000

```



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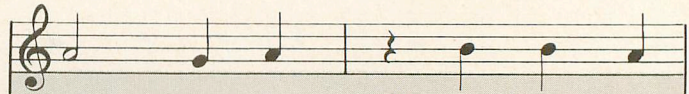
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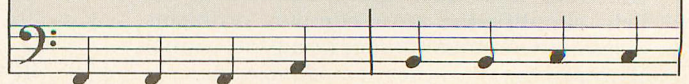


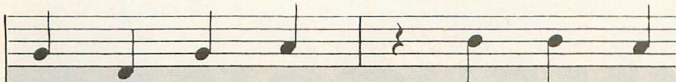
Listing continued from page 51

```

490 TIMER=0:A$="" :K$="" :POKE 135
,0:LO=2351
500 IF TIMER>T THEN 570
510 K$ = INKEY$
520 IF K$ = "" THEN 500
530 IF K$ = CHR$(13) OR (LEN(A$)
=2 AND K$<>CHR$(8)) THEN 580
540 IF K$ = CHR$(8) THEN A$ = ""
:GOSUB 4090:LO=2351:GOTO 500
550 C=ASC(K$)-65:IF C>=0 AND C<7
THEN A$=A$+K$:GOSUB 6000:LO=235
2
560 GOTO 500
570 CLS: PRINT@101, "TIME'S UP!
THE CORRECT"
575 PRINT@133, "ANSWER IS "N$(N)
:GOTO 650
580 CLS
590 IF A$<>N$(N) THEN 630
600 PRINT@101, "RIGHT!!"
610 AC=AC+1
620 GOTO 650
630 PRINT@101, "WRONG!! THE COR
RECT"
640 PRINT@133, "ANSWER IS "N$(N)

650 PRINT@165, "YOUR SCORE IS"
660 PRINT@197, AC" RIGHT"
670 PRINT@229, M-AC" WRONG"
675 FOR I=1 TO 1200:NEXT I
680 GOSUB 4000
685 IF M<MX THEN SCREEN 1,1
690 NEXT M
700 PRINT@293, "DO YOU WANT TO T
RY"
710 PRINT@325, "AGAIN? HIT <Y>
OR <N>."
720 Q$=INKEY$
730 IF Q$="" THEN 720
740 IF Q$="Y" THEN 250
750 IF Q$="N" THEN 780
760 PRINT "YOU MUST PRESS <Y> OR
<N>"
770 GOTO 720
780 CLS 3
790 PLAY "O3T4L4.DL8DL1.GL4.DL8G
L1.BL4.DL8GL2BL4.DL8GL2BL4.DL8GL
1.BL4.GL8BO4L1LDO3L2BL2GL1DL2.DL4
DL1.G"
800 CLS
810 END
2000 'SUB TO DRAW STAFF
2010 LINE(75,56)-(75,152),PSET
2020 FOR W=56 TO 120 STEP 64
    
```





```

2030 FOR Y=0 TO 32 STEP 8
2040 LINE(75,W+Y)-(175,W+Y),PSET
2050 NEXT Y
2060 LINE(175,W)-(175,W+32),PSET

```

```

2070 NEXT W
2080 T1$="BM87,91;H1L1G2D3F2R3E2
U1E1U3H1U6H1U6H1U5H1U5H1U2H1U4H1
U4E1U2E2"
2090 T2$="BM88,47;F1D2F1D4G1D5G1
D1G3D1G4D1G1D8F1D1F3R1F1R5E1R1E2
U5H3L4G1L1G1D1F1"

```

```

2100 B$="BM81,149;E1R1E1R1E3R1E3
U1E2U1E1U9H1U1H3L1H1L5G1L1G1D1G1
D4F1D1F1R1F1R2E1R1E1"

```

```

2110 DRAW T1$:DRAW T2$:DRAW B$
2120 CIRCLE(101,124),3
2130 CIRCLE(101,132),3
2140 RETURN

```

```

3000 'SUB TO DRAW NOTES
3010 IF N=7 THEN LINE(115,96)-(1
35,96),PSET
3020 IF N>6 THEN SL=124 ELSE SL=
140

```

```

3030 CIRCLE(125,SL-4*N),4
3040 LINE(129,SL-4*N)-(129,SL-20
-4*N),PSET
3050 RETURN

```

```

4000 'SUB TO ERASE NOTES AND CHA
RACTERS

```

```

4030 FOR W=49 TO 145 STEP 8
4040 LINE(121,W)-(129,W+6),PRESE
T,BF
4050 NEXT W

```

```

4060 LINE(121,89)-(129,119),PRES
ET,BF
4070 LINE(121,48)-(129,48),PRESE
T

```

```

4080 LINE(115,96)-(135,96),PRESE
T
4090 LINE(120,24)-(135,35),PRESE
T,BF
4100 RETURN

```

```

5000 'SUB TO PLAY NOTES
5010 IF N>6 AND N<14 THEN P$="O3
"+N$(N)
5020 IF N<7 THEN P$="O2"+LEFT$(N
$(N),1)
5030 IF N=14 THEN P$="O4;C"
5040 PLAY P$:RETURN
6000 'SUB TO PRINT CHARACTERS
6010 FOR J=0 TO 6
6020 POKE LO+32*J,255-B(C,J)
6030 NEXT J
6040 RETURN

```



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THE ORIGINAL

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.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

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

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

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

— Color Computer News, Jan. 1982

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Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 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.

RIGHT JUSTIFICATION & HYPHENATION

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

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

FEATURES & SPECIFICATIONS:

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

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

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

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

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

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

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

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

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

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

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— The RAINBOW, Jan. 1982

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Custom Color

Part II of how to interface your Color Computer to the rest of the electrical world.

THE CAPABILITY of the Color Computer is astounding for several reasons: the 6809 processor is an architectural gem; for the synchronous address multiplexer, which performs the fancy memory footwork; and a simplicity of design that permits expansion without conceptual complexity. Some have said the design limits its capabilities; not so. In the future I will explore controlling the Color Computer from the outside world. This month's column presents the completion of the CoCoPort, an input/output expansion device that can be expanded from a pair of I/O ports to a total of eight.

The Phantom

Last month I mentioned that in some situations you might want all your decoded memory sections to be turned off. Although that might seem unlikely, it is often true; it has to do with what you might consider a "larger perspective." So far, the mythical processor in these examples had had only three address lines. What if it had all 16 lines, like the Color Computer's processor? How would a 3-to-8 demultiplexer be used?

Organize the sixteen address lines like this, with the last six broken into groups of three:

15 14 13 12 11 10 9 8 7 6 (543) (210)

by Dennis Kitz

In this case, eight addresses can be represented by lines 2, 1, and 0, as created earlier. But what about 5, 4, and 3? Here's the key: in the overall addressing scheme, these three represent eight blocks, of addresses, each block acting as a gateway to addresses 2, 1, and 0! Sort of like eight streets on which are eight houses. Now this:

(15 14 13) 12 11 10 9 8 7 6 (543) (210)

Here, eight huge blocks are created, each consisting of the remaining addresses 12 through 0... 8,192 combinations in each block. Think of sections of a city, or zip codes.

The result? When you send a letter to 140 50th St., you don't want it going to 140 49th St., 140 48th St., or 140 140th St. All the other 140 addresses must be turned off. That is, as long as all the addresses or address blocks are specified, one specific address can call up only one specific result, routing its way from decoded large block to decoded small block to decoded smaller block to decoded individual address. In other words, in a city where every street and every house is numbered, a letter can only be delivered

to a single house—in the computer's case, one house in 65,536.

Enter the phantom. Consider:

15 14 13 12 11 10 9 8 7 (6) 5 4 3 2 x 0

I am suggesting this: suppose address 6 (or any address) selects the block to be used, but this block happens to be missing address 1. (That is, address 1 is simply not wired into this arrangement.) Compare the results when address 1 is used or omitted (see the table below).

With A1 Used:	Device:	With A1 Left Out	Device:
A2 A1 A0		A2 A1 A0	
000	#0	0x0	#0
001	#1	0x1	#1
010	#2	0x0	#0
011	#3	0x1	#1
100	#4	1x0	#4
101	#5	1x1	#5
110	#6	1x0	#4
111	#7	1x1	#5

Table 1. Comparison Chart

With A1 missing, there are only four combinations possible, no matter what address line 1 directs! In other words, without A1 hooked in, device 0 and device 2 are the same pattern, device 1 and device 3 are the same, and so on. Conversely (and here is the phantom), if I say

Please turn the page

stead, I made a simple pair of single-sided circuit boards (glued back-to-back for strength) that extend the lines from the cartridge socket. The extension is necessary because another cable connects to the I/O ports and won't fit inside the door with the CoCoPort inserted. There is also a danger of pulling the CoCoPort out or sideways with a taut or twisted cable.

- Good luck obtaining a 40-pin female socket with 0.1-inch spacing and a right-angle bend for the disk/cartridge feed-through (visible on the right side of the board in Photo 3). Although it is a legitimate part number (AMP #531326-1), I could not find a distributor for it. Instead, I carefully bent to 90 degrees the pins of a straight wire-wrap socket (available from Digi-Key, Hiway 32 South, P.O. Box 677, Thief River Falls, MN 56701; phone (800) 346-5144; part #C5-20, \$3.90). Buy two; it's tricky to align properly, but it works just fine when you get the hang of it.

- The I/O connector is a 3M-type 20-pin latching connector, formerly available off the shelf at Radio Shack (if you can find some left), or from Digi-Key (male #R219-ND, \$1.29, and female #R303-ND, \$1.86). Since there are only 20 pins, I chose to leave out the IRQA and IRQB lines. My arrangement looks like this:

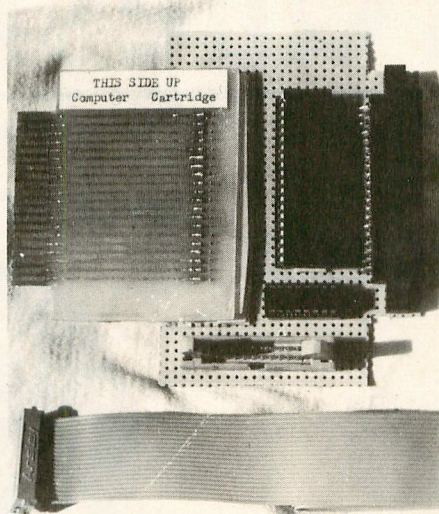


Photo 3. The finished CoCoPort shows plug-in extender card, 6821 PIA, and female feed-through socket. 3M I/O connector is at bottom, with matching cable.

3M Connector Pin Arrangement

PB6	PB4	PB2	PB0	PA6	PA4	PA2	PA0	CA1	GND
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
PB7	PB5	PB3	PB1	PA7	PA5	PA3	PA1	CB1	GND

Fig. 2. Pin arrangement used for 3M connector on my version of the CoCoPort.

- **Caution:** Make absolutely sure you have wired the circuit correctly (have someone double-check by reading the connections aloud to you); make absolutely sure the board is inserted with the correct side up; make absolutely sure there are no solder splashes, shorts, etc.; make absolutely sure the board is inserted fully — neither crooked nor misaligned side-to-side. The 6809E processor is unbuffered and hooked directly to the edge connector. An improper board will probably blow your 6809E processor, and cost \$20 for a replacement. Work carefully!

Programming

Programming the CoCoPort is an easy task, and is defined using the instructions provided with the Motorola 6821 PIA data sheet, together with the addresses identified above. To program the PIA from Basic, use Listing 1, and to program it in assembly language, use Listing 2. Since there are many possible configurations of the PIA, I will leave the details to you; the significant parts of the data sheet are reprinted in Fig. 3. (See page 62)

The CoCoPort is available as a printed circuit board, a complete kit, or assembled and tested. For information and pricing, please write to World Electron-

Text continued on page 60



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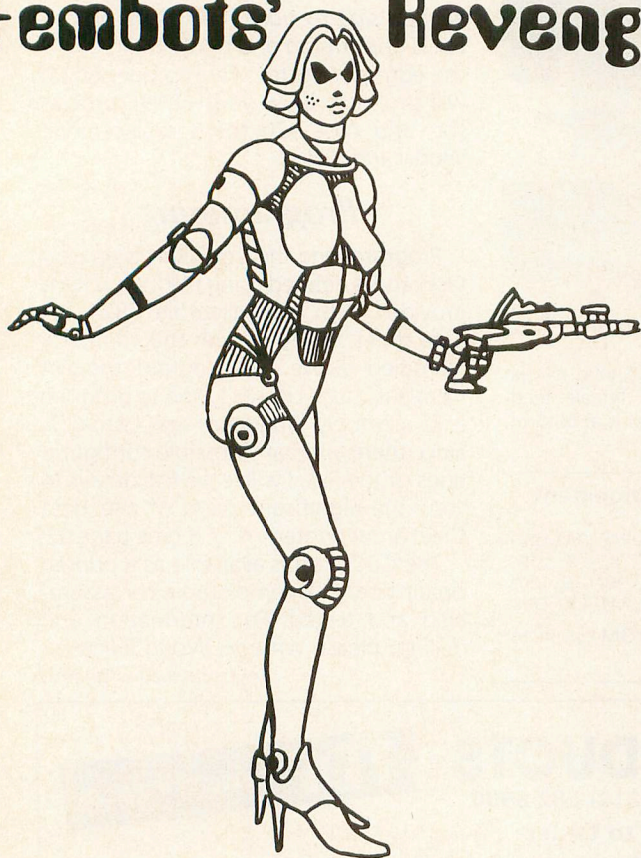
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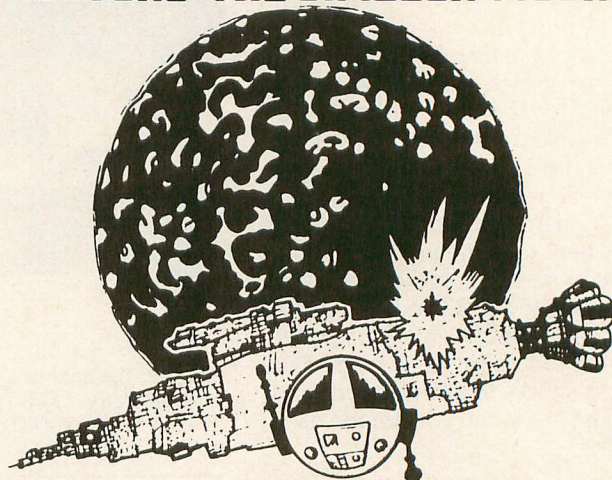
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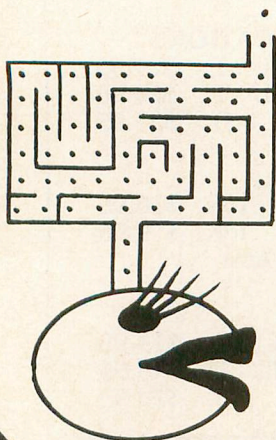
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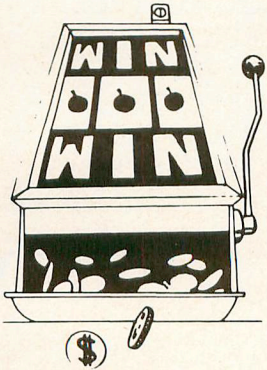
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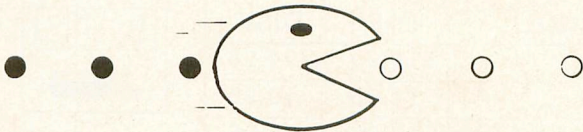
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Text continued from page 57

ics, 177 27th St., Brooklyn, New York 11232, (212) 499-5400. If you have any technical questions regarding this project, you may write to me — enclosing a self-addressed, stamped envelope or two international postal reply coupons: in care of *The Color Computer Magazine*, Highland Mill, Camden, ME 04843.

Parts List

The CoCoPort

Motorola MC6821 peripheral interface adaptor

extender board or cable

40-pin female socket with 0.1-inch spacing and a right-angle bend (AMP #531326)

or

straight wire-wrap socket: Digi-Key, Hiway 32 South, POB 677, Thief River Falls, MN 56701, (800) 346-5144; part #C5-20, \$3.09

3M-type 20-pin latching I/O connector, Radio Shack or Digi-Key; male #R219-ND, \$1.29, and female #R303-ND, \$1.86 ■ ■ ■

For assistance in the preparation of the March Custom Color, the author wishes to extend thanks to: Nick Maggio, Castor Avenue Computer Center, Philadelphia; Greg Keilty, Radio Shack Computer Department, Barre, Vermont; and Andy Christiansen, whose computer was exposed in the photos.

Program Listing 1

```

10 POKE &HFF55 : REM Open Control Register A
20 INPUT "Data Direction Port A (Hex)";A$
30 A$="&H"+A$ : A=VAL(A$) : POKE &HFF54,A
40 POKE &HFF55,4 : REM Close Control Register A
50 POKE &HFF57,0 : REM Open Control Register B
60 INPUT "Data Direction Port B (Hex)";A$
70 A$="&H"+A$ : A=VAL(A$) : POKE &HFF56,A
80 POKE &HFF57,4 : REM Close Control Register B
90 PRINT "Input Data A =";PEEK(&HFF54)
100 PRINT "Input Data B=";PEEK(&HFF56)
110 END
    
```

Program Listing 2

```

LDA    $#00    ; VALUE TO SELECT CONTROL A
STA    $FF55   ; OPEN CONTROL REGISTER A
LDA    DATAA  ; DATA DIRECTION VALUE
STA    $FF54   ; SELECT DATA DIRECTION
LDA    $#04    ; VALUE TO CLOSE CONTROL A
STA    $FF55   ; CLOSE CONTROL REGISTER A
    
```

Listing continued

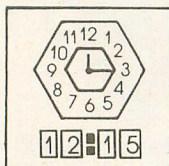


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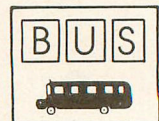
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Listing continued

```
LDA    $#00    ; VALUE TO SELECT CONTROL B
STA    $FF57   ; OPEN CONTROL REGISTER B
LDA    DATAB   ; DATA DIRECTION VALUE
STA    $FF56   ; SELECT DATA DIRECTION
LDA    $#04    ; VALUE TO CLOSE CONTROL B
STA    $FF57   ; CLOSE CONTROL REGISTER B
RET    ; BACK TO CALLING PROGRAM
```

To input data from a port and return it in the A register, use these two sets of instructions:

```
LDA    $FF54   ; GET FROM PORT A
RET    ; BACK TO CALLING PROGRAM
LDA    $FF56   ; GET FROM PORT B
RET    ; BACK TO CALLING PROGRAM
```

To output data to a port from the A register, use these two sets of instructions:

```
LDA    DATA   ; GET DATA FROM CALLING PRGM
STA    $FF54   ; PUT DATA THROUGH PORT A
RET    ; BACK TO CALLING PROGRAM
LDA    DATA   ; GET DATA FROM CALLING PRGM
STA    $FF56   ; PUT DATA THROUGH PORT B
RET    ; BACK TO CALLING PROGRAM
```

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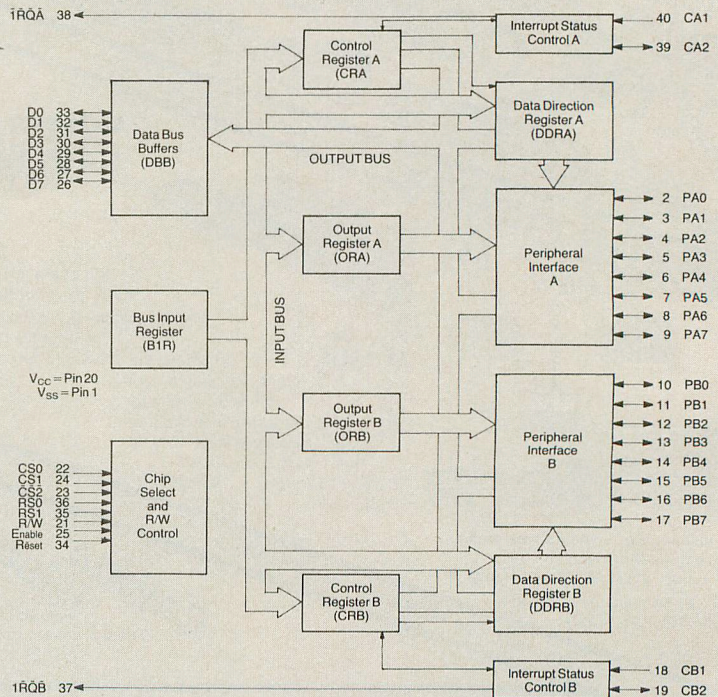
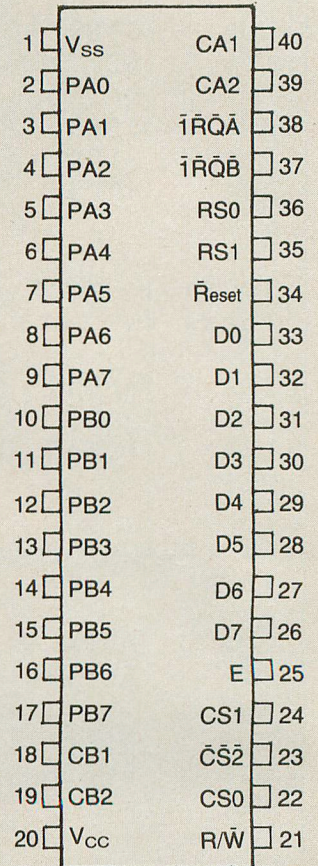
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Fig. 3. Pinout and programming schemes for the Motorola 6821 peripheral interface adapter. Courtesy Motorola, Inc.

	7	6	5	4	3	2	1	0
CRA	1RQA1	1RWA2	CA2 Control			DDRA Access	CA1 Control	
CRB	1RQB1	1RQB2	CB2 Control			DDRB Access	CB1 Control	

RS1	RS0	Control Register Bit		Location Selected
		CRA-2	CRB-2	
0	0	1	X	Peripheral Register A
0	0	0	X	Data Direction Register A
0	1	X	X	Control Register A
1	0	X	1	Peripheral Register B
1	0	X	0	Data Direction Register B
1	1	X	X	Control Register B

X Don't Care



CRA-5 (CRB-5)	CRA-4 (CRB-4)	CRA-3 (CRB-3)	Interrupt Input CA2 (CB2)	Interrupt Flag CRA-6 (CRB-6)	MPU Interrupt Request $\bar{I}R\bar{Q}A$ ($\bar{I}R\bar{Q}B$)
0	0	0	Active	Set high on of CA2 (CB2)	Disabled— $\bar{I}R\bar{Q}$ remains high
0	0	1	Active	Set high on of CA2 (CB2)	Goes low when the interrupt flag bit CRA-6 (CRB-6) goes high
0	1	0	Active	Set high on of CA2 (CB2)	Disabled— $\bar{I}R\bar{Q}$ remains high
0	1	1	Active	Set high on of CA2 (CB2)	Goes low when the interrupt flag bit CRA-6 (CRB-6) goes high

- Notes 1 indicates positive transition (low to high)
 2 indicates negative transition (high to low)
 3 The interrupt flag bit CRA-6 is cleared by an MPU Read of the A Data Register and CRB-6 is cleared by an MPU Read of the 8 Data Register
 4 If CRA-3 (CRB-3) is low when an interrupt occurs (interrupt disabled) and is later brought high, $\bar{I}R\bar{Q}A$ ($\bar{I}R\bar{Q}B$) occurs after CRA-3 (CRB-3) is written to a "one"

CRA-1 (CRB-1)	CRA-0 (CRB-0)	Interrupt Input CA1 (CB1)	Interrupt Flag CRA-7 (CRB7)	MPU Interrupt Request $\bar{I}R\bar{Q}A$ ($\bar{I}R\bar{Q}B$)
0	0	Active	Set high on of CA1 (CB1)	Disabled— $\bar{I}R\bar{Q}$ remains high
0	1	Active	Set high on of CA1 (CB1)	Goes low when the interrupt flag bit CRA-7 (CRB-7) goes high
1	0	Active	Set high on of CA1 (CB1)	Disabled— $\bar{I}R\bar{Q}$ remains high
1	1	Active	Set high on of CA1 (CB1)	Goes low when the interrupt flag bit CRA-7 (CRB-7) goes high

- Notes 1 indicates positive transition (low to high)
 2 indicates negative transition (high to low)
 3 The interrupt flag bit CRA-7 is cleared by an MPU Read of the A Data Register.
 4 If CRA-0 (CRB-0) is low when an interrupt occurs (interrupt disabled) and is later brought high, $\bar{I}R\bar{Q}A$ ($\bar{I}R\bar{Q}B$) occurs after CRA-0 (CRB-0) is written to a "one".

CRB-5	CRB-4	CRB-3	CB2	
			Cleared	Set
1	0	0	Low on the positive transition of the first E pulse following an MPU Write "B" Data Register operation.	High when the interrupt flag bit CRB-7 is set by an active transition of the CB1 signal.
1	0	1	Low on the positive transition of the first E pulse after an MPU write "B" Data Register operation.	High on the positive edge of the first "E" pulse following an "E" pulse which occurred while the part was deselected.
1	1	0	Low when CRB-3 goes low as a result of an MPU Write in Control Register "B".	Always low as long as CRB-3 is low. Will go high on an MPU Write in Control Register "B" that changes CRB-3 to one.
1	1	1	Always high as long as CRB-3 is high. Will be cleared when an MPU Write Control Register "B" results in clearing CRB-3 to zero.	High when CRB-3 goes high as a result of an MPU Write into Control Register "B".

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PRESENTS

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SOFTWARE DESIGNED to turn your Color Computer into a telecommunications terminal is called, rather simply, Terminal Software. There are two types of terminal software: dumb and smart. The four programs reviewed here are smart terminal programs. These programs approach the subject of telephone communications in different ways.

Introduction

To begin we'll examine what these programs have in common.

All of them give you control over the RS-232 parameters: baud rate, parity, word size, stop bits, and duplex or half-duplex operation. Unlike parallel interfaces that use eight data lines to transmit and receive information, the RS-232 uses only one data line. Each character sent must be divided into a series of individual bits, which the receiving computer puts back together as the original character.

Baud rate measures the speed with which the character is sent or received by your computer. As a crude approximation, dividing the baud rate by 10 will give you the number of characters transmitted per second.

Parity is a software method of determining whether the character received equals the character sent (information can be distorted by the phone lines, adding or skipping bits of data in the stream sent). Parity can be set to odd, even, or off.

Word size can be set at either seven or eight bits. If you are sending and receiving only text information, seven bits per character is required; graphics requires eight bits per word.

Stop bits are the number of bits sent after the word itself. You usually use only one or two stop bits.

Duplex operation sends each character you type to the RS-232 and waits for the other computer to echo the character back to your computer to display the character on your video. Half-duplex operation sends each character you type to the RS-232 and doesn't check to see if the receiving computer echoes the character. Echo sends each character you type to your video and RS-232 simultaneously.

Three other common features included in these programs are word wrap, macros, and all capitals operation. Word wrap prevents words at the end of a display line from being split in half. If a word's length is greater than the room left on a particular line, the entire word

drops to the next display line. Macros are another convenience feature. Any special prompts (such as the answers to the log-on questions asked by CompuServe) can be typed in before you establish contact (since the telephone calls are expensive, any preparation you do off-line will save you money).

On the Color Computer, lowercase letters are printed as reverse characters rather than true lowercase letters. This can be visually confusing when communicating with computers that use normal upper/lowercase characters. Two of the terminal programs convert any received lowercase characters to uppercase for the video display only. While you'll see only uppercase letters, the buffer stores both sets of characters so when you send the buffer to your printer it will properly print the information in upper and lowercase characters. ColorTerm 1.1 doesn't need to do this since it uses a graphics screen to display upper and lowercase letters. Super Color 3.0 gives you the option of a normal or a graphic screen formatted in 51 by 21 or 64 by 21.

All the programs will receive and transmit, and CLOAD and CSAVE Basic programs in ASCII format, but not all of them can process machine-language programs.

Finally, there's buffer control: the capability to stop and start data storage in your memory buffer while receiving data from the other computer. When your buffer is closed, incoming information displays on the screen but is not stored for printing or saving to tape or disk.

COLORCOM/E

Eigen Systems
P.O. Box 18006
Austin, TX 78766
\$49.95 ROMpak or Disk

COLORCOM/E PROVIDES 24 commands. After initialization, COLORCOM/E immediately begins to scan the RS-232 port for incoming information, and keyboard input. At this stage you can type in a macro and save it for when you connect to another computer. You can also load in programs, data, or previously saved macros to send to the host computer.

The manual is a 22-page photocopies 8½ by 11 inch booklet. It is accurate and to the point beginning at a level easily understood by the novice and rapidly building in sophistication. It has several appendices, one of which includes dia-

grams of the RS-232 connections of your Color Computer, which are different depending on whether you're transmitting data to a modem or printer. Another appendix shows all the characters capable of being generated by the Color Computer. And a third appendix gives a one-page summary of the COLORCOM/E commands.

COLORCOM/E's RS-232 setup is easy to change by using the L or V commands. COLORCOM/E can read or write cassette tapes off-line (before you call the host computer) and on-line (connected to the host computer, although doing so while on-line results in all incoming data being ignored and lost, as do the other terminal programs). In order to leave the maximum amount of room for the memory buffer, COLORCOM/E uses the standard Radio Shack text page, which uses reverse video to indicate lowercase letters.

To send data to the printer or cassette tape, you scan through the data memory buffer and place Data Start and End marks around the information you want printed (or saved), or you tell COLORCOM/E to automatically mark any incoming data that begins with a capture character. Most BBS systems will send a control R before sending a Basic program, and then a control T to mark the program's end. The automatic capture feature leaves your buffer closed (incoming data isn't stored) until it receives the control R which opens the buffer to store incoming data. A control T will close the buffer again. You can also send marked data to the host computer.

One important piece of information not in the manual is the number of stop bits used by COLORCOM/E. The communication mode uses one stop bit and the printer mode uses two.

COLORTERM 1.1

Martin Consulting
94 Macalester Bay
Winnipeg, Manitoba, R3T 2X5 Canada
(204) 269-3234
\$34.95 Tape and Disk

YOU CONTROL COLORTERM with 18 commands. To configure your RS-232 you need to issue a series of POKE commands from Basic after loading ColorTerm but before execution. These POKES tell ColorTerm what baud rate to use, the parity, number of stop bits, duplex or half-duplex, the number of data bits per word, and where the data buffer stops (so you can load Basic programs in

Table 1 — Features

		COLOR COM/E	COLOR TERM 1.1	COLOR TERM + PLUS +	SUPER COLOR TERMINAL
Retail Price					
Tape		n.a.	\$34.95	\$29.95	\$49.95
Disk		\$49.95	\$34.95	\$39.95	\$69.95
ROMpak		\$49.95	n.a.	n.a.	\$59.95
buffer size					
Tape	16K	n.a.	4,025	10,000	12,000
	32K	n.a.	20,409	27,000	29,000
	64K	n.a.	n.a.	n.a.	55,000
Disk	16K	14,000	1,465	7,000	6,000
	32K	30,300	17,849	23,000	23,000
	64K	n.a.	n.a.	n.a.	55,000
ROMpak	16K	14,200	n.a.	n.a.	14,000
	32K	30,300	n.a.	n.a.	31,000
	64K	n.a.	n.a.	n.a.	60,000
Video Display		32 x 16	51 x 21 64 x 21	32 x 16	32 x 16 51 x 21 64 x 21
Word Wrap		Y	N	Y	Y
Macros		Y	Y	Y	Y
All Caps		N	N	Y	Y
Buffer Control		Y	N	Y	Y
File Save Load					
Basic(ASCII)		Y	Y	Y	Y
Mach. Lan.		N	Y	Y	Y*
Data		Y	Y	Y	Y
Baud Rates Used					
110		Y	Y	Y	Y
300		Y	Y	Y	Y
600		Y	Y	Y	Y
1200		Y	Y	Y	Y
2400		N	Y	Y	Y
4800		N	Y	Y	Y
9600		N	Y	Y	Y
19200		N	N	Y	N
Terminal Program features. (n.a. means not available) Y* Super "Color" Terminal disk program cannot save or load machine code to or from disks.					

memory without disturbing ColorTerm or its memory buffer). After you've set these parameters, save the altered ColorTerm program to either tape or disk so you won't have to go through this procedure again.

After configuration you're ready to go. At this point you can load a Basic program, or data, for transmission to the host computer. The limit is the memory size of your computer (see chart).

The reason ColorTerm's buffer is so small is because the program uses your computer's high resolution graphics RAM to generate a 51 or 64 character screen width. The characters are less than half the size of the normal characters, but remain legible. If you have a high quality TV or a color monitor with a large screen, these characters should be easy to read. I used a nine-inch Sony Trinitron (vintage 1972) and had only a little difficulty reading the screen. The

documentation booklet (5 by 8 inches — 22 pages) advises setting the TV to black and white operation to improve the appearance of the letters.

Basic's EXEC command invokes the program, and then immediately begins checking the RS-232 port for incoming information. ColorTerm features auto repeat (any key held down for more than one second repeats at about ten times per second); screen oriented cursor (the arrow keys and space bar can move the cursor anywhere you want on the screen); and true lowercase letters with descenders.

You can generate a total of 91 characters for transmission; all the keys of the Color Computer keyboard plus exponent sign (also called caret or up arrow), the left and right brackets, underline, backslash, and the control code 03. You have seven keys available that you can assign any key codes not normally generated by

the Color Computer. For example, you can redefine the Control-T and Control-U keys to transmit left and right braces, respectively.

To save on-line time, ColorTerm gives you two macro buffers, maximum 127 characters each, which you can save to tape or disk.

If security is a problem for you, ColorTerm lets you use a simple substitution code for data sent to the host computer. The substitution table is included in the booklet.

To send data to the printer or host computer, specify the beginning and ending locations (in hexadecimal notation) of the data in the memory buffer, an awkward procedure. To save data to tape, you must return to Basic, via the reset button, and use the Basic command CSAVEM "filename", 12055, address of buffer top, 7168. If you use the

Text continued on page 66

top of the memory buffer, the entire receive buffer saves to tape. If you want to save data in the middle of the buffer, you need to know the start and stop locations (in decimal) to save it. This is also an awkward procedure. One problem with printing data is that you must use the same RS-232 configuration for communicating with the other computer and for sending data to the printer. If your printer can't be set to the same parameters, reset your computer, CSAVEM your data, type in a short, eight line, Basic program, reload your data, and have the program send the data to the printer using the normal Color Computer printer settings.

ColorTerm 1.1 lets you specify a portion of the video display as "protected." Information in this protected area will not be affected by screen scroll, so you can place a data table in the first half of the screen and then refer to it as needed while displaying and scrolling data off the rest of the screen.

A special plus provided by ColorTerm is the ability to reconfigure itself before a return to Basic that lets you use its video display driver in your own programs. So, if you need it, you can use the ColorTerm 51 or 64 character display technique.

Color Term + Plus +

Double Density Software
920 Baldwin Street
Denton, TX 76201
(817) 566-2004

\$29.95 Tape,
\$39.95 Radio Shack Disk

COLOR TERM +PLUS+ PROVIDES approximately 24 commands. After loading and executing the program, you see a menu of 10 commands. Two of these 10 commands access another set of possible commands; Communicate, and Edit/Write buffer.

There are two possible communication modes, normal and high speed. The high speed mode is for accurate communications at 1200 Baud and above. In this mode you must use eight bit words, no parity, and two stop bits. The normal mode provides accurate transmission up to 600 Baud, above that speed you can expect some loss of accuracy.

While in the communications mode you can send all the keyboard characters on the Color Computer, all 26 control characters (A-Z, codes 1-26), escape

(code 27), and delete/rubout, for a total of 82 characters.

One unique feature of ColorTerm + Plus + is the ability to edit and write to your memory buffer, allowing you to selectively remove (or add or change) information in the buffer before you save it. When you upload information to another computer, you can instruct ColorTerm + Plus + to pause every 80 characters and wait for the other computer to respond before sending the next 80 characters.

Like ColorTerm 1.1, you can't change the RS-232 settings for your printer, you must use the default setting used by the Radio Shack LPVII and VIII.

Also, Color Term + Plus + like ColorTerm 1.1, includes a method of scrambling data transmissions for security purposes, based on an eight-character key code you select. This coding is restricted to information in your buffer, which is sent after it's been coded, and is not restricted to what you are currently typing while on-line with the other machine. Another restriction is that the coded information can only be sent using eight bit words and no parity. Both machines must have Color Term + Plus + and must use the same eight character key code for this feature to work properly.

The manual is a simple 8½ by 11 inch, eleven page, all capital, typed document. The last page is a command summary page, and lists all 26 ASCII control codes. These codes are sent by holding down the control key and pressing the equivalent alphabetical letter.

Super "Color" Terminal 3.0

Nelson Software Systems
A Division of Softlaw Corporation
9072 Lyndale Avenue So.
Minneapolis, MN 55420
(800) 328-2737

\$49.95 Tape,
\$59.95 ROMpak,
\$69.95 Disk

SUPER "COLOR" TERMINAL automatically begins after loading from tape or disk, and presents its nine item menu. In the communications mode you can send the buffer, toggle it open and closed, or send any of the 128 standard ASCII characters. You can access the character codes not listed on your computer keyboard with combinations of the control key and the shift key. One nice

feature of Super "Color" Terminal is the one-hand control key. To use any of the control functions, or to send any character not on your keyboard, press Clear, release it, then press the control code key (i.e., Press Clear, then Shift Down-Arrow to send the escape code (character code 27)). You don't have to hold the Clear key down to use the control functions.

You have three screen options with Super "Color" Terminal: the standard 32 by 16 screen, or a 51 by 21, or 64 by 21 graphic screen with true upper and lowercase characters.

To maintain compatibility with other ASCII files, Super "Color" Terminal automatically traps nulls (character code 0) and rubouts (character code 127) from entering the system in the seven-bit word mode. It also has selectable character trapping to prevent any particular character or range of characters from entering your system. The selectable trapping is restricted to one character, or a range of characters above or below a specified character. That is, you can trap all characters with an ASCII code less than 8, or you can trap all characters above 120. You can't do combinations of trapping.

The program includes an upload delay option for sending data to another computer. This option forces Super "Color" Terminal to wait for a response from the other computer after sending a line of data. As soon as you receive the response, the computer sends the next line of data. The response the other computer looks for can be set to any character you need. Or, you can delay output without waiting for a response.

Super "Color" Terminal is the only program that lets you allocate or change the size of your input buffer while using the program. You can select any buffer size from 2K to 16K (in 2K increments), or 23K (disk version), 29K (tape version), or 31K (ROMpak version). If you have a 64K computer, the buffer size is even larger than the maximum listed here. These buffer sizes are limited by your computer's memory size. Like COLORCOM/E, Super "Color" Terminal has an automatic capture feature. However, unlike COLORCOM/E, it automatically closes the buffer when full, rather than wrapping around to the beginning of the file and destroying the beginning information. The auto capture feature can be used only if you've selected a word size of five to seven, and not eight.

Like the other programs, you can save or load Basic and machine-language programs, the only restriction is with disk systems. If you're using disk drives, you

cannot save or load machine-code programs to the disk.

When printing the buffer, you can select 110, 300, 600, 1200, or 2400 Baud rates. The buffer's information can be selectively printed.

Super "Color" Terminal allows the use of up to 10 macros, called Keystroke Multipliers (KSM's) in the documentation. Each KSM can be programmed with up to 250 keystrokes.

The Super "Color" Terminal 3.0 manual is the most professional appearing of the programs, it comes in an 8½ by 11 inch 3-ring binder, with 30 pages of documentation. The four page appendix lists the entire standard ASCII character set with the keystrokes necessary to send each character from the Color Computer keyboard, as well as key functions available while you're in the communicate mode.

Summary

Which program is best depends on your needs. If you have a 16K computer and need to send or receive large quantities of data, one of the ROMpak versions (COLORCOM/E or Super "Color" Terminal) is the best choice. If you need to see data displayed in a 64 character by

21 line format (useful for charts and tables of information), then ColorTerm is your choice. ColorTerm lets you customize its parameters and special keys to match your needs. Once set you won't need to set them everytime you use the program. Saving data to the printer or cassette tape is simpler with COLORCOM/E, you just peruse your way through the buffer and mark the data you want saved. Color Term + Plus+ lets you edit the buffer before sending or saving it. ColorTerm 1.1 has a simple substitution code data encoding and decoding technique to protect your data as you communicate over unsecured phone lines, and Color Term + Plus+ uses an eight character code to generate the coded and decoded data.

Color Logo

Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$49.95 ROMpak
\$99 Disk

LOGO IS A CHILDREN'S programming language. It is simple to learn and easy to use. Amazing things happen

when you introduce kids to Color Logo.

On first exposure Color Logo may seem like an overblown sophisticated Etch-A-Sketch program — electronic training wheels for toddling computerists. Just don't let the sun shine on that simplistic attitude. Color Logo is not a game, it's a computer programming language for kids.

You'll have to learn it to teach it to a child. The documentation is easy to understand and very readable. Educational concepts, such as *Piagetian learning*, *anthropomorphic images*, and *subproceduralization* (what!?) take a backseat in favor of more understandable concepts.

Results come quickly to the Logo learner, making the task fun for the student. Debugging is approached as an educational concept. As "adult" programmers already know, the right programming attitude enjoys debugging just as much as writing the program itself.

The Turtle

Consider the turtle. It's nothing more than a transparent oval cursor on the screen. Turtle graphics is the art of making the turtle travel around the screen leaving a trail behind it. The turtle (an an-

Reviews continued on page 68

PRODUCTS FOR YOUR RADIO SHACK

COLOR COMPUTER

NEW!

MACRO-80C

The Micro Works is pleased to announce the release of its **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**

SDS80C — Our famous editor, assembler and monitor in Rompack. Complete manual included. **Price: \$89.95**

PARALLEL PRINTER INTERFACE — Serial to parallel converter allows use of all standard parallel printers. You supply printer cable. **PI80C Price: \$69.95**

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YOU NEED COLOR FORTH!!

Why?

- 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**

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**

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

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

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

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REVIEWS\$

thropomorphic image, by the way) is inherent to all Logo programming. To the young learner, the turtle graphic is a pleasant fantasy. Accept the fantasy of the turtle, and it's easy to accept the fantasy that the traveling turtle's tail will leave a trail in the sand... er, I mean on the screen.

To trot a turtle, you need to master only two commands: FD for forward, and RT for right turn. FD 60 sends the turtle on a 60-step trek, and RT 90 turns it right 90 degrees. Entering that pair of commands four times will make the turtle draw a square.

My Son The Programmer

Knowing nothing about Color Logo, I sat down with my seven-year-old son. We'd only covered the RT and FD commands when his jabbering sent me to the other room to read the documentation in peace. After five minutes I noticed an unusual quiet in the computer room. I sneaked in and saw he had used the two commands to draw an equilateral triangle. "Aha!" I cried, startling the poor kid. I asked him how he managed the triangle, and he redrew it for me.

What happened made me realize how powerful Logo can be. Without knowing

any rules about angles and sides, my son had sidestepped several books worth of pedantic pettifoggery and achieved his desired result by experimenting.

I saw the same thing happen with my daughter and other children; none of them prodigies, just nice kids.

"If you make the turtle take little steps and little turns, it goes in a circle!"

"Look, if you make it RT an extra 10 at the end and repeat 20 times, it makes a pinwheel!"

"See what happens when..."

"What would happen if...?"

"How do you get it to...?"

Now you see. Logo is a graphics laboratory where experiments lead to discovery about systems. The term *Piagetian learning* simply means learning naturally by regarding the environment and finding answers. If the answers are wrong, the learner debugs through experience.

Modes of Learning

There are four modes to Color Logo: Break, Run, Edit, and Doodle.

When you power up Logo you are in the Break mode. Anytime you exit any of the other three modes you are put back into Break mode. In Break, you can load

and save programs, and output to a printer.

Use the Run mode to enter turtle commands, or to call up procedures written in the Edit mode. Run is also a way station for entering the Doodle mode. In Run, commands are typed at the bottom of the screen. After three lines, the material feeds upward into oblivion, leaving plenty of room for the traveling turtle.

This mode supports 23 commands, all of which can be abbreviated. To name a few: penup, pendown, print, colorset, vanish, and background.

Programming procedures are written and stored in the Edit mode. The following program, written in the Edit mode will draw the square mentioned earlier.

TO SQUARE

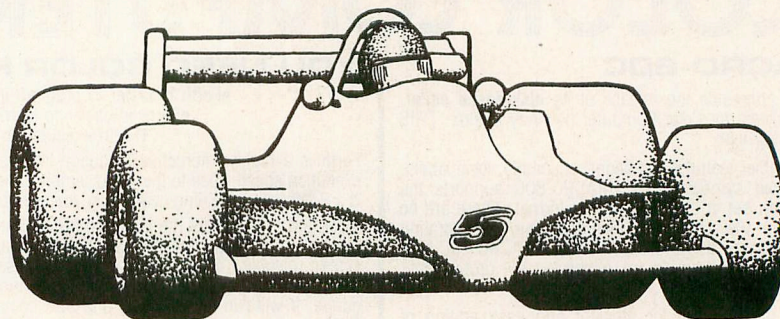
FD 60 RT 90 FD 60 RT 90 FD 60 RT 90

FD 60 RT 90

END

If you were to issue the command SQUARE in the Run mode, the turtle would follow the program and draw the square. If, in the Edit mode, you named it TO CIRCLE, then returned to Run and gave the command CIRCLE, it would draw the square. In other words, TO SQUARE is just a handle. Don't be put off by any strange sounding commands in

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Logo, they may just be fanciful names for procedures.

The Edit mode can also be used as a simple 12-command word processor. The text can be saved or printed. The manual uses a letter to Grandma as a way to show children how they might use the editor.

Finally, the Doodle mode, which you enter from Run. It is especially for non-typists and turns number keys one through eight into turtle commands. The turtle obeys the commands as they are entered, and can be replayed and edited in the Edit mode.

This Logo

Color Logo differs from other Logo versions in several ways. It is predominantly a graphics language. It does not include string operations. Color Logo uses strings as labels on graphics.

Color Logo's authors Larry Kheriarty and George Gerhold note that its capability of creating multiple turtles, all performing independently, makes it different from other versions. (Turtles creating a tree is a charming example of this.)

Text-oriented adventure programs, data base managers, and mailing lists are not possible with Color Logo. But you and your child will create colorful pinwheels, games, and other turtle graphics.

Best of all, Color Logo will make tangible the imagination and creativity that repose in all children and adults who delight in exploring.

— by Richard Ramella

101 Color Computer Programming Tips & Tricks

By Ron Clark
ARCsoft Publishers
P.O. Box 132
Woodsboro, MD 21798
128 pages

\$7.95

THE INTRODUCTION STATES that this book "goes beyond Getting Started With Color Basic and Going Ahead With Extended Color Basic, the Tandy Corp./Radio Shack manuals for the Color Computer. Beyond, not in the sense of moving to a higher level, but beyond introductions to usefulness."

Having read both manuals thoroughly, and this book, I agree with the statement. The book doesn't pretend to be an all-encompassing description of the Color Computer's abilities; instead it is a

Reviews continued on page 70

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summary of the more useful and interesting aspects of Radio Shack's Color Computer Basic.

The book is primarily intended for new Color Computer owners. But, even if you're already familiar with Basic programming techniques, this book provides a fast, easy-access method of learning about the Color Computer without reading 500+ pages of documentation. Once you master the techniques given in this book, you can use the computer's manuals for reference. If you're a novice to programming, you'll find this book a useful, nonthreatening way to acquaint yourself with the Color Computer's abilities. After reading and trying the methods described, you should find it easier to understand the Tandy manuals.

If you have been programming the Color Computer for a while, you'll find little of interest in this book, although you may find it mentions things you have forgotten.

The book contains six sections: Colorful Graphics; Sound of Music; Text on Text; Fun and Games; Number Crunching; and Odds & Ends. This makes it easy to find the items that interest you. Each section divides into individual sequentially numbered topics. Colorful Graphics divides into 36 topics (for example, Number 18 — Line Art). Each topic gives a one or two paragraph explanation and a short program, which illustrates the point covered. You can then experiment with the program until you're thoroughly familiar with the subject at hand.

The subjects covered rank from the silly to the sublime; for example, Tip 101, (from Odds & Ends) is a two-line Yes/No decision maker:

```
10 X=RND(100)
20 X>49 THEN PRINT "YES" ELSE
PRINT "NO"
```

Table 1

```
10 CLEAR:CLS
20 PMODE 2,1
30 PCLS
40 SCREEN 1,0
50 FOR L=4 TO 24 STEP 2
60 $$=STR$(L)
70 DRAW"S"+$$+"COBM128,
93E5F5E5F5"
80 DRAW"S"+$$+"C1BM128,
93E5F5E5F5"
90 DRAW"S"+$$+"COBM128,
93E5F5E5F5"
100 DRAW"S"+$$+"C1BM128,
93E5F5E5F5"
110 NEXT L
```

Contrast that with the Tip 25 (see Table

1), from the section on Colorful Graphics, which uses animation techniques and the scale command to create the image of a bird flying toward you.

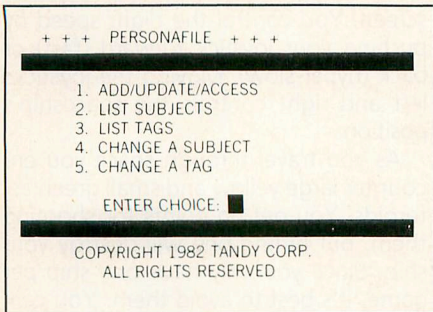
Here are some other representative programs that are included:

- Tip 1 — Graphic-Screen Familiarization Tour (Section I). This program familiarizes you with the memory locations the video monitor uses for storing graphic characters.
- Tip 33 — How To Graph (Section 1), using the data you give it, the program draws a bar graph on the screen.
- Tip 37 — Sound Cues (Section II, Sound Of Music), illustrates the use of sound to tell you that it's waiting for your keyboard response, or that it has finished its computations.
- Tip 57 — Bubble Sort (Section III, Text on Text), this program uses the elementary bubble sort technique to alphabetically sort a list of up to 100 names.
- Tip 67 — Lions Roar (Section IV, Fun & Games). This is one of the more ingenious programs in the book. The program connects the tape recorder to the TV's speaker and plays the recorded noise (or word, sentence, and so on), turning the recorder on and off as appropriate. This technique proves useful in spelling programs.
- Tip 81 — FIX Versus INT (Section V, Number Crunching), illustrates the difference between the two Basic commands FIX and INT.
- Tip 86 — Hex Converter (Section V), a very simple program that converts decimal (base 10) numbers to hexadecimal (base 16) numbers.
- Tip 88 — Memory PEEK (Section VI, Odds & Ends). This shows a simple method of looking into the computer's memory to see what it actually stores there.

These programs can easily be converted into subroutines and used in larger programs with only a little work, primarily renumbering lines and making sure that variable names are not accidentally interchanged between the subroutines.

At the end of the book is a tips index based on the Basic commands used, and the subject matter of the tip.

In summary, this book introduces you to the Color Computer without overwhelming you with information. The coding is straightforward, the logic simple, and the explanations are to the point. The only drawback I found is that the index directs you to the sequence number of the program, and not the page number. — T.K. Color staff



Personafile

Radio Shack
One Tandy Center
Fort Worth, TX 76102
16K minimum, one disk drive
\$59.95

RADIO SHACK'S PERSONAFILE is a simple, user-friendly program that keeps track of general text information. It is not a full-fledged database management system; the program has no facilities for sorting records or for selecting them according to data values. You cannot perform calculations on numerical data, either.

What you can do with Personafile is record data in a free-form, stream of consciousness manner. There are no data fields as such; every record gets a single 256-character block into which you enter information in any form.

Records are indexed according to a two-level scheme, using headers called Subject and Tag. Subject is a general category, while Tag is the individual entry. One obvious reason for using two labels is the need to establish a unique identity for each record, so that information can be retrieved later.

This scheme also lets you keep multiple files on a single disk — handy, since a disk can hold up to 540 records and it's unlikely that one file would be that long. The Subject and Tag can each be up to 22 characters long, allowing you to record enough of a label to make identification simple.

I use Personafile to keep track of my computer magazine clippings. I have several file folders full of articles organized according to subject; the problem is that it's easy to forget exactly what I've got! With Personafile, the Subject fields can correspond to the titles on my folders — Pascal, Forth, Hardware Projects, and so on — while the Tags provide clues to each article's identity.

You retrieve Personafile entries by specifying the Subject and Tag. You don't even have to remember what has

already been used, because the program provides alphabetized listings of both. You can use ALL for either of the headers during a search, and an asterisk as a wild card search character.

The Personafile disk contains three files:

- Basic and machine-language files named DOS. The latter is program author Robert Kilgus' Color Disk Operating System, which the Disk Spectaculator package also uses; the former is essentially the loader program.

- PFILE is the Personafile machine language program

Every item saved under Personafile goes into an ASCII file called INFO. The program assigns the name for its own use, of course, since the user accesses data by Subject and Tag. These go into another ASCII file, INDEX, which is created and updated along with INFO. INDEX is always sorted in alphabetical order. The file entries are not rearranged, however, which saves disk space and increases operating speed.

Personafile is menu-driven, but the choices are few and you are unlikely to suffer a sensory overload. The main menu lists only five items: Add/Update/Access a File, List Subjects, List Tags, Change a Subject, and Change a Tag. Selecting a number brings up the appropriate secondary menu. For example, the Add/Update/Access menu asks for Subject and Tag identifiers and either presents the corresponding record (if it exists), or gives you the opportunity to enter new information. Help lines are always present to guide you in controlling the cursor. Help screens are also available for some of the menus. Access these by typing a question mark.

The Add/Update/Access menu also leads to commands for changing information in an existing record, deleting the record, or printing it. Printing can only be done for the current record (i.e. the one on the screen at any given time); there is no provision for automatically printing everything in my Hardware Projects file, for instance.

I have to admit that I occasionally miss the ability to search a file for specific text strings, but that and the price are about the only faults I can find with the program. It is an extremely pleasant program to work with and requires only a few commands which are accompanied by generous screen prompts. Even if I don't use Personafile for a few weeks at a time, I find it easy to get back into the swing of things without referring to the manual.

— by Scott Norman

Reviews continued on page 72

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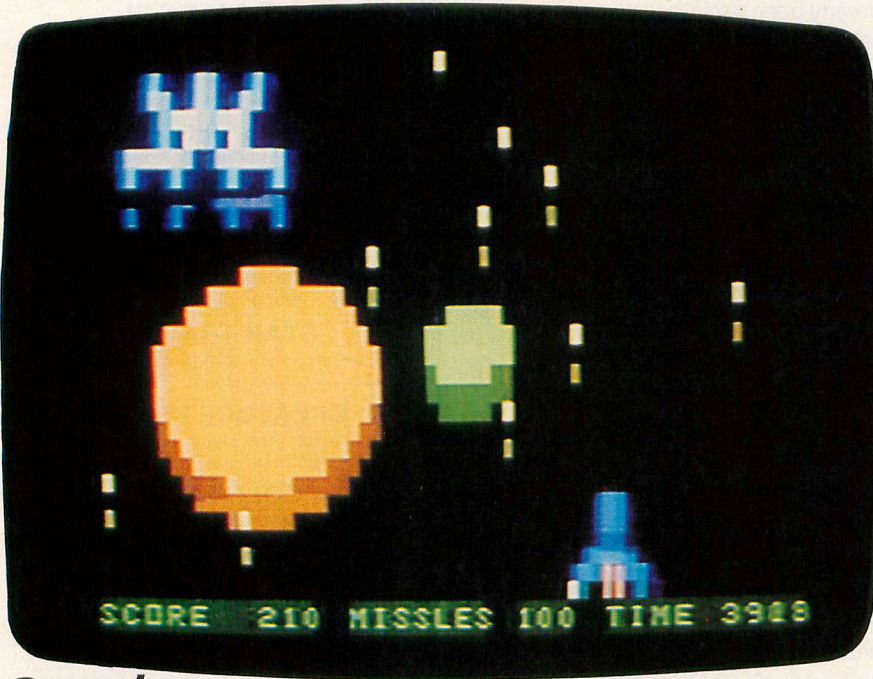
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Color Computer/71



Gauntlet

Avalon Hill
4517 Harford Rd.
Baltimore, MD 21214 **\$20**

Gauntlet is a combination Asteroids/Space Invaders game. You're in a blue

Purple alien to the left and your spaceship to the right with asteroids in the middle.

spaceship and your mission is to destroy the purple alien ships.

The ship stays at the bottom of the

screen. You control the flight speed by pushing your joystick forward (fast) or back (hyper-slow). Moving the joysticks left and right controls the spaceship's position.

As you travel through space you encounter large yellow and small green asteroids. You get no points for shooting them, but hitting one will destroy your ship. Since you only have one ship per game, it's best to avoid them. You can, however, shoot your way through them John Wayne-style. This is sometimes necessary as two asteroids side by side can be impossible to squeeze through.

Firing upon and hitting the purple aliens earns you 100 points. Your first hit disables the alien so that he can no longer fire at you, but doesn't remove him from the screen. His debris is deadly, so whenever possible, continue blasting away.

The graphics aren't spectacular, but the action is good, and the price is low enough to justify the lack of detail on the screen. The biggest bonus is that 4K users (if there are any holdouts left) can also play the game. The documentation contains a list of the commands to input that let you run the game on the minimal configuration. — K.L. Color staff

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Breakthru

by Britt Monk

Avalon Hill
4517 Harford Rd.
Baltimore, MD 21214

\$20

THIS IS TRULY a good game. Don't expect Britt Monk's version to be yet another version of the game Break Out; it's better.

The game runs in machine language on a 16K Color Basic computer with one joystick, and is available on cassette.

You start the game with a three-dimensional green and black screen. At the far end (remember, this is 3D) of the screen is a wall of 40 bricks. Between you and the bricks are walls, a floor, and a ceiling. Your ball will bounce off these as it travels between your racquet and the brick wall. The best way to describe the field of play is as a racquetball court with an in-play ceiling.

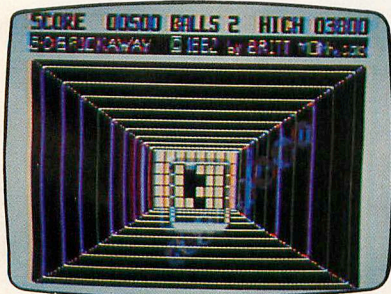
The program serves the ball toward the bricks for you and when it hits the first brick, the screen explodes into color. As the ball travels toward the bricks and away from your paddle it gets smaller, and as it comes closer it gets bigger. Its trajectory changes as it bounces from wall to wall, ceiling to wall, floor to ceiling, and so on.

The documentation advises that you try to keep the ball within the sights of your paddle (the paddle is transparent). While it sounds like good advice, it's not that easy. Once you get into a rhythm it does get easier.

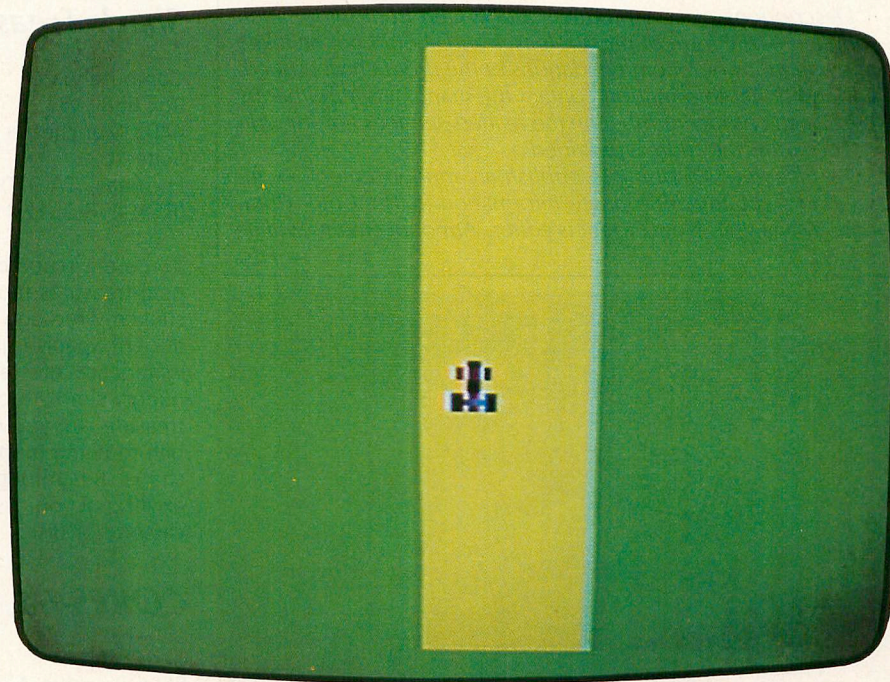
Two factors control the ball trajectory. Pushing the fire button at impact makes the ball bounce less erratically. The price you pay for this more predictable bounce is speed; the ball really zings along. Also, the part of your paddle the ball hits determines its path back and forth along the court. A dead-center hit results in a straighter trip down court.

Breakthru simulates three-dimensional play without wearing the funny glasses. It's an enjoyable, fast, and fun game.

— K.L. Color staff



Multiple exposures show the ball in flight.



Revolution

Inter + Action
113 Ward St.
New Haven, CT 06519
32K Disk
\$24.95

HERE'S THE SCENARIO: You're a racecar driver with an arsenal of four cars ready and waiting in the pit. You have an excellent pit crew (your car never needs servicing during a race). You can race at 10 of the world's finest tracks and can even create your own race-tracks.

The game begins with a meeting with your crew chief; he explains the rules of the game. He straps you into a Volkswagen and pushes you onto the field at Daytona. You're such an important racer that the sponsors let you decide how many laps to the race; select a number and press Enter, and the race begins.

Steering and speed are controlled by the right joystick. Moving the stick forward increases speed, moving it back decreases speed, and moving the stick to the left and right control steering. Everytime you pass the starting line your pit crew displays a board telling you how many laps you've completed and your time for the lap just run.

You have 10 tracks to choose from; the degree of difficulty changes from track to track. You also have four different cars to drive: Volkswagen, Porsche, Lotus, and Ferrari. Each car has different capabilities. The Volkswagen is best for

picking up milk and eggs at the Stop and Go, while the Ferrari is best for a quick entry into Forest Lawn.

After the race the finish board tells you your time, your average lap speed, your best lap speed, and how many times you strayed off-course. It also tells you who holds the current track record and with what car. If, at the end of the race, your time is better than any previous driver's your name is etched into that track's record books. Johnny Cash is my Daytona leader driving a Ferrari. And you thought he could only sing.

Revolution has a special feature that makes this game even more worthwhile; you can design your own track. You don't need to know anything about programming to do it. All you do is select the Design a New Track option from the menu, choose a difficulty level (road width), and draw your track using the joystick to make the curves. Press the fire button when you're through and it's off to the races again. You can save your new tracks to disk, so you can keep hundreds of different tracks on disk.

The game is well documented and easy to learn; it contains few fancy graphics. The racetrack is yellow, the surrounding grounds are green, and your car resembles a Volkswagen, a Porsche, a Lotus, or Ferrari. There are no checkered flags, trees, crowded stands, and no other cars on the road. While these frills might have been nice, the program doesn't suffer by their absence.

Revolution is the kind of game you'll play over and over. — K.L. Color staff.

NEW:PRODUCTS

Descriptions of new products are written from information supplied in the form of press releases and should not be taken as evaluations or recommendations of the products described. For additional information contact the manufacturer either by circling the proper number on the readers service card, or writing or calling the address provided.

Manufacturers wishing to publish an announcement are invited to send any appropriate information to *The Color Computer Magazine*, New Products editor. Announcements will be edited. — Eds.



Gin Champion

Radio Shack
One Tandy Center
Fort Worth, TX 76102

Gin Champion (catalog #26-3083) challenges the player in 16 variations of the card game using skill levels ranging

from one to ten. Variations include Oklahoma Gin, Runs Around the Corner, Laying Off on Gin, Spades Double, and others. The game features colorful graphics in one or two color schemes and uses simple commands or joysticks to maneuver cards. Available in ROMpak and requires 16K RAM.

Programmable Sound Module

Maple Leaf Systems
P.O. Box 2190, Station C
Downsview, Ontario
M3N 2S9
Canada

The programmable Sound Module plug-in cartridge makes a fantastic array of sound effects possible for Color Computer users. Three tone channels and three noise channels are added by the device. Once a sound is created it can continue indefinitely without further servicing. The cartridge contains PSM/OS, an operating system for the module which adds new words to Basic or Extended Color Basic.

Number Relationships

Programs by Mr. Bob
P.O. Box 94
Montrose, CA 91020

This program is designed for children between four and eight years old. Children should already know how to count to 20 to use the program. The program illustrates the relationships numbers have to one another. It teaches children to identify numbers in both ascending and descending sequence, to recognize number patterns, to count by twos, fives, tens, etc., and to add and subtract. Teaching is accomplished using an education game. 16K Extended Color Basic and joysticks required.

Shark Treasure

Computerware
Box 668
4403 Manchester Avenue,
Suite 102
Encinitas, CA 92024
(619) 436-3512

You are a scuba diver after gold treasures found near the sunken wreckage of an ancient Spanish galleon. The waters are infested with hungry sharks. How much treasure can you recover before being munched by the sharks. Beautiful graphics and exciting action. Available on cassette or disk.

16K system 3K is available; for 32K, 19K is available; and for 64K, more than 52K of workspace is available to the programmer. The editor includes over 25 commands, and the assembler supports the full compliment of the 6809 instruction set with all addressing modes, and will cross assemble 6800 source code to produce 6809 compatible object code. A demonstration program listing and source file is included to help the novice.

Video Plus

Computerware
Box 668
4403 Manchester Avenue,
Suite 102
Encinitas, CA 92024
(619) 436-3512

With Video Plus you can connect your computer to any composite Video/Monitor to get a crisp, clear picture with no RF interference. Video Plus comes fully assembled and is easy to install.

CORES-64

Cer-Comp
5566 Ricochet Avenue
Las Vegas, NV 89110
(702) 452-0632

CORES-64 does not require a disk system or Flex. This new version of Cer-Comp's editor assembler CORES9 supports 16, 32, and 64K systems. In a

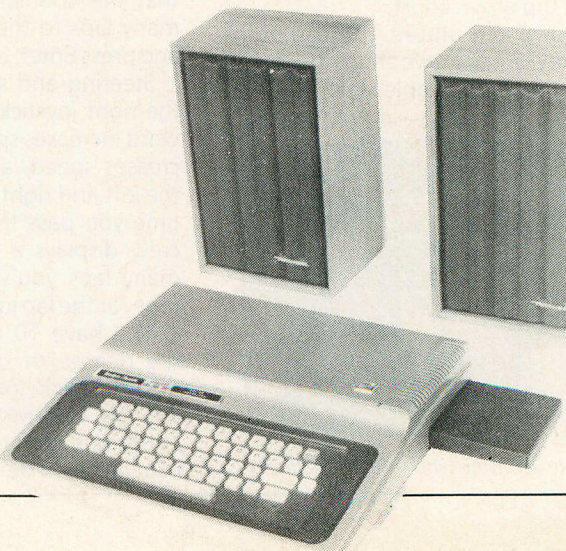
Stereo Composer

Spech Systems
38 W 255 Deerpath Road
Batavia, IL 60510
(312) 879-6880

The Stereo Composer music synthesizer allows the programming of four separate voices with a seven octave range. Dotted and double-

dotted notes, as well as eighth, quarter, and standard triplet notes are supported. Music can be played at any tempo in any key. Tempo can be changed as the music plays.

The hardware includes two 8-bit digital to analog converters which drive two audio power amplifiers allowing the user to use his own external speakers. Music is produced in stereo.





Super-Pro Keyboard

Mark Data Products
24001 Alicia Parkway,
No. 226
Mission Viejo, CA 92691
(714) 768-1551

This professional-type

keyboard uses the same key layout and nomenclature as the original Color Computer keyboard. Easy to follow instructions are included for fast installation of this high-quality American made product. Also available is a plug adapter for the newest revision boards.

Bulletin Board Service

Spectrum Projects
93-15 86 Drive
Woodhaven, NY 11421
(212) 441-2807 — voice line.

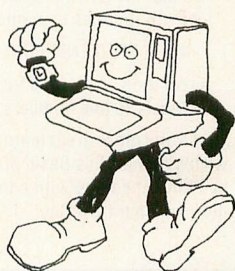
Spectrum Projects has added a third BBS making it a triple BBS accessible 24 hours a day, seven days a week. The new phone number is (212) 441-5719.

Colorport

Maple Leaf Systems
P.O. Box 2190, Station C
Downsview, Ontario
M3N 2S9
Canada

Colorport adds powerful I/O capability resulting in a very cost-effective 6809-based control system. This plug-in cartridge adds two fully programmable 8-bit bidirectional parallel ports with full handshaking, which can be configured for versatile interfacing to peripherals.

Colorport uses its own power supply. Available with or without memory.



Versaclock

Maple Leaf Systems
P.O. Box 2190, Station C
Downsview, Ontario
M3N 2S9
Canada

The Versaclock plug-in cartridge enables your computer to tell time. The clock gives seconds, minutes, hours, day of the week, month, and year. It has both 12 and 24 hour modes. It can handle daylight savings time, and can also serve as an alarm. Battery backup is provided.

Synther 7

Computerware
Box 668
4403 Manchester Avenue,
Suite 102
Encinitas, CA 92024
(714) 436-3512

Turn your Color Computer keyboard into a musical instrument with this digital synthesizer, play music using the upper row of keys, and simulate the sound of many different instruments. Attack, decay, sustain, and release are adjustable. Five different stop waveforms may be set to a variety of ranges. Available on cassette or disk.

Multiport

Maple Leaf Systems
P.O. Box 2190, Station C
Downsview, Ontario
M3N 2S9
Canada

Multiport is a multiple-slot expansion unit for the Color Computer. It allows the

connection of up to four peripherals simultaneously. The computer can switch between peripherals under software control, allowing one program to access any or all of the peripherals at any time. Peripherals can be chosen using a POKE command.

Megapede

Computerware
Box 668
4403 Manchester Avenue,
Suite 102
Encinitas, CA 92024
(714) 436-3512

You've heard of centipedes and caterpillars and all those other bugs. Megapede is (as the mega suggests) exponentially more challenging. Caught in a jungle of algae, you are attacked by vicious fleas, mean spiders, and the relentless centipedes. You must shoot your way out of this predicament. Available on cassette and disk.

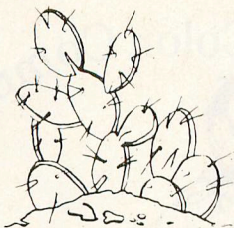
The Voice

Speech Systems
38 W 255 Deerpath Road
Batavia, IL 60510
(312) 879-6880

The Voice uses a special large scale integrated circuit to reproduce any of 64 phonemes at four inflections. (Phonemes are basic units of speech.) Sounds may be output through the TV

speaker, or audio speakers using a built-in audio amplifier.



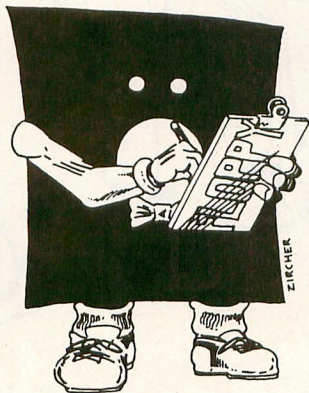


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PROGRAMS REQUIRE 16K EXTENDED BASIC FOR TAPE, AND 32K DISK UNLESS OTHERWISE NOTED.

DISK UTILITIES



The Disk Manager

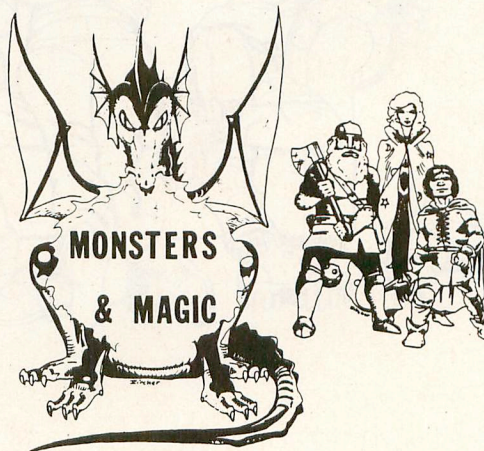
If you use a disk drive you NEED this program! It does more than any other disk utility. You can use it to rebuild a crashed disk easily - two different ways. You can also print a SUPER DIRECTORY for a disk that contains such information as program size, which granules are used, and the start, end, and execute addresses for machine language programs. It will also print a menu on the screen for a disk in the drive, and when you indicate your choice it will load and either RUN or EXEC the program for you as appropriate. In addition, it codes your files by DATE, and it codes your disks by NAME and NUMBER. And, it creates and maintains a file of all your disks (and the programs on them) which you can sort and print as needed. You can sort a collection of up to 300 disks. Could you use a printed list of EVERY program in your collection, in alphabetical order? This list tells you which disk has the program you need so you can find it easily, and all this is only the beginning. There are so many features we have no space to mention them all. Both the 16K and 32K versions are included, and we suggest you place a copy of the program on every diskette for quick access. You will wonder how you got along without this beauty!! Full, easy to follow instructions. Requires a disk drive. **\$29.95**

NEW THIS MONTH

The Disk Master

This helpful addition to your library performs a whole list of great functions. We've seen programs selling for just as much that do only one or two of these things, and the whole thing is menu driven for ease of use. It provides a speed check and adjustment function to get your drives into perfect adjustment. It moves programs from tape to disk — or disk to tape — or from one drive to another — all effortlessly. It prints a directory — with machine language addresses — to the screen or printer. It gives you two different disk maps. One shows which sectors are used in each gran, and the other shows which grans are available. It even gives you a way to easily purge a number of files from a crowded disk. Why buy a different program for every function, when this does so much? Requires a disk drive. **\$24.95**

Your Personal check is welcome - no delay. Include \$1.50 shipping for each program ordered. (Shipping free on \$50.00 or larger orders). Az. residents add 6% sales tax. Orders shipped within two days.



Monsters & Magic

The most realistic fantasy role-playing game yet for the Color Computer. You start out by rolling up your character's basic ability scores and buying equipment. When you are ready it's into the dungeon. Your character starts at first level, but can rise in levels by garnering experience in the fray. If you have role-played fantasy games you will be amazed at the realism of the combat system. Armor class, initiative, and damage by weapon type are all included, with over 50 different monsters to fight - each with it's own abilities. As you rise in level you can win treasure and find magic weapons and spells - if you live!! You set the game length by telling how many monsters you want to fight before you reach your final battle to the death against the powerful Dungeon Lord. There are 1000+ place description combinations in this text based game, and real excitement in every one! This is a fantasy simulation, and is truly not like any adventure game you have ever seen. For 1 player; requires 32K extended BASIC. **TAPE - \$19.95, DISK - \$24.95**

Astrology

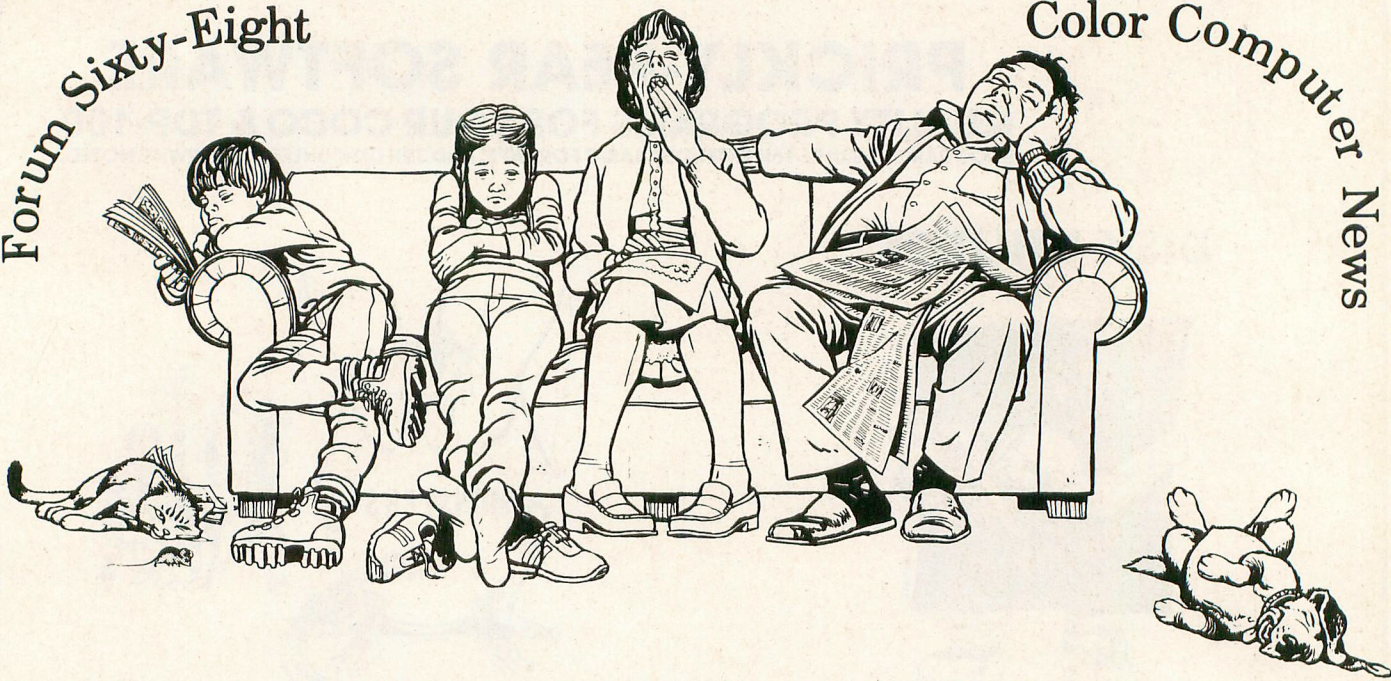
Truly a classic, this program will accurately cast your complete horoscope. You just enter the date, time, and place of birth. The sun sign, rising sign, mid heaven (MC), lunar nodes, and planetary influences including houses and aspects between the planets will all be calculated, and a full chart drawn. You can also do progressed charts and transits. It will even tell you the day of the week you were born. The accompanying book will help you interpret this chart of your horoscope. The extent of the documentation is tremendous, even by our exceptionally high standards, and no previous knowledge of the subject is required. You can share in this wisdom which has been used for thousands of years in many cultures. This program was written by a professional Astrologer. Please specify 16K or 32K system. **\$34.95 tape — \$39.95 disk**

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Color Computer News



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Screen Expander

Computerware
Box 668
4403 Manchester Avenue,
Suite 102
Encinitas, CA 92024
(619) 436-3512

The 64K Screen Expander allows for users to have a 51 by 24 upper and lower case display. The utility uses Basic and assembly-language programs. It does not affect any software and stays after resetting. The PRINT command is also expanded. It now works with true coordinate positions. Available on cassette and disk.

The Memory Loader

little bits computing services
P.O. Box 396
Hibernia, NJ 07842

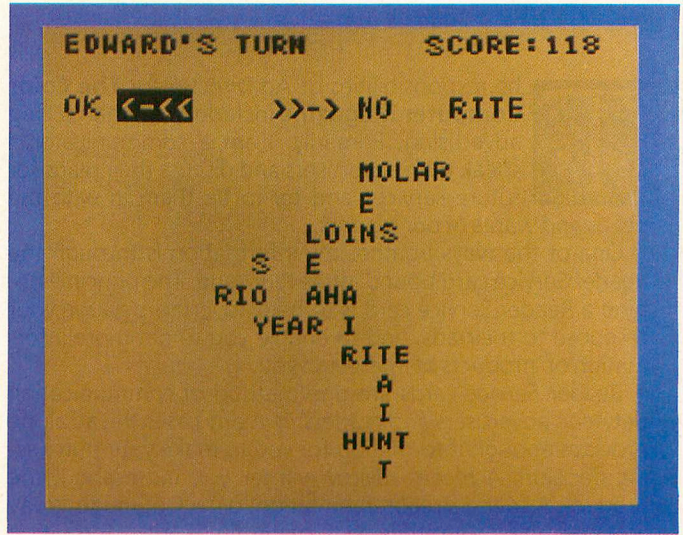
The Memory Loader allows you to sell cassette-based

programs of unlimited length to users with any size memory. The system works for either Basic or assembly-language programs. To use the Memory Loader, the programmer breaks his software into sections, called overlays. The overlays are stored separately on cassette tapes. With a few minor modifications, the program will execute automatically, loading and unloading from the cassette whenever a new overlay is called.

Novi Download (BBS)

Michigan Software Distributors, Inc.
43345 Grand River Avenue
P.O. Box 849
Novi, MI 48050
(313) 348-4477, voice
(313) 348-4479, data

Bulletin Board Service for Color Computers. Data line is (313) 348-4479.



Crosswords

Radio Shack
One Tandy Center
Fort Worth, TX 76102

Crosswords (catalog #26-3082) allows from one to four players to create words from a group of randomly selected

letters and position them on a playing area to form a crossword pattern. Players' options include combination or single play mode selection, and various time limits for each turn. Play is controlled by either keyboard or joystick. Crosswords is available in ROMpak and requires 16K RAM.

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END OF FILE



he responsibilities of Ad Director for **The Color Computer Magazine** include more than selling advertising. Primarily, I am a communicator. I speak with advertisers and discuss their plans for future services and try to tie them in with the needs and wants of our readers.

One of the ways I gather my information is through the Reader Service card bound into every issue. The principle behind a Reader Service card is to help advertisers gauge your response to their ads, and to enable you to get more information on products of interest to you.

Reader Service cards are one method of communication between advertisers and readers. In many cases the ad alone provides enough information for you to make your purchasing decision. A recent review will tell you more about the product. A friend's recommendation, or lack of, might sway you one way or another. Still, many times the information you need can be quickly received through circling the advertiser's reader service number.

My intention here, is to help you make the most of your Reader Service card. My first tip is to fill the card out properly. Without your name and address, companies cannot mail you the requested information. So make sure you fill out the name and address lines. The first three questions on the card are intended to let manufacturers know what equipment you have. Many people in the software business have asked me if more users have Color Basic or Extended, disk drives,

printers, 16K or 32K. Manufacturers want to produce products that will best fit your requirements and need your input to do it.

They also need to anticipate your future requirements. You may not have disk drives now, but plan to add them soon. By supplying the right information to the advertiser, you help those people who are working to keep our computer rooms well stocked with the latest and best products.

To use the Reader Service card, just circle the numbers on the card that correspond to the Reader Service number mentioned near the ad or in the Advertisers Index. Advertisers are happy to send you the information, but keep in mind the fact that they have to pay printing and postage on each brochure sent. Most of them are Color Computer enthusiasts also. Circling numbers just to get lots of mail hurts them, and drives prices up for everyone, so use the service discriminately. Don't hesitate to send for information on something of interest to you, but do remember that the people sending the information are not corporate conglomerates, they are fellow computerists.

Let me know your thoughts. Reader Service cards are only the start of how we can communicate with each other. Many ideas cannot be expressed by checking boxes on a card. Send in the card, and if you have problems, questions, and ideas, write to the advertiser first. If you have general needs from the market as a whole, write to me and I'll pass the information around.

— D.E. Advertising Director

FOR...NEXT (06,83)

WE HAVE A FEW TREATS IN STORE to begin your summer with. The June issue has your leisure time in mind. We have a contest in the works that will make for a good summer project.

Also, Dennis Kitsz took time out from hardware projects to write a scrolling banner-display program at the request of a museum that we'll pass along to you. William Barden

Jr. finishes Color Animation with some fancy-yet-simple assembly-language graphic techniques.

Not to be outdone by Messrs. Kitsz and Barden, Jake Commander has a summer treat planned too. In April we published Jake's memory map, and next month we'll publish his disassembler. After all, what's a disassembly without a disassembler? A loaded question that we'll pass on.

Of course there's plenty more up our sleeves, including a whole mess of game reviews. See you next month.

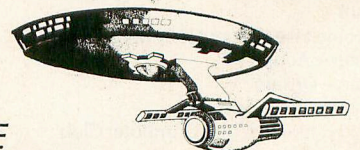
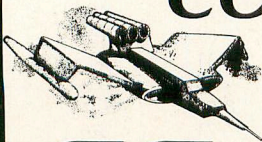
COMING NEXT MONTH

from Command Software

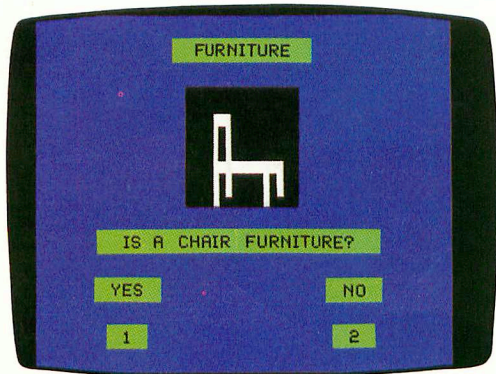
CC SPACE TREK

by Jake Commander

AVAILABLE ON CASSETTE



RADIO SHACK TRS-80® COLOR COMPUTER Software* Update



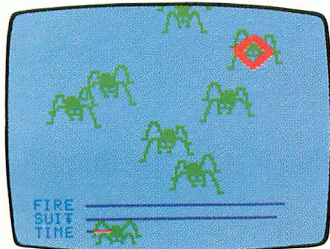
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Fight Off Invaders in Klendathu

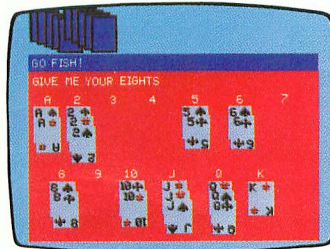


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These 4 Daring Adventure Programs Will Test Your Skill and Bravery



Search the strange labyrinth for hidden treasures in the new **Madness and the Minotaur** game. But you must beware of the mystical Minotaur and other terrible creatures. 26-3313, \$14.95

You're "in" and you want to get out—but the whole place is crazy! As you try to escape from **Bedlam**, you'll encounter guard dogs, strange patients and numerous

perils. What's worse, the way out changes every time you play. 26-3312, \$14.95

The mysterious **Pyramid** stands before you. Does it still possess its ancient riches? What deadly curses must you overcome to retrieve them? 26-3310, \$14.95

Can you claim the wealth of **Raaka-Tu**? The temple of this forgotten civilization contains vast treasures for the one who is resourceful enough to reach its inner chambers. 26-3311, \$14.95



Get the TRS-80 Color Computer Quick Reference Guide Today!

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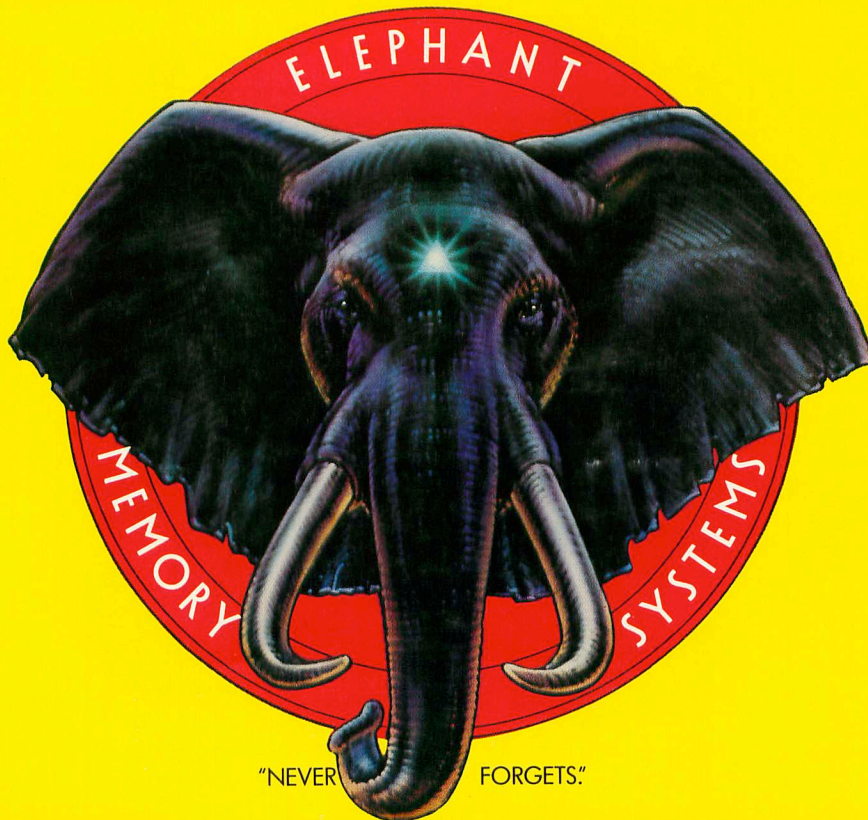
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TELEPHONE _____

* Programs require cassette recorder. Retail prices may vary at individual stores and dealers.

Circle No. 11 on Reader Service Card

REMEMBER:



MORE THAN JUST ANOTHER PRETTY FACE.

Says who? Says ANSI.

Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

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They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to

make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

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