

Back to School

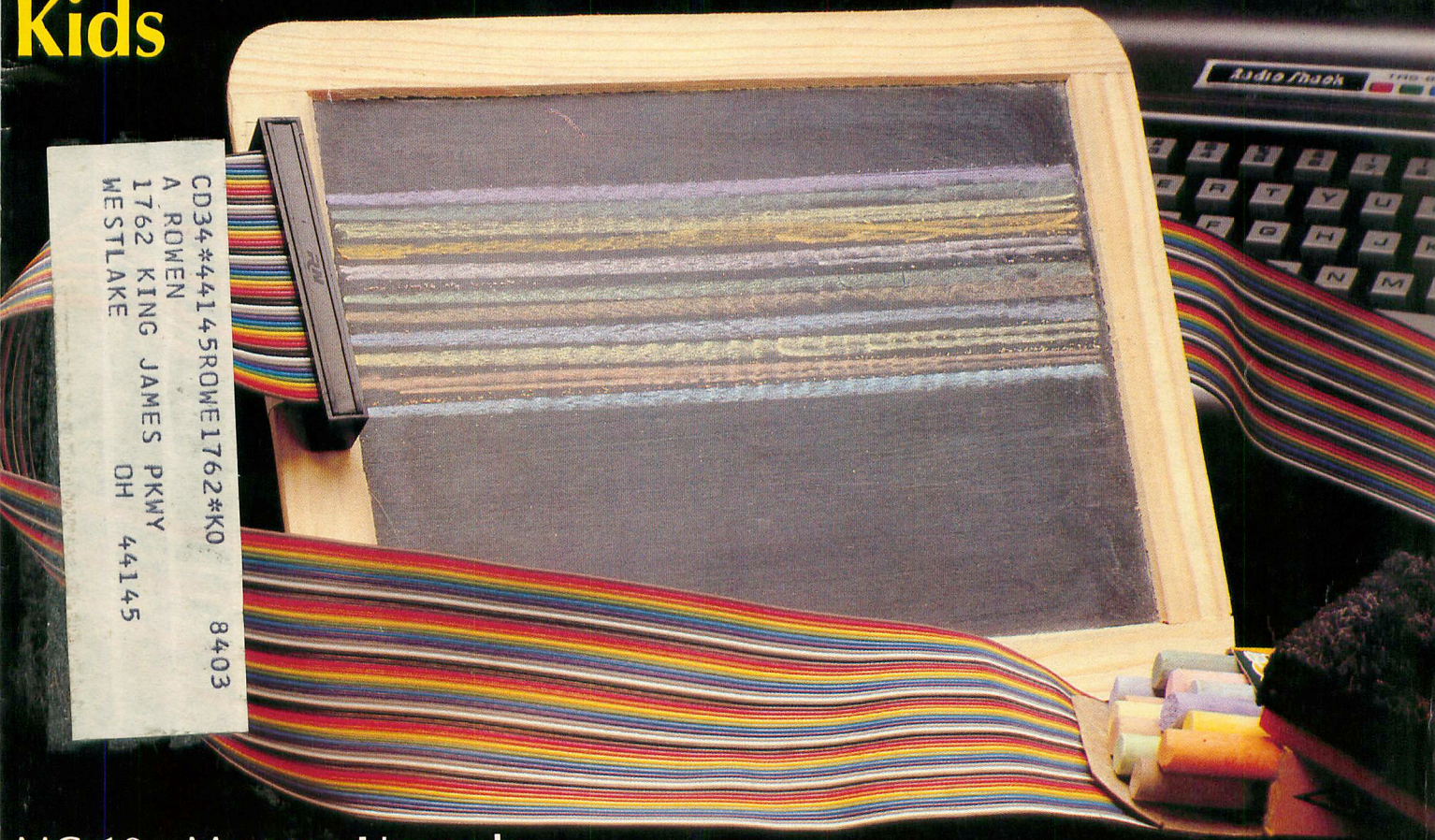
September 1983 \$2.95

Color Computer^{*} MAGAZINE



For TRS-80[®] Color Computer & TDP-100[™] Users

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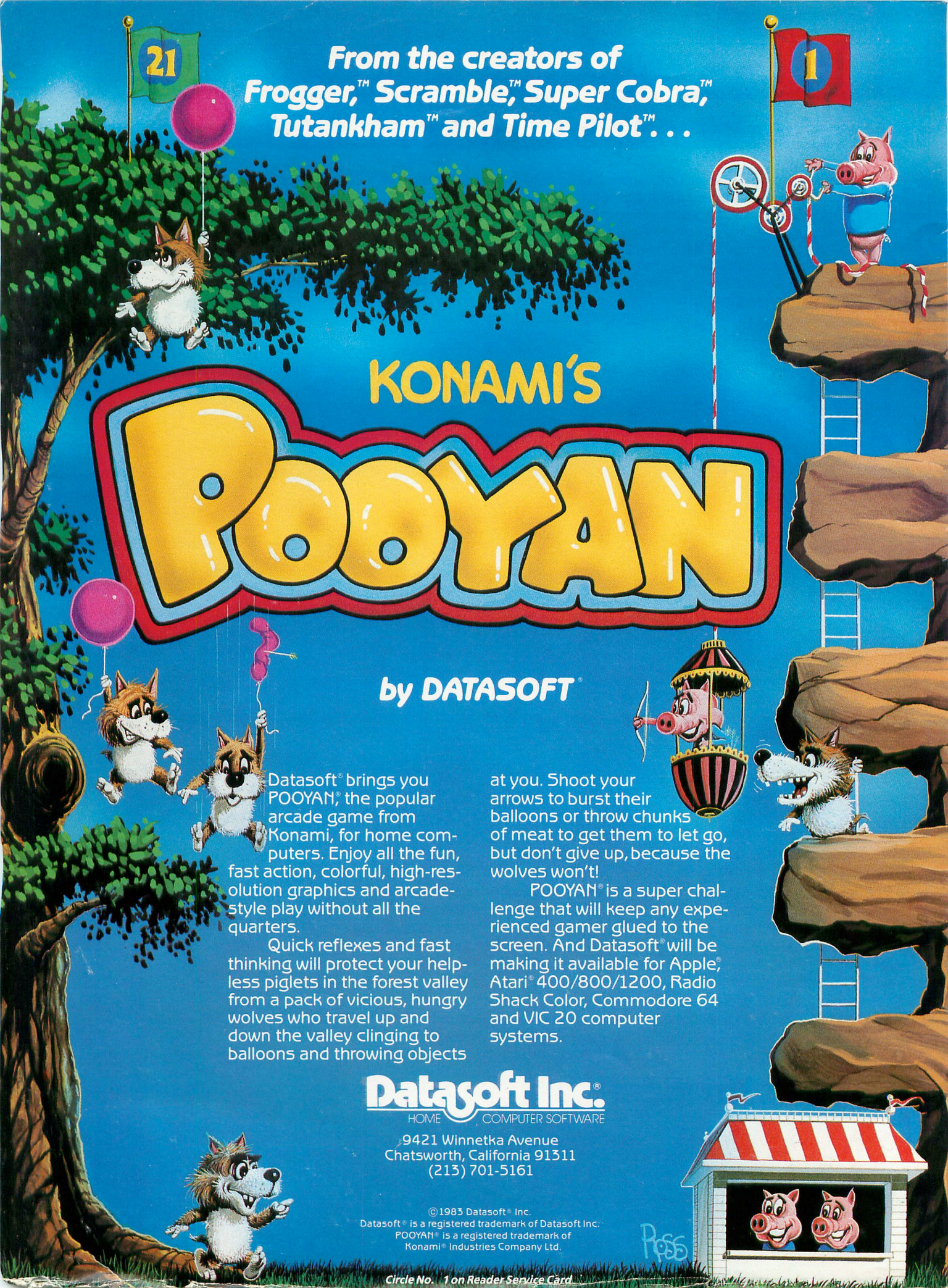
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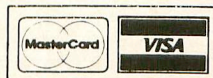
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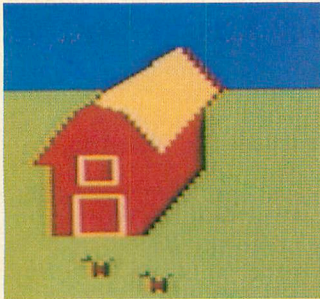
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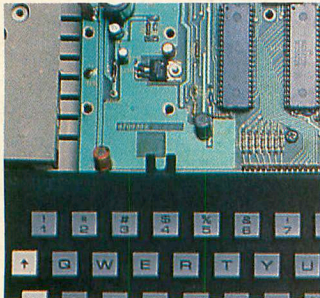
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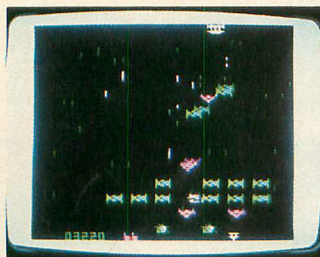
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p. 64



p. 113

FEATURES

- 15/Your Color Computer — A Tutor** by Shirley Georgi **(Education)**
A computer in the hands of a skilled teacher is better than no computer and an overworked teacher.
- 21/Sorcerer's Puzzles** by Richard Ramella **(Game)**
The Sorcerer has three bedtime stories for Sunflower and Poke, with puzzles to keep you busy for hours.
- 32/Color Computing for Kids** by Jean Plessler **(Education)**
What's better than peanut butter? This series, written just for kids and their computers!
- 42/Dissecting Your ROM** by Jake Commander **(Tutorial)**
The third of a 12-part series examining the Color Computer ROM, bit by bit.
- 49/Talk Together** by Bill Barden **(Tutorial)**
Make your MC-10 and your Color Computer share programs.
- 64/Children's Computer Workshop** by Kerry Leichtman **(Education)**
What do Sesame Street and Radio Shack have in common? Educational software!
- 78/Custom Color** by Dennis Kitzs **(Hardware)**
Give your MC-10 more memory.
- 95/The Jargon Generator** by Glenn Knight **(General)**
Talk to bureaucrats, technocrats and pseudocrats in their own language.
- 99/Teaching Computers to Teach** by J. Craig Dickinson **(Education)**
Color LOGO makes computer literacy easy and fun.
- 102/Refunding** by Brian Alsop **(Home Management)**
Saving money's important — now you can save time saving money.
- 108/DEFUSR** by Terry Kepner **(General)**
A question-and-answer column — the answer to your requests!

DEPARTMENTS

- 4/PEEK (09,83)**
- 10/INKEY\$**
- 74/GOTO SCHOOL**
- 111/REVIEW\$**
Moon Shuttle, Date-O-Base, Screen Print, Ghost Gobbler, and others.
- 123/NEW:PRODUCT\$**
- 128/FOR...NEXT (10,83)**
- 128/END OF FILE**
On computer literacy.
- Cover**
Education Interface by Charley Freiberg **ABC membership applied for.**

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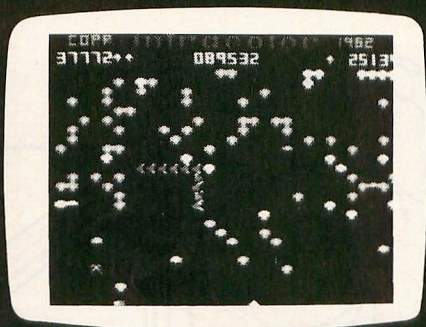
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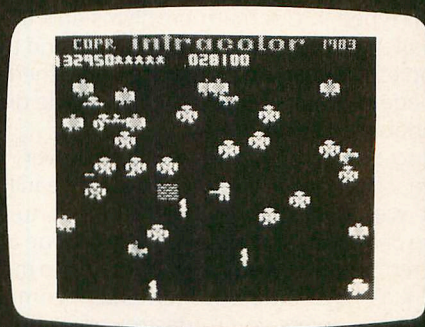


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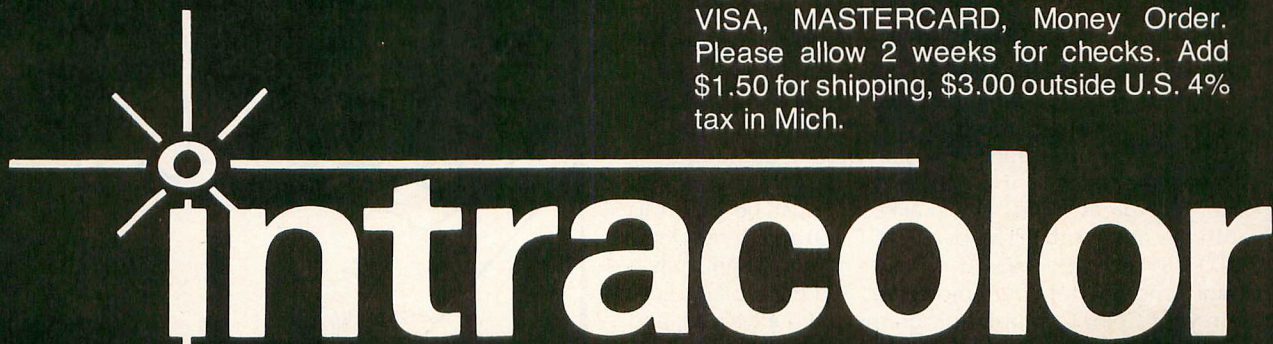
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September days are golden and bring memories of things past to my nose: school bus leather seats, chalk, lunches packed in paper bags, wet wool, white school paste, bright, fallen leaves. When I was in school, "computer" was a word not often heard, and then only rarely, in math classes.

I learned to hate a once-favorite math teacher when he rented what must have been something resembling a mini-computer, to give us a head start on the digital revolution. There were three keyboards hooked into one box referred to only as "the memory," that had to be wheeled about on a cart meant for a mimeograph machine. We were sternly forbidden to touch the memory. None of us had video screens — we each typed in our math problems and then patiently (sort of) waited as the computer processed and then spit out printed copies of what we had typed. Only then did we see what damage our hunt-and-peck typing style did to usually understandable algebra problems.

I've got to give that teacher credit, however; back in the days when commercial software wasn't readily available, and what was available gave no thought to being user friendly, he persisted, and when I got to college at least basic computer terms weren't a foreign language to me.

Today's kids have different memories—computers smell only like plastic, unless you're destroying a disk somehow. But computers today are fun and good learning tools, as teachers and kids are discovering. To help you on that discovery, we have a number of articles: GOTO 15 to find out what to look for in educational software, and how to use it effectively. Shirley Georgi is the author of some wonderful programs for small children. Paul Kimmelman will keep you informed of trends and sources in education and computers (GOTO 74). If you're interested in LOGO and what that means to education, GOTO 99, where a teacher from the Asa Adams school (where LOGO is used extensively) explains its benefits and structure. Then GOTO 64 to discover what the Sesame Street people are doing with computers and kids. Finally, if you're a kid who wants to learn about computers and programming from the very beginning (or if you're an adult with the same desire), GOTO 32. Jean Plesser begins a regular column here, entitled "Color Computing for Kids." Parents will find this approach to computing very useful, and it will give children their own special treat to look forward to each month. A hint for adults not yet computer-literate: read this column; it'll even show you where the "on" button is!

For those of you who have graduated, we have many things to keep you happy, as well. GOTO 21 for a new installment in the saga of Poke and Sunflower, on their way to becoming sorcerers. The Sorcerer has three new puzzles that will keep you busy for some time.

GOTO 42 for the exciting third part of Jake Commander's ROM disassembly.

They say great minds think alike. It must be true this month, because both Bill Barden (GOTO 49) and Dennis Kitz (GOTO 78) have the MC-10 on their minds. Dennis has a memory upgrade for your enjoyment, and Bill explains how to run your Color Computer programs on your MC-10, and vice-versa.

Having trouble making your Congressman listen to you? You simply aren't speaking the right language. GOTO 95 for a solution to this problem.

You can't afford not to GOTO 102. Also has a program that will save you time and energy, doubling the savings you're already making on your refunding program.

Finally—good news for those of you who are lost in the seas of the unknown. GOTO 108, a new column where your questions will be answered, sources found, fears put to rest.

—D.M., Managing Editor

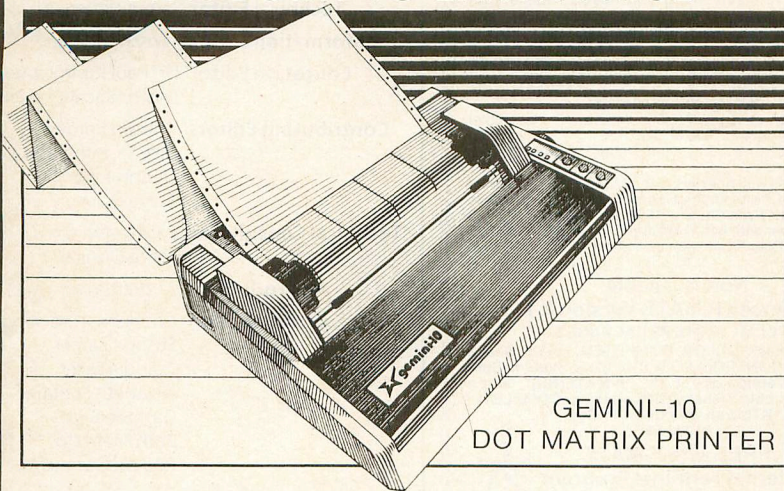




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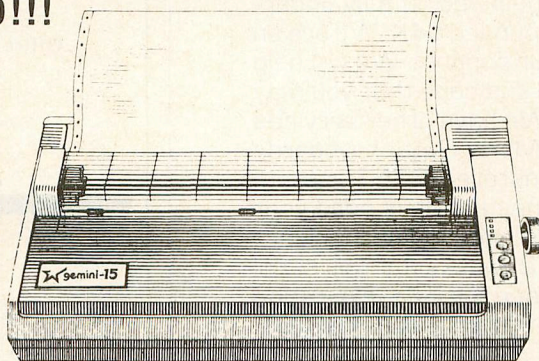
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Publisher James S. Povec

Advertising Director David J. Ezequelle
(207) 236-9621
Highland Mill
Camden, ME 04843

Director of Marketing Carl Cramer

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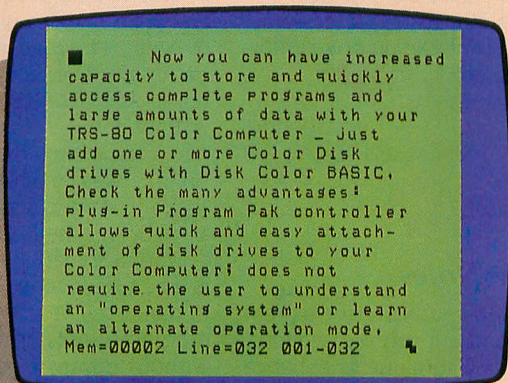
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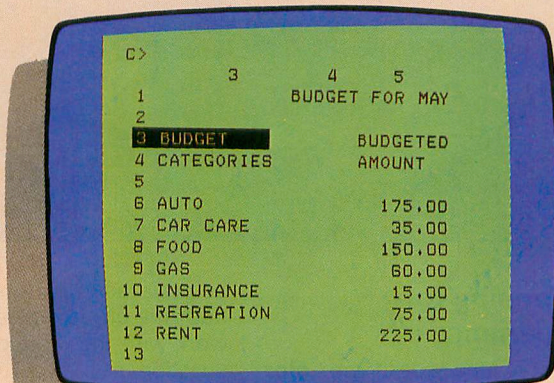
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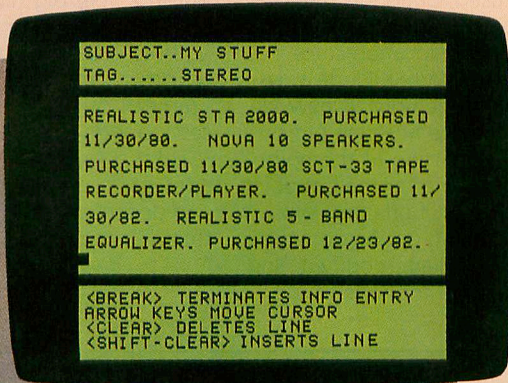
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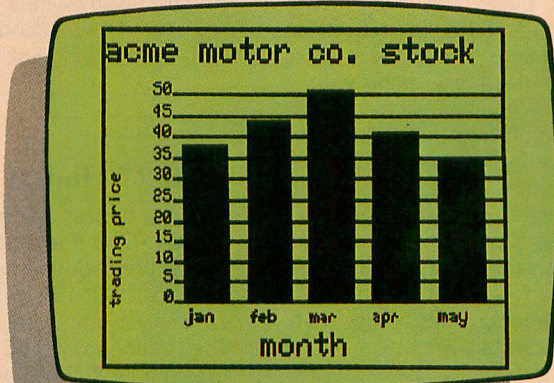
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INKEY\$
The Color Computer Magazine
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Shopping for Experience

In the June issue of **The Color Computer Magazine** you published an article on how to shop for equipment. The article was an excellent idea, however, I feel there was some very bad advice given in that article.

I should probably start by introducing myself as both an owner of a Color Computer and also as a salesman for a store that supports the Color Computer. We have in stock close to 60 different software packages from several manufacturers, along with many types of accessories, ranging from joysticks and lowercase adapters to printers and disk drives. We also know which things work with the Color Computer and which do not. Along with all this we also have one other thing: experience. This means that we can talk about other than pure technical specifications. If you tell us your needs we can make a practical suggestion — not just tell you the print speed of a printer, but whether it will really do what you want and need.

So far so good; it sounds like I agree with Keith Baker. Find yourself a good dealer who can support you. Now for the catch. We are not in business to demonstrate hardware and software so that you can then go buy it somewhere else. We do not attempt to compete with mail order prices, nor do we want to. We pride ourselves on providing excellent service and support. Even the best mail order houses cannot provide the help *and support that can*

be provided in person, where both the buyer and seller can work with the product in question.

In closing, I would just like to remind people what it was like a year or two ago. It was difficult to find any kind of dealer who would support the Color Computer. If you are fortunate enough to have a local dealer you can work with, don't put him out of business by using his knowledge and inventory and then making your purchase somewhere else.

Randy Frankel
Encinitas, CA

SCRPRRT Hint

I want to pass along to those readers using Radio Shack's screen print routine with their LP VII or DMP-100 printers a fix for a very annoying problem. The routine, called SCRPRRT, uses the keys (Shift) and (Up Arrow) to activate the screen print. This conflicts with the use of these keys to exit from the insert mode while editing. The fix is to POKE &H3DA5,&H5B (after CLOADM"SCRPRRT"). This enables use of (Shift) (Down Arrow) to activate the screen print. To record the corrected version, enter:

```
CSAVEM"SCRPRRT",&H3D80,&H3FFF,&H3D80
If used with a 16K Color Computer. If used with a 32K Color Computer run the following program after CLOADM"SCRPRRT", but before entering EXEC:
1 CLEAR 100,&H3D80
10 FOR A=&H3D80 TO &H3FAE:V=PEEK(A):H$=HEX$(V)
20 IF H$="3D" THEN V=&H7D
```

```
30 IF H$="3E" THEN V=&H7E
40 IF H$="3F" THEN V=&H7F
50 POKE A+&H4000,V:NEXT A:END
```

Then, save it to tape with SAVEM"SCRPRRT",&H7D80,&H7FFF,&H7D80. This places SCRPRRT at the top of 32K RAM. Note: a screenprint can be done within a program by using the command: EXEC &H7D98.

Tom Goodrick
Bellingham, MA

DBM Notes

I enjoyed your first issue a great deal, and am sure subsequent issues will continue to enhance my enjoyment of the Color Computer. The article, "Your Basic DBM," was just what I was looking for as a tape file management program. Thanks to Mr. Detwiler; as he suggested, here is one modification to further its utility.

The basic program allows for file updating. If an old file is used, option 2, menu 1, you cannot put it back on file in the same location since rewinding and SKIPF destroys the file in memory. A new file or an update must be put on the tape starting at the point immediately after the last point read prior to updating. With the following option an old file can be recalled, modified, and put back on the tape in the

exact same spot, negating the need for creating a new file (and unneeded tape pass time) each time a file is updated.

I find the DBM most helpful at the front of a tape, followed by several data programs. I designate my files with plenty of blank records to allow for expansion. The technique above would cause overlaying of data between tape files if a file in the middle of a series on tape were made longer (since files are placed back to back by this method).

I found something curious; maybe someone can explain to me: STEP 9579 SKIPF SK\$. The program works as written without quotes around the variable SK\$ as the manual requires. It will not work if the quotes are included — the tape search will not end. Use of SKIPF on the keyboard does require the quotes.

The main limitation on this program is that the total file must be resident in memory for the program to work, and on a 16K machine you can't put in a very big file. My first application was for storage and recall of data processing articles in various publications. I ran out of space at the first session with only 20 records.

How about a DBM that goes back and forth to tape and doesn't need to have the total file in memory?

Bernard Z. Werschler
Wenham, MA

Werschler's Program

```
1085 PRINTTAB (8) "7 - OVERLAY UPDATED FILE"
1110 ON A GO SUB 3000, 4000, 5000, 6000, 7000, 8000, 9400
9400 CLS
9500 PRINT @ 0 "**** SET RECORDER TO REWIND ****"
9510 PRINT @ 64, "**** WHEN REWIND COMPLETED, PUSH P"
9511 PRINT @ 99, "ON KEYBOARD TO STOP MOTOR ****"
9512 PRINT @ 160, "PRESS R AND ENTER TO REWIND"
9520 INPUT H$
9530 IF H$ = "R" THEN 9540 ELSE 9520
9540 MOTOR ON
9550 AS = INKEY$
9560 IF AS = "P" THEN 9570 ELSE 9550
9570 MOTOR OFF
9572 CLS
9575 PRINT @ 160, "**** PRESS PLAY BUTTON ****"
9576 PRINT @ 224, "ENTER NAME OF FILE PRECEDING"
9577 PRINT @ 256, "FILE TO BE UPDATED"
9578 INPUT SK$
9579 SKIPF SK$
9593 PRINT @ 352, "**** WHEN TAPE STOPS TYPE CONT AND"
9594 PRINT @ 416, "WHEN MENU APPEARS SELECT ITEM 6"
9595 STOP
9600 GO TO 1000
```

Please turn to page 12



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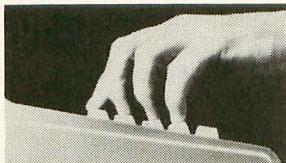
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Comline Correction

I've just received the May issue, which contained my article "Comline." There were a couple of errors in Table 1. Anyone who followed these instructions would have their program disappear.

The first step, "CLOAD your first program," was left out. What shows as the third step is actually the fourth step and should read:

"Type POKE 25, PEEK(27)-1 : POKE 26, PEEK(28)+254

And press ENTER

Go to step 6"

Step 6 is "CLOAD the second program."

Scott Norman, in his article "Language Teacher" in the same issue, shows a much simpler method of combining programs. I haven't tried it, but it should work 254 times out of 256. If PEEK(28) happens to be zero or one, then the POKE 26, PEEK (28) - 2" won't work.

A simple solution is to enter "PRINT PEEK (28)" after CLOADing your first program. If PEEK (28) is less than two, edit your program and add a couple of spaces somewhere where they won't do any harm. This will increase the length of your program by two bytes, which will in turn increase the value of PEEK (28) by two. You can then proceed as instructed by Mr. Norman.

Don Wood
Winnepeg, Manitoba, Canada

Reader Service

I have just received the May and June issues.

Congratulations on each; I really enjoyed Jake Commander's Space Trek. However, I had some problems with his graphics. I also enjoyed D.E. Wood's condenser program, and William Barden's Color Animation.

In regards to David Ezequelle's "End of File," I feel that Reader Service cards provide a valuable service for both readers and advertisers. However, instead of just sending a copy of their ad from the magazine, advertisers should consider doing something like Computerware's annual newsletter. Their newsletter is very informative and interesting and gives one a better sense of security when ordering from them.

I also liked your June issue, especially part two of William Barden's Color Animation and Douglas Adam's excerpt from *The Restaurant at the End of the Universe*. Dennis Kitsz's Display Scroller was good, too. I think your contest is a good idea and plan to enter it.

Jeffrey Carden
Saranac Lake, NY

Jeff isn't the only one who had problems with Space Trek, and we apologize again. See the fix in the July issue.

— Eds.

The Indy Color Computer Club meets in Indianapolis, IN, first and third Thursdays of the month.
Contact Mike Davis (317)257-3300.

The Color Computer Club meets in Sarasota, FL the last Thursday of the month at 4047 Bee Ridge Rd.
Contact Ernie Bontrager (813)921-7510.

Broome Color Computer Club meets in the NYSE&G Corp. Service Center, Old Vestal Rd., Binghamton, NY, the first Thursday of the month.
Contact Bucky Nelmer (607)723-8223

Color Computer Users Group of Philadelphia, PA meets third Saturday of the month in the Science building at LaSalle College.
Contact A. Weiss, Apt. 1626, Kennedy House, 1901 JFK Blvd., Philadelphia.

I would like to start a Color Computer Club in the Baton Rouge, LA area. Interested?
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Space Colors

For those who don't like the data as given in Commander's "Space Trek," and would like to fool with the borders of the scanner some more, here is a Table showing what results each Basic word will give if put in Lines 20 - 60 instead of what's there now. "Pattern" refers to the numbers given in the *Color Computer Quick Reference Guide* by Radio Shack, on page 23. Or, number

the graphics characters on page 276 of *Getting Started With Color Basic* from zero to fifteen.

The following produces the zero pattern (a black rectangle): FOR, PCLEAR, RETURN, and SOUND. The second Table produces two characters.

Thanks for a good program, even if it did take a lot of debugging.

Robert Frazier
Tenino, WA 98589

Fix (08,83)

- GO SUB Destroy will indeed, run in 4K Color Basic.
- Spelling Games listing begins on p. 52, continues on p. 54 and then on p. 56 through p. 58. States and Capitals listing begins on p. 53 and is completed on p. 55.

Correction lines for Jake's Color Computer Disassembler

```
45 SP$=" "
880 LN$=LEFT$(LN$+SP$,15)+OP$
890 LN$=LEFT$(LN$+SP$,20)+AD$
900 IFCM$<>" " THEN LN$=LEFT$(LN$+
SP$,27)+CM$
930 LN$=LEFT$(LN$+SP$,L):RETURN
```

Jake's disassembly in the June issue will almost run in Color Basic. Typing these lines into the program will make it function fine without Extended Color Basic.

Table. Frazier's Border Chart

	PATTERN	COLOR	PATTERN	COLOR
USR	15	8	3	1
ELSE	:		4	1
GOSUB	1	1	6	3
GOTO	1	1	5	3
INSTR	15	8	14	2
MID\$	15	8	0	

Table. Frazier's Two Characters Chart

	PATTERN	COLOR	PATTERN	COLOR	PATTERN	COLOR	PATTERN	COLOR			
AUDIO	1	3	CIRCLE	2	5	CLEAR	5	2	CLOAD	7	2
CLS	14	2	COLOR	1	5	CONT	3	2	CSAVE	8	2
DEF	9	4	DEL	5	4	DIM	12	1	DLOAD	10	5
DRAW	6	5	EDIT	6	4	END	10	1	EXEC	2	3
FN	12	5	TO	5	3	STEP	9	3	NEXT	11	1
GET	4	5	GO	1	1	IF	5	1	THEN	7	3
INPUT	9	1	LET	10	4	LIST	4	2	LIST	11	2
LINE	11	4	MOTOR	15	2	NEW	6	2	ON	8	1
OFF	10	3	OPEN	9	2	PCLS	12	4	PCOPY	7	5
PLAY	9	5	PMODE	8	5	POKE	2	2	PRESET	14	4
PAINT	3	5	PRINT	7	1	USING	13	5	PSET	13	4
PUT	5	5	READ	13	1	RENUM	11	5	RESET	13	2
RESTORE	15	1	RUN	14	1	SCREEN	15	4	SET	12	2
SKIPF	3	3	STOP	1	2	TROFF	8	4	TRON	7	4

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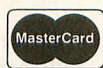
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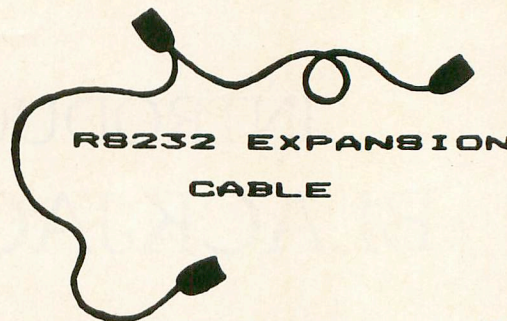
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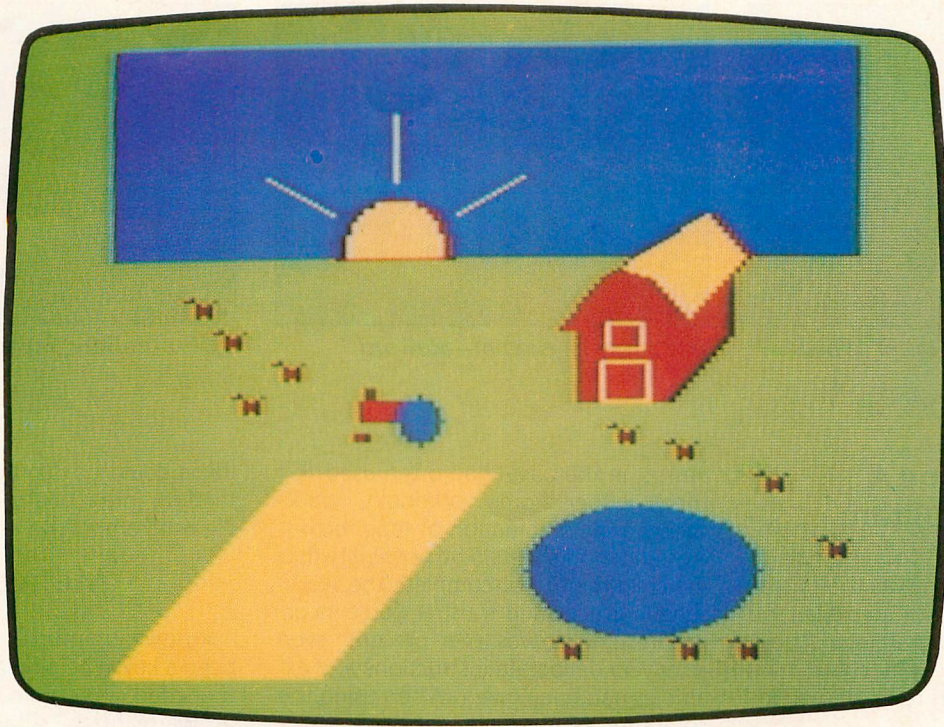
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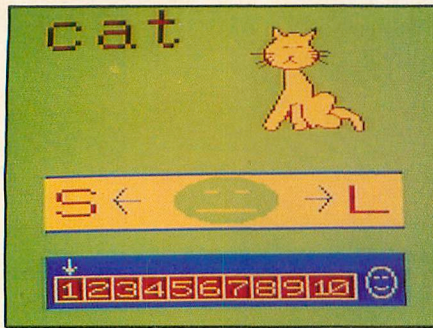
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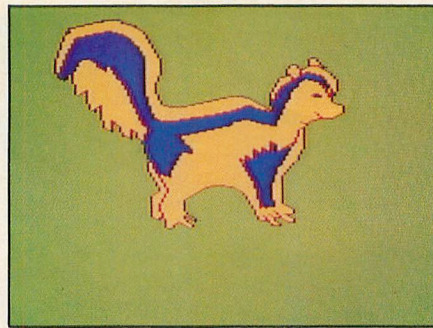
by Shirley Georgi

JACK DECODES WELL but pays little attention to suffixes on words. Mary has difficulty distinguishing between the short i and the short e sounds, and Scott cannot discriminate final consonant sounds unless another person pronounces the word for him. After doing an informal reading inventory with the children in my classroom, these were just a few of the weaknesses I discovered. The diagnostics gave some direction for individualizing my instruction; now it was time for me to find a suitable program for remediation. What could I do?

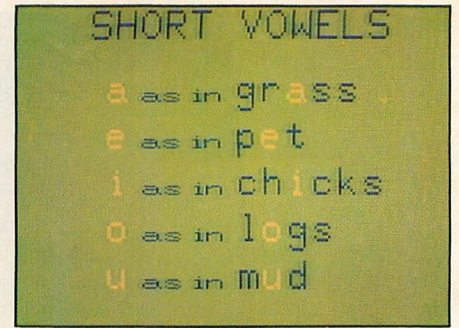
With the size of my classroom increasing, I found less time to do individual work with each child on his weak areas. I felt frustrated. The weaknesses would need work, and I earnestly wanted to find a solution.



Pictorial Representation of Words



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Designing A Good Program

The greatest vehicle I found for helping provide remediation was the micro-computer. It could not *replace* the teacher, but a good program *could* work as a "caring presence." It could talk, teach, move, score and reward (see Figure 1).

When writing any educational materials, definitive objectives and an overall goal must first be established. (A computerist would call this a "top down" approach.) Each exercise I was to write needed to be explicit and systematic as well as innovative and enticing. The programs had to have well-defined skill tasks integrated with motivation, both in the content of each exercise and in the achievement of a reward upon its successful completion. The program needed to be so well written that the student would accomplish the objective while enjoying a game-like atmosphere.

In my application for skill work dealing with phonetic analysis, the combination of visual and auditory stimuli was crucial. Like other students, Mary not only needed to see the graphic representation of both words (i.e., pin and pen) but also needed to hear both words articulately pronounced. In addition, pictures on the screen exemplifying each word would provide clarity in definition and stimulate interest in the exercise (see Figure 2).

In remediating for specific weak-

nesses, in the past I had often used skill sheets either from workbooks, worksheets or a combination of tape recordings and worksheets. The possibility that the child might not complete the worksheet correctly and thus reinforce incorrect responses was ever present, even after very deliberate instructions and examples had been given. When using the computer as a remediation tool, incorrect responses are rarely reinforced. Good programming techniques let each keyboard entry be examined immediately, and the child can obtain immediate feedback as to his accuracy in answering the item. At this point, if an answer is incorrect directions can be repeated or correct responses are rarely reinforced. Good programming techniques let each keyboard entry be examined immediately, and the child can obtain immediate feedback as to his accuracy in answering the item. At this point, if an answer is incorrect directions can be repeated or correct responses are rarely reinforced.

A program with these qualities would be great for my student, Scott. Besides having difficulty with final consonant sounds, Scott would complete assigned worksheets very quickly but not accurately. If he were working in a group, he would work ahead of the others and not listen carefully to the current word or sounds being taught. A computer program would have to be written so Scott would have to tend to the task at hand. By programming the exercise so inputs are completely ignored until all directions have been given, Scott would not be able to rush ahead. He would soon learn that no answer would be accepted until he had listened to the entire instructional message for each item. In addition, no

items could be omitted either inadvertently or intentionally, unless specified in the program software.

Motivation

Positive reinforcement has always been a key in helping a child to progress. If needed, a program should give a child a "warm fuzzy" after every correct response. Maybe it's a smiling face, a peppy tune, a picture of an arrow striking a bull's eye, or just a printed or spoken word of encouragement. Whatever it is, the child feels motivated to go on (see Figure 3).

Recently, I visited every grade one through four classroom at our local elementary school to see what kind of motivation is provided to students. Although each teacher had ideas of her own, all classrooms consistently had some type of chart so students could monitor their own progress and feel inspired to strive for the next level. Progress charts would be a natural for the computer; exercises can be written so that after an item is correctly answered, the score is increased by one, and shown on the scoring machine. The scoring machine becomes an ever-present part of the screen, and is constantly showing the child his or her record of achievement. In essence, the scoring machine is saying,

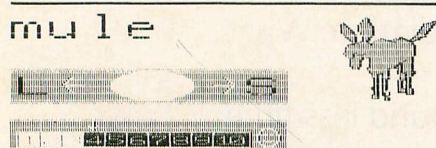


Figure 1. Printout of color screen for vowel exercise showing the printed word, picture, 'tester' and scoring machine.

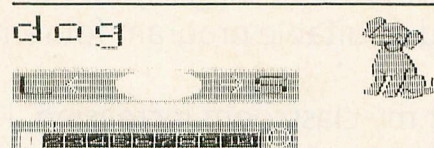


Figure 2. Representation of the word, dog, can be seen while the word is being pronounced for the child through the computer's sound channel.

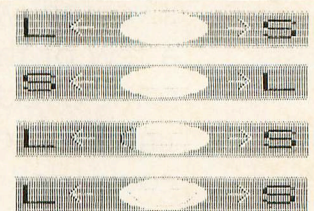
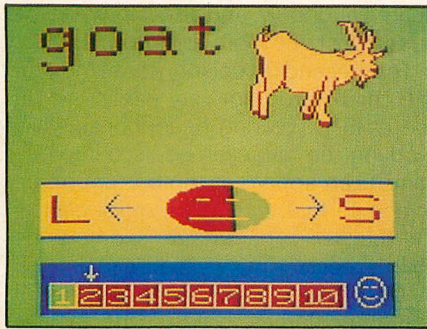


Figure 3. The multiple choice program. The long arrows point to the long (L) vowels; short arrows point to short (S) vowels. The face smiles for a correct response, and changes color on timed exercises to indicate time remaining.



The Timing Mechanism—the Face Changes Color

"You're doing great; keep on going; here's credit for one more correct answer!" (see Figure 4).

Another of my concerns focussed on children with poor visual motor skills, especially children in the primary grades. They were often hampered in answering items because they had difficulty with the eye-hand coordination needed to communicate the correct response, but had no difficulty with the concept or skill itself. Using the computer allows students to concentrate only on the given task. Entries can be limited to a few keys, buttons, joysticks or a light pen.

In early primary reading materials, pictures are fundamental to teaching sound and symbol relationships. When using worksheets to remediate a problem, an occasional problem arises in the child's correct interpretation of the pictures. For example, an ax could be called a hatchet, a pony referred to as a horse, or a purse thought of as a handbag. Even if the teacher talks about each picture while assigning the work, students may still rename some pictures and therefore give incorrect responses in the exercise. In good computer programs, the child can see the word and picture on the screen while hearing the word pronounced as he or she is doing each item. Confusion in comprehension or mistaken identity is in this way avoided (see Figure 5).

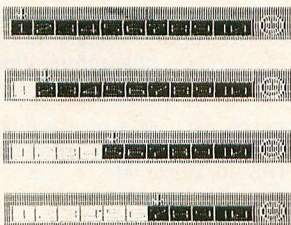
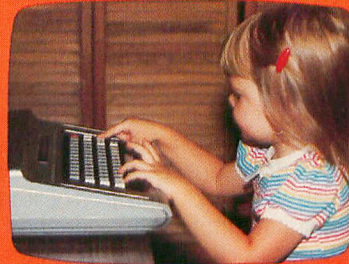
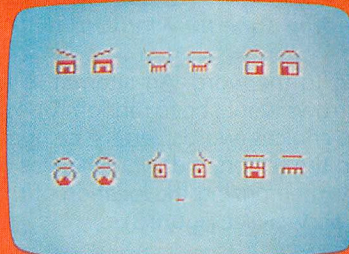
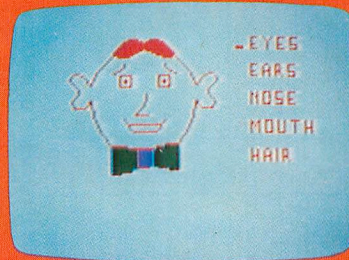


Figure 4. The scoring machine keeps track of the initial correct responses a student made in completing an exercise.



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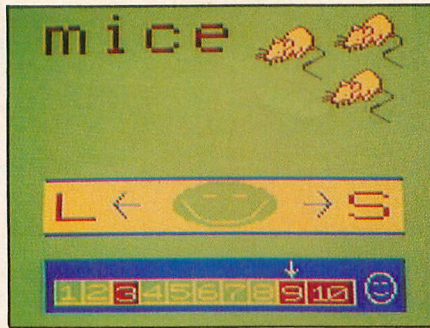
SOFTWARE AUTHORS WANTED

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Avoiding Memorization

While watching my son, Tim, and his friend, Michael, "playing" a spelling game on the computer, I found that the boys *did the exercise* very carefully the first few times they ran the program. A problem arose when they began memorizing the order of the items and the positional input of each answer on the keyboard. The exercise had become so automatic that neither boy was reading the message on the screen, nor listening to the taped message. They *had not* achieved mastery of the concepts in the exercise, but they *had* achieved positional memorization of the correct input. A simple solution would be to program in a random command for the ordering of the items to be presented.

Another method to eliminate positional memorization and yet keep the input simple is to use the arrow keys on the keyboard. For example, if the choice was between the words "pin" and "pen," pen might have a right arrow pointing to it while pin has a left arrow. These choices can be randomized so the right arrow might point to pen or the left arrow might point to pen. The child would then have to carefully examine each word every time he went through the exercise to select the correct arrow



The Smiling Face for Motivation

pointing to the word. An alternative to using arrows would be to randomly position the choices (words, letters, or numbers) on the screen, reducing chances of students memorizing the location of the correct answer (see Figure 3).

Computer Response

Another factor that must be addressed concerns the response students receive when answering an item. Software can be written so that when the child guesses incorrectly, directions can be restated and an instructional clue given. The item can be repeated until it is answered correctly. Thus, the child is not escaping a concept. When an item is answered correctly, the correct response can still be re-

peated auditorily, and also shown on the screen. Just one more reinforcement!

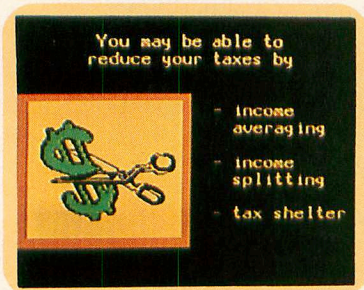
Teacher and lay personnel can monitor the child's program very easily. Even if the child is wearing headphones while working on an exercise, scoring machines can appear at the bottom of the screen so that with just a quick glance, the teacher or parent can see how the child is progressing (see Figure 4).

With the ever-growing popularity of computer games, children are familiar with the Menu, whereby the player is asked to pick a difficulty level, usually defined as easy, hard or tough. A timer is often used to facilitate the speed of the game. The same concept can be utilized well in programs for reading and language instruction.

In the easiest mode, students should be able to progress through the program at their own pace, since the objectives being taught are at an instructional level. Once the student has had sufficient instruction so that he is attaining mastery level, the program can be timed so the time window for selecting an answer will only appear on the screen for a given number of seconds. This is particularly useful to help a child integrate words into his or her sight vocabulary (see Figure 3).

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gram which was used for instruction becomes a tool for review, and does not become boring to the learner. Because sound phonetic skills are an absolute essential in teaching primary reading, review programs are essential. Computer programs can offer a viable means for this. Even if a student has "mastered" a concept (as shown by criterion-referenced testing), there is still a need for occasional reinforcement for long-term retention.

Although it is important to give children favorable responses when they have correctly completed an item, it is equally as important to find a reward for the student who finally masters the objective, and completes the criterion-referenced items with 90 - 100 percent accuracy on the initial attempt. A "dangl-



Figure 5. Primary reading materials should contain high quality sound and pictures. With today's low end computers you can have both.

ing carrot" can be programmed into the software so that only when the child achieves such mastery does he or she get the final reward. For example, a mystery character might appear on the screen only when items have been answered correctly on the initial attempt. This makes the program become a game, with the child being his or her own opponent (see Figure 6).

Psychologists are beginning to study how children are affected by some computer games and educational exercises. One concern centers around the amount of subliminal violence these programs perpetuate. Shooting the enemy, sinking the ship or destroying the town exemplify the rewards in these programs. The aggressive factor is ever present. I feel that it is important that such actions be minimized in the planning stages for writing computer programs. There is infinite adventure under Mary Poppins' umbrella, in the world of Jacques Cousteau, and beyond the star-lit heavens of Apollo. Topics are innumerable, and the rewards in the programs themselves can be exciting without being destructive.

A Binocular View

Ten years ago, large computers had the capabilities for programming such

ideas into software, but the cost was formidable for classroom and home users. With low-end computer systems being sold for only a few hundred dollars, we are going to see a majority of schools and millions of families buying and using small computers. The software possibilities for these computers is infinite, and growth is in the infant stages. Educators need to be an integral part in facilitating growth so that computer-aided instruction (CAI) can be a viable tool to help the teacher manage instruction. Wouldn't it be wonderful to go to the media center, find a specific tape on suffixes (ed and ing), let Jack run the program at home or school, and know he is getting personalized instruction? Put on your binoculars; the tape is appearing on the horizon. ■ ■ ■

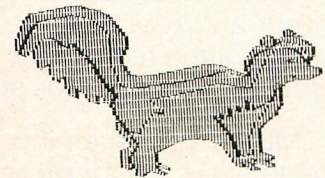


Figure 6. This skunk, the mystery animal, appears at the conclusion of an exercise as a reward.

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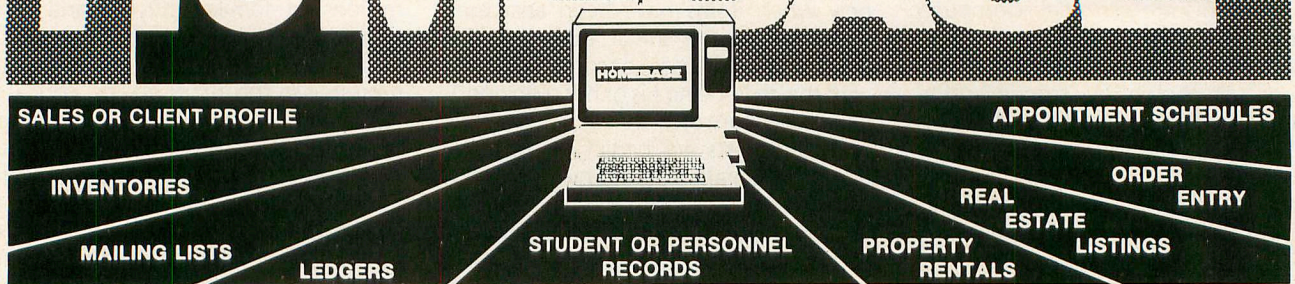
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SORCERERS' PUZZLES



4K Color Basic



by Richard Ramella

THERE'S MORE in here than spells and potions," said Sorcerer Donald E. Goldberg as he opened the heavy tome entitled *Wizardry Made Simple*. The girl named Sunflower and the boy named Poke listened with interest. Life had become exciting since the Sorcerer had accepted them as apprentices.

Bob, the twisted major domo, threw a log into the fireplace and turned from the shower of flame and sparks. "Are you going to read a story, master?"

"Three stories," said the Sorcerer, who didn't look *magickal* at all, and discarded robes of office in favor of rumpled corduroy suits.

"I'll bet there's a test in every story," Poke laughed.

"Watch your tongue, rapsSCALLION, for the mighty Sorcerer might take offense," Bob warned.

"Quiet, Bob," said the Sorcerer, and Bob was. "Yes, there will be tests in these tales. The tasks of apprentices never end."

"Read!" said Sunflower, her face aglow.

"I shall," said the Sorcerer. "The first tale is..."

Bricks

"I'm sorry I ever got into this pyramid business," said Uz, grand architect of all Egypt. "It's just one headache after another!"

"What's wrong now?" asked Lahin, the water girl.

"It's those six massive bricks in that rectangular excavation bounded by the

Please turn the page

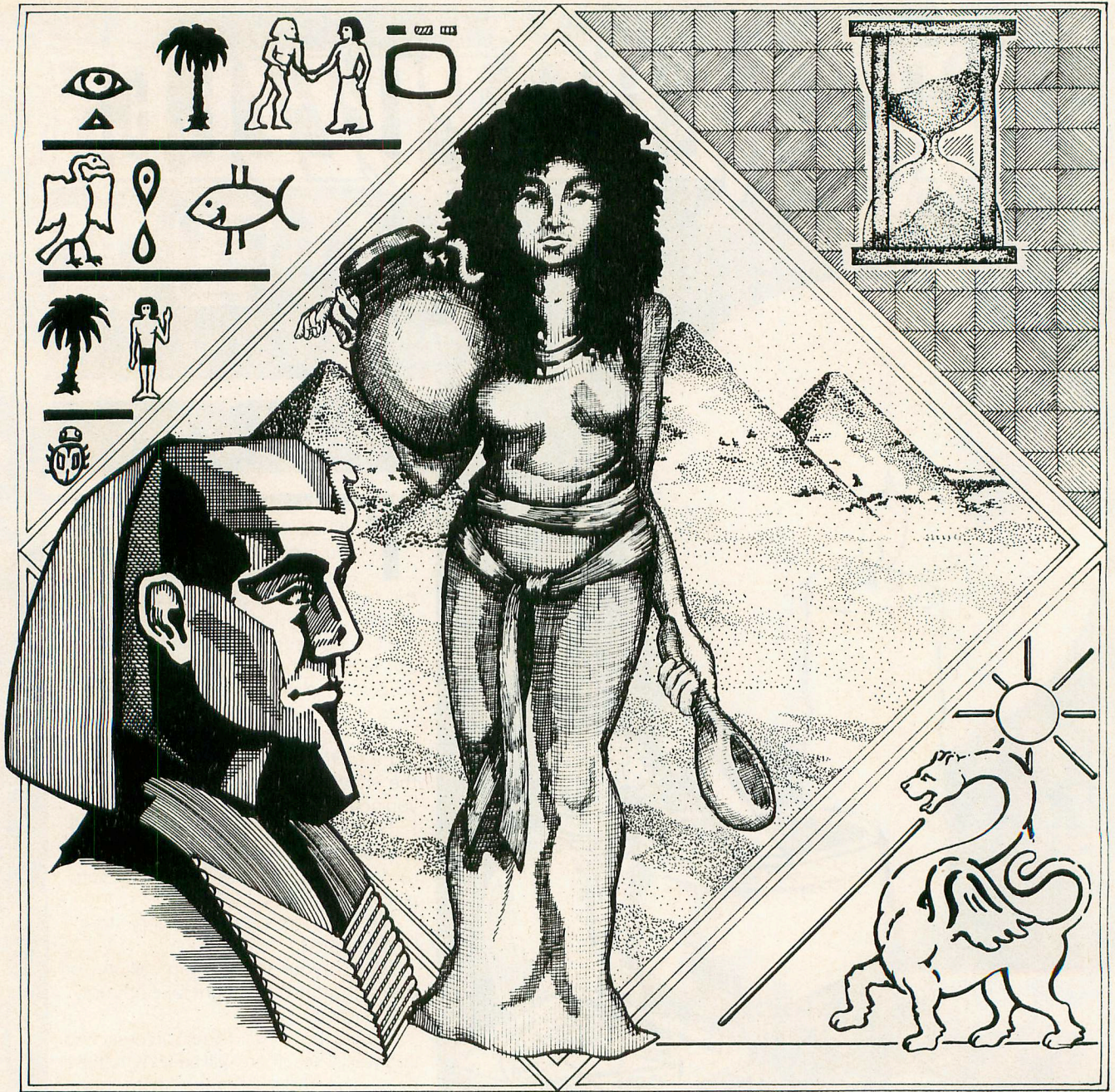


Illustration by Rod McCormick

green frame," said Uz. "As you can see, there are five bricks of different colors and one empty space. The positions of the orange brick in the northwest corner and the blue brick in the southeast corner must be exchanged in the fewest possible moves. The Pharaoh says it has to be done by quitting time today."

"It's easy for him to give difficult orders, isn't it?" Lahin commiserated.

"Why am I telling you all this?" Uz moaned. "You're only a girl. I'm going home for lunch and think this over." He took a few steps and turned. "If you get any ideas, let me know. If you solve it, I'll make you an engineer or an architect or something."

Lahin slipped into a nearby tent and removed the dust cover from a TRS-80 Color Computer. "It was bad luck to be thrown back in time five centuries, but at least I had my Color Computer with me."

When Lahin finished programming the problem, she had this graphic depiction: a green rectangle containing five colored blocks and a blank space. Tapping the arrow keys sends a flashing cursor around the six available positions. When you press the letter M, the brick on which the cursor rests moves into the adjacent blank space. With each M (for MOVE) command, the first letter of the color of the moved block is added to the answer string shown under the rectan-

gle. If 25 M commands are given without reversing the orange and blue blocks' positions, the program ends.

Lahin confidently began to shift colors and found a successful rearrangement scheme in only 13 moves. "So I'm just a girl, am I?" she said. "I wonder if anyone else could do as well?"

"I like stories that demonstrate the natural superiority of females," Sunflower said.

"Says you," Poke protested.

"Now, apprentices," the Sorcerer cautioned. "You'll both try this test before bed, but now for the second story. It's called..."

Please turn to p. 24

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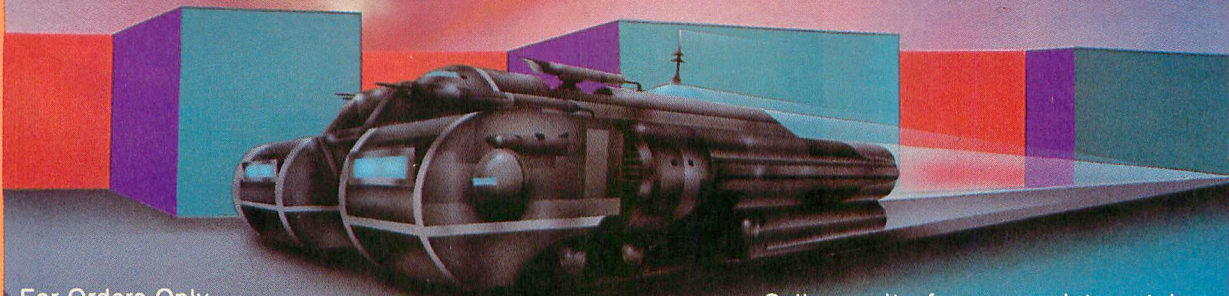
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Gordian Knot

Uldabro, the Exalted Vile of Gordius, gave a sneer that barely passed for a smile as his guards shoved Captain Sam "Lucky" Alexander into the darkest, smallest cell of the dread Dungeon of Time.

"You won't hold me, Uldabro," smiled Alexander, "there's not a jail in the galaxy I can't escape."

"We'll see about that, Earth Thing," said Uldabro. "It's a splendid occasion for me to imprison a creature named Alexander on Gordius. Do you see the significance?"

"Sure," said Alexander, "you're talking about the Gordian knot, said to have been tied by Gordius and severed by Alexander the Great."

"Exactly, you base consumer of vegetables!" Uldabro was himself a vegetable of sorts. The Vile of Gordius sneered again. "There is a panel on the inside of your locked cell door. It displays a scrambled message. Unscramble it and the door opens — you can walk to freedom."

Alexander looked at the panel with interest. "How's it work?"

Uldabro explained slowly: "The scrambled message is displayed on three lines. Letters with orange blocks beneath are in correct position. Move the cursor by pressing the four arrow keys. When the cursor is in the desired position, type M (for move) and the letters are reordered according to a scheme based on the letter position of the cursor. You have 15 tries to unscramble the message and be declared winner. Otherwise, all you get is a score of zero to 54. In all due respect for anyone's intelligence, I dare say this puzzle is all but impossible to solve, though the steps to its solution are known to its creator. Remember: Knowing the message is not the solution; the number sequence necessary to put the letters in order form the solution."

"Okay," said Alexander, "take a hike so I can get to work."

"That was my intent, for it smells rank down here," said the Exalted Vile. With an imperious sweep of his robes, he left the cell. A guard slammed the main dungeon door shut, and "Lucky" Alexander was left alone with his problem.

"Wow!" said Poke. "Is the Gordian Knot puzzle really impossible?"

"I think so," said the Sorcerer. "No one has ever solved it, and I doubt if anyone will. But you'll have to try it."

"Of course," said Sunflower.

"It's getting late," said Sorcerer Goldberg. "And now for the tale of..."

64 Witches

The annual witches' convention on Bald Mountain was thrown into disarray when 64 witches showed up for a meeting in a hall containing 64 chairs in an eight-by-eight grid.

"I don't understand all the fuss," said Gaspar the (friendly) host. Eight witches stood before him. Each was dressed in a different color: yellow, blue, red, buff, cyan, magenta, orange and black. Each represented seven of her sisters dressed similarly.

"The problem," said the yellow witch, "can be understood if you pretend we witches are all queens — chess pieces — and the eight-by-eight rows of chairs are squares on a chessboard."

"Yes?" said Gaspar, who was above average in intelligence.

"Then you must seat us so that no two

are in a line where one could take the other by making a legal queen's move."

"I see," said Gaspar, "no two in the same diagonal line or orthogonal line — up and down and sideways."

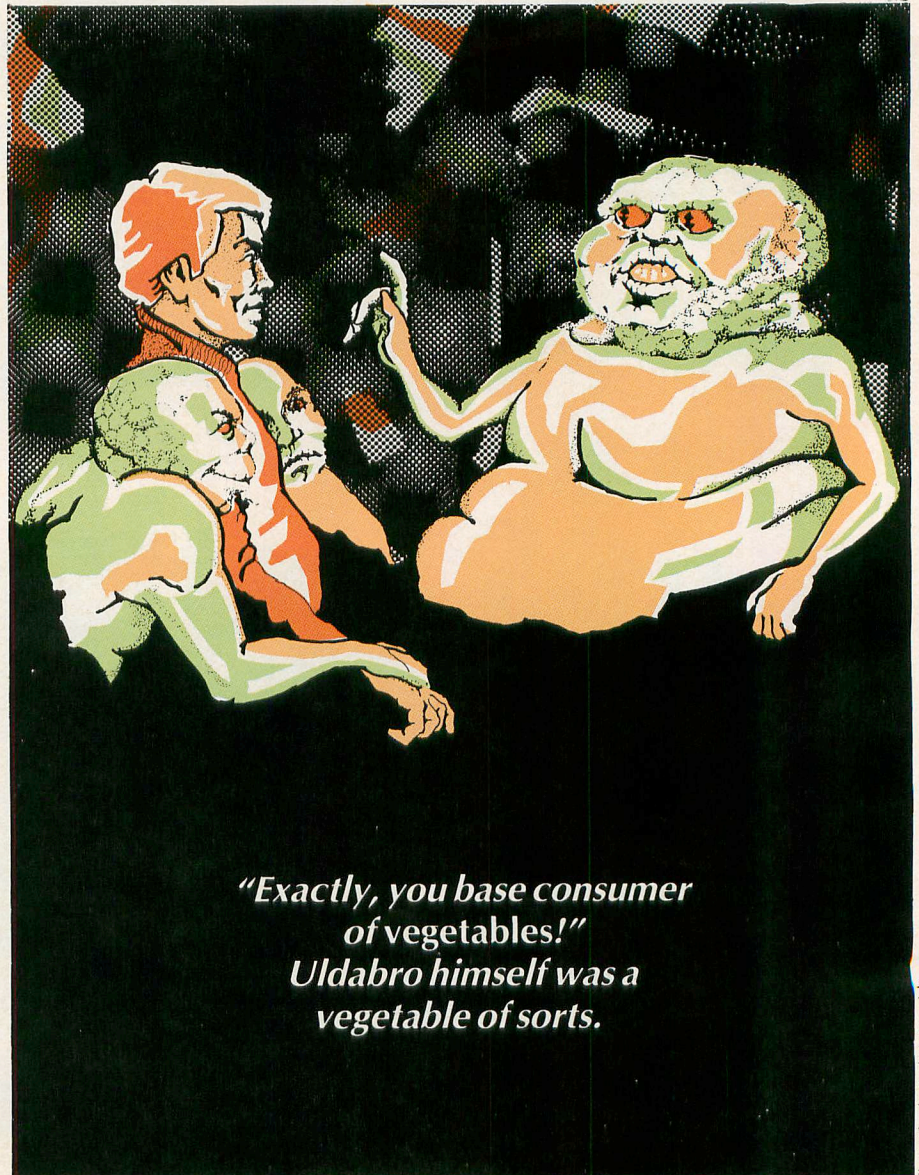
"Right-o," said the blue witch. "That rule only applies to each set of same-colored eight witches. For example, red and blue witches may sit in the same rows. After the yellow witches are seated correctly, then another set must be seated, and so on."

"I'll try," Gaspar said.

"What more can we ask?" shrugged a red witch.

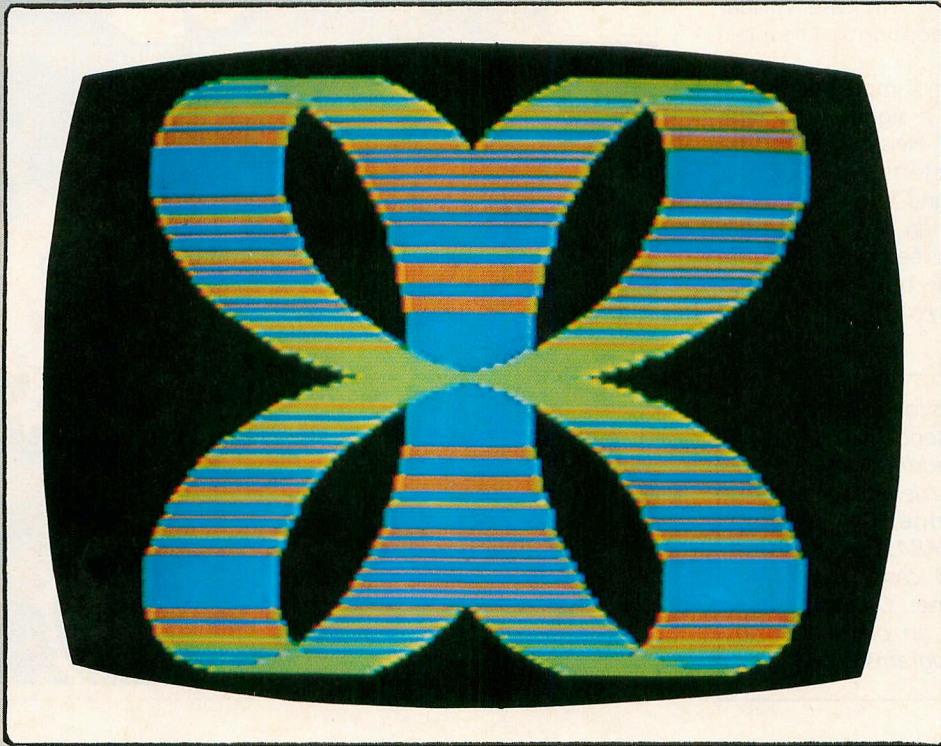
Gaspar approached the problem by pretending the hall was an orange square in a computer display. To start, a yellow square appeared in the northwest corner. He maneuvered it with the four arrow keys, and set it in position by tapping. He erased the square from a set position by tapping E. When he made a

Please turn to p. 26



***"Exactly, you base consumer
of vegetables!"
Uldabro himself was a
vegetable of sorts.***

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Continued from p. 24

mistake, the witch refused to stay seated. As each set of eight witches was successfully seated, the cursor turned to the next color. At any time he could end by tapping T, and replace the room with a scoreboard showing the Point values of the colors already set, in case Gaspar wanted to save the position and try again at another time.

"I think perfection is impossible here," Gaspar said, "but a significantly high score certainly isn't." He set to work.

"And now for the tests," said Sorcerer Goldberg to Poke and Sunflower as he closed the book. Then he noticed both children had fallen asleep before the fire. "Oh well, there's no hurry; these tests will take awhile, anyway." ■ ■ ■

For the answers or strategies for these puzzles, send a 20 cent stamped and self-addressed envelope to Sorcerer's Puzzles, **The Color Computer Magazine**, Highland Mill, Camden, ME 04843. Canadians please include 40 cents coin, self-addressed envelope. Cheerful, free advice also given on problems you have with these programs.

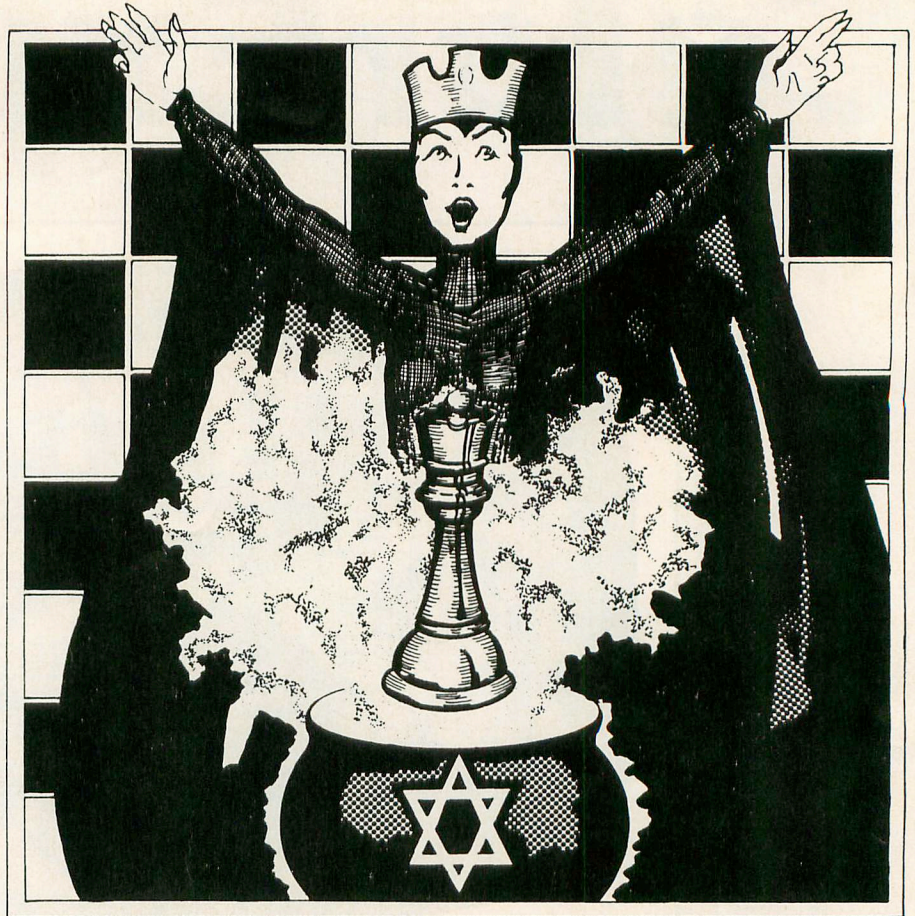


illustration by Rod McCormick

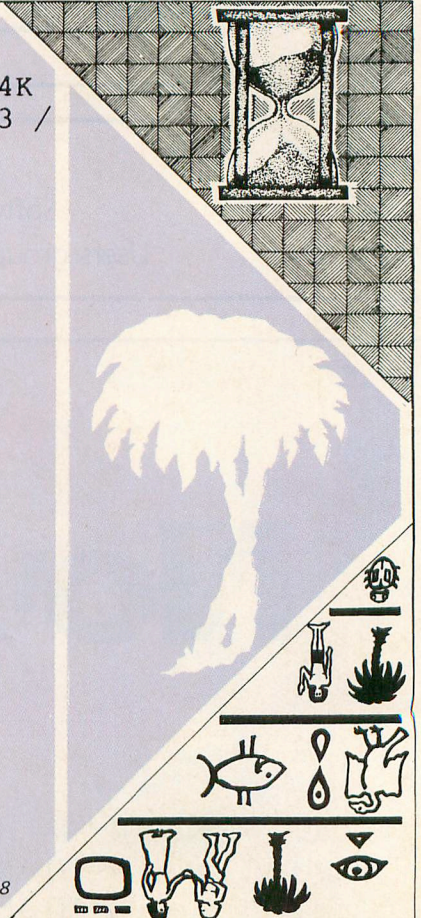
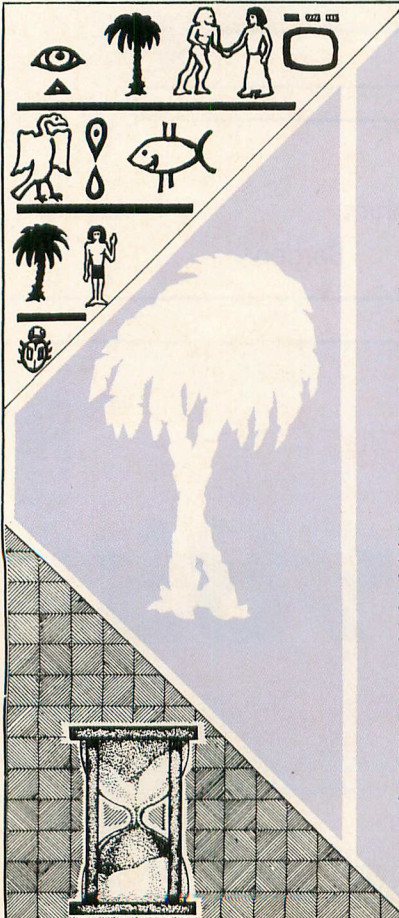
Program Listing. Bricks

```

100 REM* BRICKS *COLOR BASIC 4K
110 REM* SORCERER'S PUZZLES #3 /
    R. RAMELLA
120 CLS 0
130 FOR A=1 TO 11
140 K$=K$+CHR$(128):NEXT
170 W=192:FOR A=1 TO 4
180 A$=A$+CHR$(143+112)
190 B$=B$+CHR$(143+48)
200 C$=C$+CHR$(143+80)
210 D$=D$+CHR$(143+64)
220 E$=E$+CHR$(143+32)
230 F$=F$+CHR$(128):NEXT
250 G$=A$+F$+B$
260 H$=C$+D$+E$
270 PRINT@33,G$;
280 PRINT@65,G$;
290 PRINT@97,H$;
300 PRINT@129,H$;
320 Y=1:FOR X=1 TO 25
330 SET(X,Y,1)
340 SET(X,Y+9,1):NEXT
370 X=1:FOR Y=1 TO 10
380 SET(X,Y,1)
390 SET(X+25,Y,1):NEXT
410 X=5:Y=4:V=33

```

Listing continues on p. 28



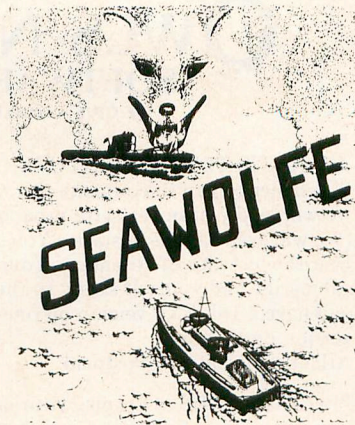
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TRS-80 COLOR COMMODORE 64 VIC-20 SINCLAIR/TIMEX TI99/4A

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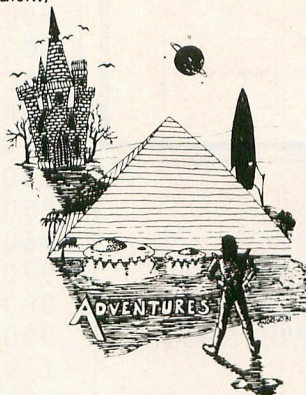


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PYRAMID (by Rodger Olsen)

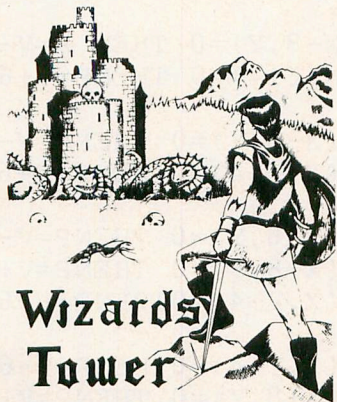
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Listing continued from p. 26

```

440 Z$=INKEY$
450 PRINT@448,"MOVES MADE:"Q;
460 IF Q=25 THENPRINT@416,"25 MO
VES UP. TRIAL MUST END.";:SOUND1
,5:GOTO460
470 RESET(X,Y)
480 Z=POINT(X+1,Y)
490 FOR T=1 TO 10:NEXT T
510 IF Z<>0 GOTO 580
520 SET(X,Y,Z)
530 FOR T=1 TO 40:NEXT T
550 PRINT@V,F$;
560 PRINT@V+32,F$;
570 GOTO 610
580 FOR T=1 TO 10:NEXT T
600 SET(X,Y,Z)
610 IF Z$=CHR$(94) AND Y-4>3 THE
N Y=Y-4:V=V-64
620 IF Z$=CHR$(10) AND Y+4<9 THE
N Y=Y+4:V=V+64
630 IF Z$=CHR$(8) AND X-8>4 THEN
X=X-8:V=V-4
640 IF Z$=CHR$(9) AND X+8<22 THE
N X=X+8:V=V+4
650 P=0
660 IF Z$="M" GOSUB 680

```

```

670 GOTO 440
680 IF Z=8 THEN J$=A$:L$="O "
690 IF Z=4 THEN J$=B$:L$="R "
700 IF Z=6 THEN J$=C$:L$="C "
710 IF Z=5 THEN J$=D$:L$="W "
720 IF Z=3 THEN J$=E$:L$="B "
730 IF Z=0 GOSUB 1150:RETURN
740 IF X=5 AND Y=4 GOSUB 900
750 IF X=13 AND Y=4 GOSUB 930
760 IF X=21 AND Y=4 GOSUB 970
770 IF X=21 AND Y=8 GOSUB 1000
780 IF X=13 AND Y=8 GOSUB 1030
790 IF X=5 AND Y=8 GOSUB 1070
800 IF P=0 GOSUB 1150:RETURN
810 PRINT@V,F$;
820 PRINT@V+32,F$;
830 PRINT@P,J$;
840 PRINT@P+32,J$;
850 PRINT@W,L$;
860 W=W+LEN(L$)
870 Q=Q+1
880 IF POINT(4,3)=3 AND POINT(22
,7)=8 GOTO 1100
890 RETURN
900 IFPOINT(X+8,Y)=0 THEN P=V+4
910 IFPOINT(X,Y+4)=0 THENP=V+64
920 RETURN
930 IFPOINT(X-8,Y)=0 THEN P=V-4
940 IFPOINT(X+8,Y)=0 THEN P=V+4
950 IFPOINT(X,Y+4)=0 THENP=V+64
960 RETURN
970 IFPOINT(X-8,Y)=0 THEN P=V-4
980 IFPOINT(X,Y+4)=0 THENP=V+64
990 RETURN
1000 IFPOINT(X-8,Y)=0 THENP=V-4
1010 IFPOINT(X,Y-4)=0THENP=V-64
1020 RETURN
1030 IFPOINT(X-8,Y)=0 THENP=V-4
1040 IFPOINT(X+8,Y)=0 THENP=V+4
1050 IFPOINT(X,Y-4)=0THENP=V-64
1060 RETURN
1070 IFPOINT(X,Y-4)=0THENP=V-64
1080 IFPOINT(X+8,Y)=0 THENP=V+4
1090 RETURN
1100 PRINT@448,"MOVES MADE:"Q;
1110 PRINT@480,"WINNER IN"Q"MOVE
S";
1120 SOUND 100,1
1130 SOUND 200,1
1140 GOTO 1120
1150 PRINT@17,"IMPOSSIBLE ";
1160 SOUND 100,5
1170 FOR T=1 TO 500:NEXT
1190 PRINT@17,K$;
1200 RETURN

```

Program Listing.
Gordian Knot

```

100 REM*GORDIAN KNOT* 4K COLOR
110 REM*SORCERER'S PUZZLES #3 /
R. RAMELLA
120 CLS 0
130 CLEAR 400
140 U$=CHR$(94):D$=CHR$(10)
160 L$=CHR$(8):R$=CHR$(9)
180 Z$="H EOSULAYDO O DEVV GANRN
KT IO INAIAGNPANZOERF MENCMRA"
190 X$="YOU HAVE SOLVED GORDIAN
KNOT IN AN AMAZING PERFORMANCE"
200 X=1:P=1:N=0
230 FOR A=1 TO 193 STEP96
240 FOR G=A TO A+17
250 PRINT@G,MID$(Z$,X,1);
260 IF MID$(X$,P,1)=MID$(Z$,X,1)
THEN N=N+1:PRINT@G+32,CHR$(143+
112); ELSEPRINT@G+32,CHR$(128);
270 X=X+1:P=P+1
300 NEXTG,A
310 PRINT@22,"TURN:"H;
320 PRINT@54,"SCORE:"N;
330 IF H=15 OR X$=Z$GOTO740
340 X=1:P=1
360 GOSUB 710
370 V$=INKEY$
380 IF V$="M" GOSUB 570
390 IF W=5 THEN W=0: GOTO200
400 PRINT@X,CHR$(143+64);
410 FOR T=1 TO 20:NEXT
430 PRINT@X,MID$(Z$,P,1);
440 IF V$=L$ THEN X=X-1: P=P-1
450 IF V$=R$ THEN X=X+1: P=P+1
460 IF V$=D$ THEN X=X+96:P=P+18
470 IF V$=U$ THEN X=X-96:P=P-18
480 IF V$=R$ GOSUB530
490 IF V$=L$ GOSUB550
500 IF X<0 THEN X=X+96: P=P+18
510 IF X>210 THEN X=X-96:P=P-18
520 GOTO 370
530 IF X=19 OR X=115 OR X=211 TH
EN X=X-1:P=P-1:GOTO370
540 RETURN
550 IF X=0 OR X=96 OR X=192 THEN
X=X+1:P=P+1:GOTO370
560 RETURN
570 N$=N$+STR$(P)
580 H=H+1

```

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```

590 IF P/6=INT(P/6) THEN A=6:B=3
:GOTO650
600 IF P/5=INT(P/5) THEN A=5:B=4
:GOTO650
610 IF P/4=INT(P/4) THEN A=4:B=2
:GOTO650
620 IF P/3=INT(P/3) THEN A=3:B=1
:GOTO650
630 IF P/2=INT(P/2) THEN A=2:B=1
:GOTO650
640 IFP/2<>INT(P/2) THENA=3:B=2
650 FOR G=A TO 54 STEP A
660 F$=MID$(Z$,G-B,1)
670 Z$=LEFT$(Z$,G-B-1)+MID$(Z$,G
,1)+RIGHT$(Z$,LEN(Z$)-G+B)
680 Z$=LEFT$(Z$,G-1)+F$+RIGHT$(Z
$,LEN(Z$)-G)
690 NEXT G
700 W=5
710 PRINT@320,"S-C-O-R-E S-T-R-I
-N-G B-E-L-O-W "N$;:RETURN
740 PRINT@480," THE END ";
750 SOUND RND(13)*10,1
760 FORT=1TO100:NEXTT
780 PRINT@480," ";
790 FORT=1TO50:NEXTT:GOTO740

```

COLOR COMPUTER SOFTWARE

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C

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Program Listing. 64 Witches

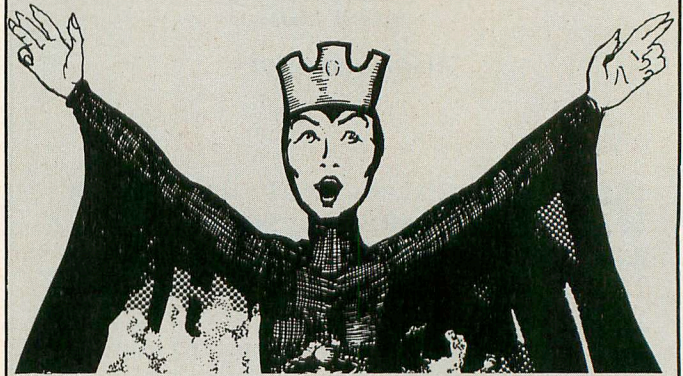


Illustration by Rod McCormick

```

100 REM* 64 WITCHES * 16K COLOR
105 REM* SORCERER'S PUZZLES #3 /
    R. RAMELLA
110 CLS0: CLEAR500: VV=1: FORA=1 TO
    15: A$=A$+CHR$(128): NEXT: FORA=1
    TO 8: A$(A)=A$: NEXT: U$=CHR$(94)
120 D$=CHR$(10): L$=CHR$(8): R$=CH
    R$(9): Y=0: FORX=30 TO 63: SET(X,0,
    8): SET(X,19,8): NEXT: FORY=0 TO 19
130 SET(30,Y,8): SET(63,Y,8): NEXT
    : PRINT@0,"64 WITCHES "; X=48: M=1
    : P=1: C=16: PRINT@X, CHR$(143+C);
140 Z$=INKEY$: PRINT@480,"LEVEL" V
    V; CHR$(143+C)" SCORE:" S; : IF QQ=8
    THEN C=C+16: VV=VV+1: QQ=0
150 IF Z$=D$ THEN X=X+32: B=B+2:
    P=P+1
160 IF Z$=U$ THEN X=X-32: B=B-2:
    P=P-1
170 IF Z$=L$ THEN X=X-2: A=A-4:
    M=M-2
180 IF Z$=R$ THEN X=X+2: A=A+4:
    M=M+2
190 IF (X-14)/32 = INT((X-14)/32
    ) THEN X=X+2: A=A+4: M=M+2
200 IF X/32 = INT(X/32) THEN X=X
    -2: A=A-4: M=M-2
210 IF X<47 THEN X=X+32: B=B+2:
    P=P+1
220 IF X>287 THEN X=X-32: B=B-2:
    P=P-1
230 Q=1: FOR N=48 TO 272 STEP32: P
    RINT@N,A$(Q); : Q=Q+1: NEXT: PRINT@X
    ,CHR$(143+C); : FOR T=1 TO 20: NEXT
    T: PRINT@X,CHR$(128);
240 FORT=1 TO 10: NEXTT: PRINT@X,C
    HR$(143+C); : IF Z$="S" GOSUB260 E
    LSEIF Z$="E" GOSUB420 ELSEIF Z$=
    "T" GOTO450
250 GOTO140
260 IF MID$(A$(P),M,1) <> CHR$(1

```



```

28) THENRETURN ELSEA$(P)=LEFT$(A
$(P),M-1)+CHR$(143+C)+RIGHT$(A$(
P),LEN(A$(P))-M):QQ=QQ+1:S=S+1
270 FORZ=1 TO 15 STEP2:IF MID$(A
$(P),Z,1)=CHR$(143+C) THENF=F+1
280 IF F=2 THEN F=0: GOSUB440: R
ETURN
290 NEXT:F=0:FORZ=1TO8:IF MID$(A
$(Z),M,1)=CHR$(143+C) THENF=F+1
300 IF F=2 THEN F=0: GOSUB440: R
ETURN
310 NEXTZ:F=0:L=P:Z=M
320 IF L=1 OR Z=1 GOTO330 ELSE L
=L-1: Z=Z-2: GOTO320
330 FORL=L TO L+8:IF MID$(A$(L),
Z,1)=CHR$(143+C) THENF=F+1
340 IF F=2 THEN F=0: GOSUB440: R
ETURN
350 IF L=8 OR Z=15 GOTO360 ELSEZ
=Z+2: NEXTL
360 F=0:L=P:Z=M
370 IF L=1 OR Z=15 GOTO380 ELSEL
=L-1: Z=Z+2: GOTO370
380 FORL=L TO L+8:IF MID$(A$(L),Z
,1)=CHR$(143+C) THENF=F+1
390 IF F=2 THEN F=0: GOSUB440: R
ETURN
400 IF L=8OR Z=1 THENF=0:RETURN
410 Z=Z-2:NEXTL:F=0:RETURN
420 IF MID$(A$(P),M,1)=CHR$(143+
C) THEN A$(P)=LEFT$(A$(P),M-1) +
CHR$(128) + RIGHT$(A$(P),LEN(A$(
P))-M) ELSERETURN
430 QQ=QQ-1:S=S-1:RETURN
440 FORT=1 TO 10:PRINT@X,CHR$(14
3+RND(7)*16);:SOUND 150,1:SOUND
200,1:NEXT:GOTO420
450 FORA=1 TO 8:FORZ=1 TO 15 STE
P2:W$=MID$(A$(A),Z,1):IF W$=CHR$(
143+16) THENW$="1" ELSEIF W$=CH
R$(143+32) THENW$="2
460 IF W$=CHR$(143+48) THEN W$="
3" ELSEIF W$=CHR$(143+64) THENW$
="4" ELSEIF W$=CHR$(143+80) THEN
W$="5
470 IF W$=CHR$(143+96) THENW$="6
" ELSEIF W$=CHR$(143+112) THENW$
="7" ELSEIF W$=CHR$(128) THENW$=
"0
480 A$(A)=LEFT$(A$(A),Z-1) + W$
+ RIGHT$(A$(A),LEN(A$(A))-Z):NEX
TZ,A:A=1:FORN=48 TO 272 STEP32:P
RINT@N,A$(A);:A=A+1:NEXT
490 PRINT@416,"FINAL SCORE"S;:GO
TO490

```

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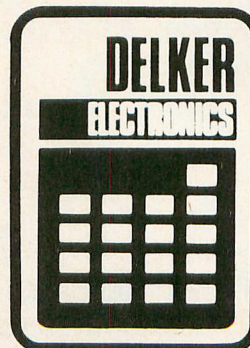
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COLOR COMPUTING

*This is the first in a series of articles
just for kids, written by someone
who used to be a kid.*

by Jean Plesser



THE TRS-80 Color Computer may be the greatest invention since peanut butter. Okay, peanut butter *is* pretty hard to top, but I did say "may be," so if you're a real peanut butter nut have no fear — peanut butter is here to stay: and so are computers.

Computers are becoming an important part of all our lives — yours too. Most of the products we buy, from toys to food (look at your jar of peanut butter) have bar codes printed on them, that are read by computers for price and stock information; the automatic teller at your local bank is a computer; many of the bills that come to your home are *printed* by computers, and so are the address labels on magazines and other mail that

you may get. Even "junk mail" is serious stuff to some hard-working computer. And, as you already know, computers don't just work for us, they also entertain us with games and some pretty incredible animation.

The computer that can make the greatest difference in your life — the one that can change the way you do things and even the way you think about doing things — is your own TRS-80 Color Computer. So, if you haven't yet become friends, now is a good time to start.

What? You never thought of your computer as

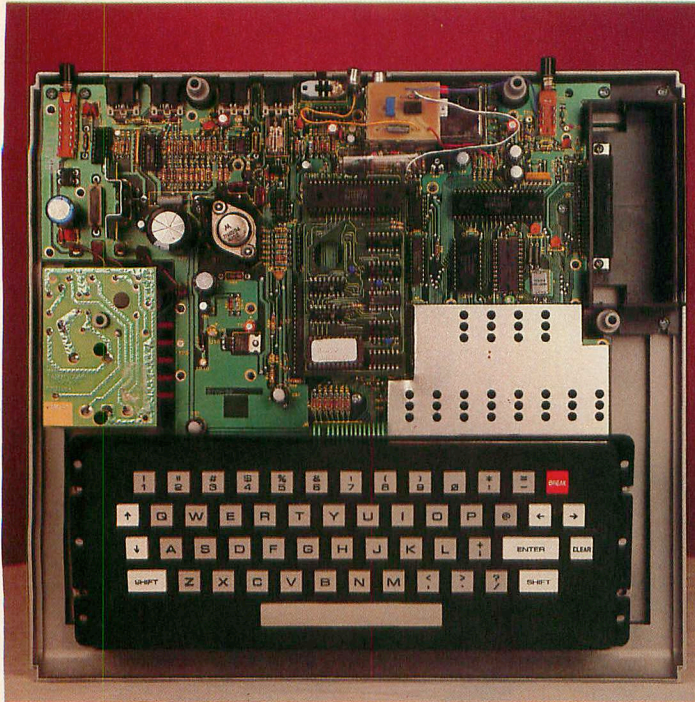
FOR KIDS



a friend? Let's think about it for a minute. What do you look for in a good friend? Someone who is agreeable, fun, helpful, available, smart, and fair? Someone who doesn't cheat, argue, get easily bored or tired, cry, yell, break your stuff, or mess up your room? Doesn't that describe someone who would make a pretty good friend? Well, it also describes your computer and, in a very short time, you'll be having as much fun with "Clare" or "Sam" or "Henrietta" (go ahead, give your new friend a name) as you can have with anyone.

"Sure," some of you are saying, "but you need to be a genius to really understand anything about computers." Not true, I say. Anyone who can read can learn to write Basic programs for their TRS-80 Color Computer and even learn some basic things about computers.

Interested? Then stick with me, and each month "Color Computing For Kids" will guide you step-by-step through computerland, and we'll conquer those fearsome dragons that once held you back. In a short time you'll be discovering treasures and excitement beyond your wildest dreams. Well, maybe not beyond your *wildest* dreams, but you will amaze yourself and others while having a lot of fun. Look out all you experts — you'll rule computerland no more!



The Computer "Brain"

How Your Friend Works

Now, let's talk a little bit about how your computer works. Don't yawn, we have to start somewhere, and I'll be as brief as possible. We're not going to take the computer apart. *Please don't take the computer apart!* Hardware whiz-kids do fit in here, only they understand how to put computers back together again, and they are hard to find. I think they keep experts locked up in computer factories where they're promised all the peanut butter they can eat if they'll just keep working... right, I'm getting a little carried away.

Let's take a look at your computer now. Go into the room where you keep it and sit down in front of it — but take the magazine — I want you to keep reading. Ready? A computer system is made up of all the stuff you're looking at — no, not the lamp or the pencil sharpener — just the things that are connected to your computer. Your system consists of the computer, a television (also called a CRT), a cassette recorder or disk drive, and maybe a printer. This time we're going to talk only about the computer. We'll get to the other stuff another time.

The TRS-80 Color Computer is a microcomputer with a short term memory (called a RAM) of 4K, 16K, or 32K. There is a *small square* on the flat area of your computer that will tell you which one you have. If you haven't found it yet, look to the right next to the vent. But, be-

fore we go on, I'd like you to pay special attention to the vents on each side of your computer — they let air get inside, and heat comes out when your computer is working. Never put anything over the vents or your computer may overheat and your new friend will end up in sick bay for awhile.

Now, back to the memory. The letter "K" stands for one thousand (1,000), therefore, 4K means 4,000, 16K means 16,000, and... right, 32K means 32,000. All of this means that your computer can

store, or remember, that many characters (bytes) at one time. A character is a letter, number, or sign like the ones printed on your keyboard, but before we get to the keyboard, let's talk about what's under that flat gray area at the top of your computer.

Think of this area as the computer's brain. It's where the memory is, as well as an arithmetic area, a clock that controls the computer's speed, and a Central Processing Unit (CPU). The CPU is where all the information and instructions (input) are sorted before being sent to the correct unit for processing (work). The results then go back to the CPU, and it sends them out to your CRT (screen) or printer. This all happens very fast, so fast that you see immediate results on your printer or CRT, but a lot is happening under that gray cover. What's faster than a speeding bullet? What's gray and never forgets? If you didn't say your TRS-80 Color Computer, go back to start, do not pass go, do not collect... right, I'm doing it again.

Now let's turn the computer on so we can learn a few more things. The button is on the back, it says "power," just push it in to turn the computer on. Turn the CRT on also. There should be three lines of writing at the top of your CRT, but if there isn't, turn the computer off then on again. Under the writing is a blank line, then the word "OK", and right under that is a blinking white rectangle. The rectangle is called a cursor; it's like a bookmark. It shows you where you're at and where the next character you type will be placed on the screen.

Please turn to p. 39

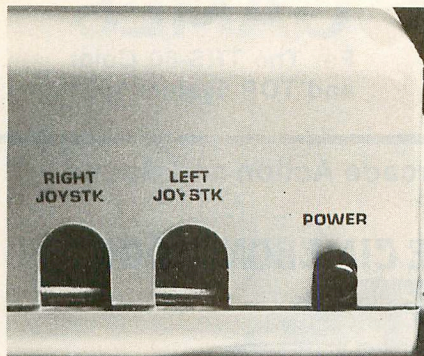


The Computer System

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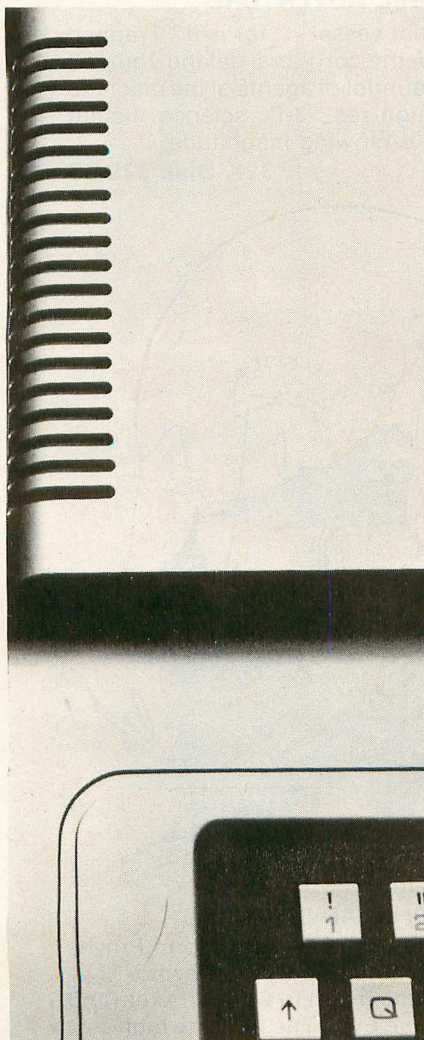
Power Button

EXTENDED COLOR BASIC 1.0
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OK



The OK Prompt



The Left Vent

SEARCH-A-WORD This Program generates a word search puzzle to our specifications. You specify the size of the puzzle and the number of words that it is to hide within the puzzle. 16K or 32K Ext. Basic.

TAPE \$17.95 FLEX VERSION \$27.95

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

REQUIRES 16K EXT. BASIC \$14.95

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

REQUIRES 16K EXT. BASIC \$19.95

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

- Up to 6 students may use the program at the same time.
- Answers for addition, subtraction and multiplication are entered from right to left, just as they are written on paper.
- Commas may be included in the answers.
- Partial products for the multiplication problems may be computed on the screen.
- Division answers that have a remainder are entered as a whole number followed by the letter "R" and the remainder.
- There are ten, user modifiable, skill levels.
- A "SMILEY FACE" is used for motivation and reward. Its size increases relative to the skill level.
- Skill levels automatically adjust to the student's ability.
- A timer measures the time used to answer each problem and the total time used for a series of problems.

REQUIRES 16K EXT. BASIC \$19.95

WORD DRILL is designed to give a multiple choice vocabulary quiz. Words and definitions are entered into the program from the keyboard or from a tape file. The computer displays a randomly chosen definition and eight word choices. The student must enter his response before a built in timer reaches zero.

REQUIRES 16K EXT. BASIC \$19.95

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

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

16K EXT. BASIC \$19.95

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

- Information on as many as 100 students (or more) may be in the computer at one time.
- Each student may have as many as 20 (or more) individual items of data in his/her record.
- The program will run from cassette or disk.
- Cassette and disk files are completely compatible.
- The program is menu driven.
- Records may be easily changed, deleted, combined or added.
- Information about students may be numerical or text.
- Records may be quickly alphabetized.
- Records may be sorted by various criteria.
- Records may be reordered (ranked) based on test scores or other data.
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- Student test scores may be weighted.

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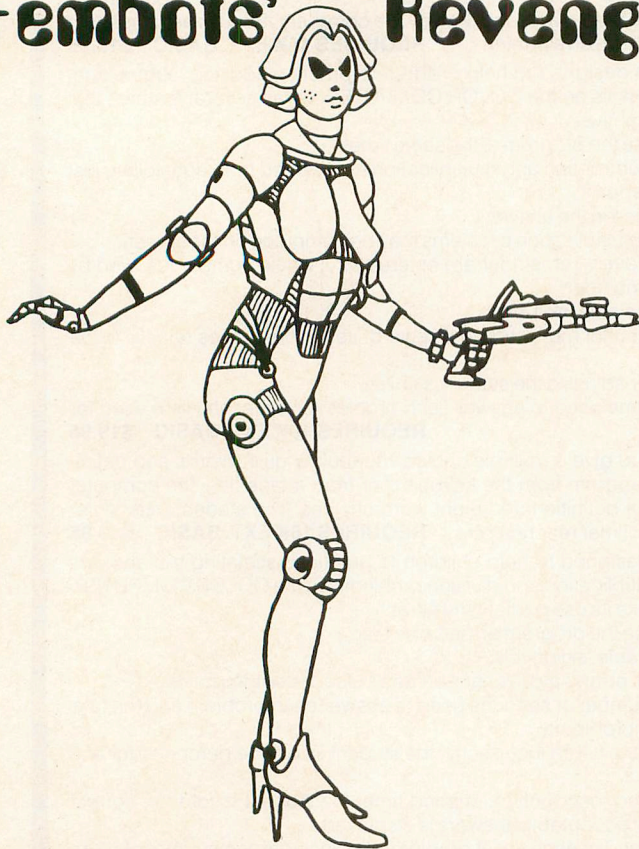
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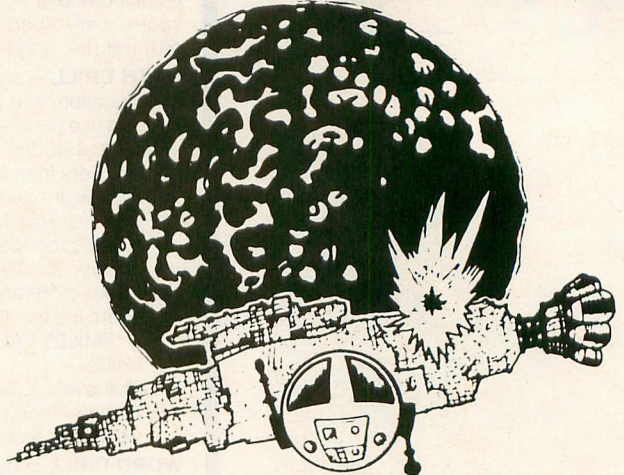
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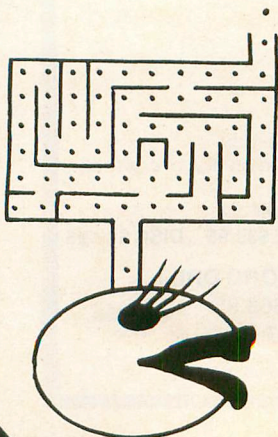
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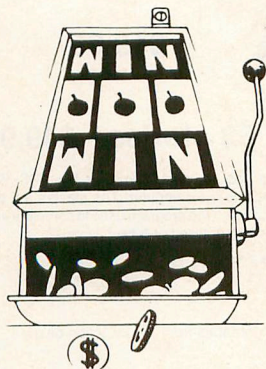
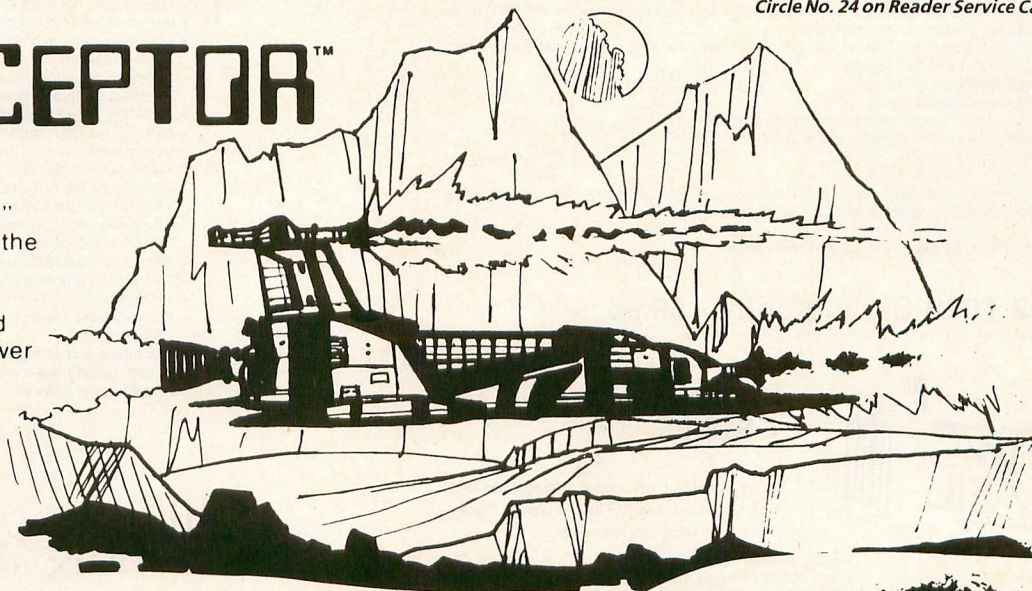
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Tape Information Management System

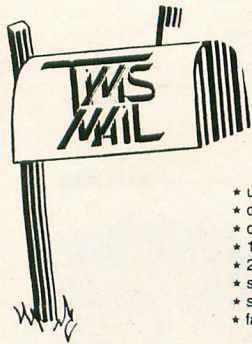
A user-oriented, easy to use personal database management system for the TRS-80[®] Color Computer with these outstanding features:

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Price includes the database management system, full documentation including a reference guide and 1981 Bibliography of Color Computer articles.

Requires 16K Extended Basic. 32K recommended.

1982 TIMS Bibliography - \$9.95.



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Requires 32K Extended Basic



\$19.95

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

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

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

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

Basic programs can be set to load anywhere in memory above the PCLEAR 0 page.

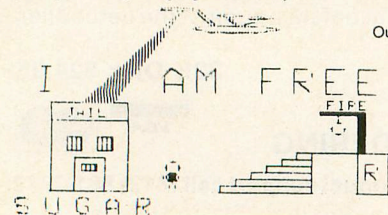
Software authors: The Auto Run prefix may be appended to your software products.

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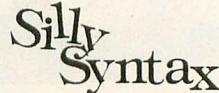
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Price includes Silly Syntax game, user guide and 2 stories.

Requires 16K Extended Basic (32K for disk).

You can create your own stories or order story tapes from the selection below.

Each story tape is \$9.95.

Silly Syntax stories - Ten stories per tape.

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NEW

PREREADER \$19.95 Disk - \$24.95

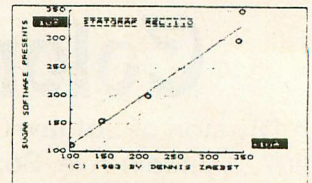
Help your preschool age (3-5) child learn to read with this easy to use menu-driven program. Great high resolution graphics, colors and sound effects. Includes capital and small letters, numbers, shapes and colors, much more! Requires 32K Extended Basic and joysticks.

NEW

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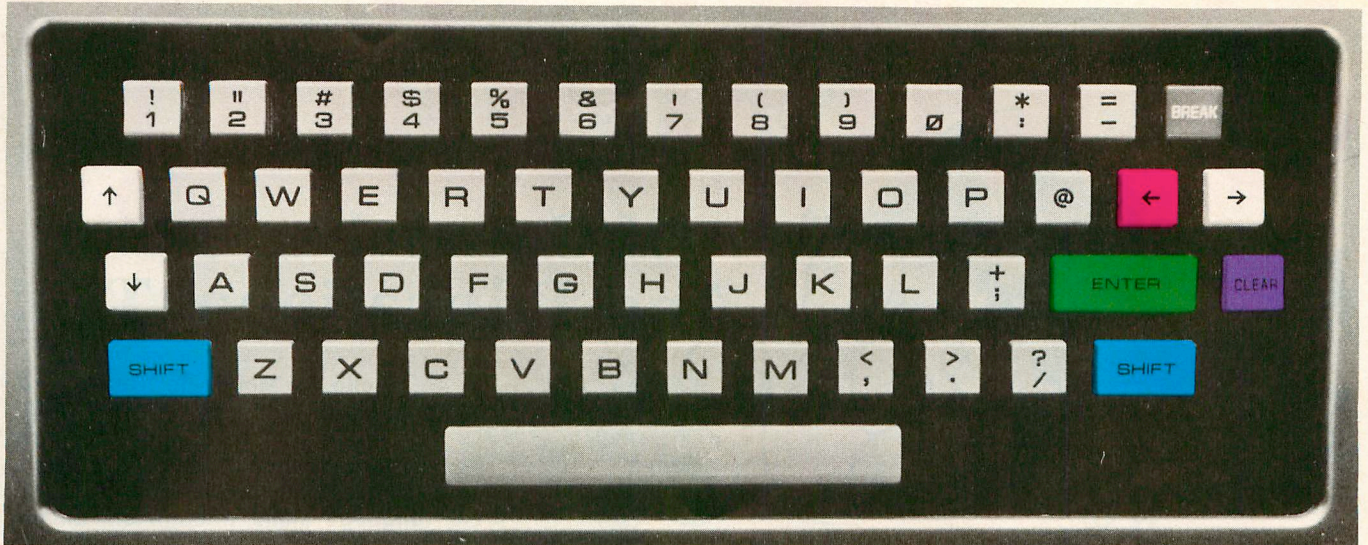


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The Keyboard — Keys Mentioned in Text Are Colored

Continued from p. 34

Keys and Things

Now, type a letter, any letter, and watch how the cursor moves to the right, leaving the letter we typed behind it. Type the letter a few more times then press the **Left Arrow** key. What happens looks a little like Pac-Man gobbling up power pills, but what's really happening is that the cursor is erasing the letters you typed. Now type a line of letters. If you ended up on the next line don't worry. Until you press the **ENTER** key you're still working on the same line, you just ran out of room on the screen. Now press one of the **SHIFT** keys. Hold it down and press the Left Arrow key again. "What happened?" you say. This is a quick way of erasing an entire line before you have pressed the ENTER key. If you haven't guessed by now, pressing the ENTER key sends anything you typed to the Central Processing Unit, and then the CPU decides where to send it next.

The next special key is **CLEAR**. Go ahead and press it. Now all you should see is the cursor winking at you from the upper left corner. The CLEAR key works something like a magic slate — you know, those black pads with a plastic sheet over them? After you write or draw something, you pull up the plastic and everything disappears and you have a clean sheet once again. The difference with the CLEAR key is that it clears the screen, but not the computer's memory. That is done by typing the word **NEW**.

The PRINT Statement

Now that you're computer certified, you're smarter than the average bear... uh, I mean person (sorry, Yogi). You're ready for the fun stuff! You can have a

lot of fun with the PRINT statement because it lets you print anything you want on your CRT. But, before we start printing, I want you to know a quick way of writing the word PRINT. You do this simply by typing a question mark ? instead of typing PRINT; then press the SHIFT key then the ? key.

Here is a list of PRINT statements for you to practice with, but be sure to pay close attention to what the computer prints out after you press the ENTER key — each comma (,), semi colon (;), colon (:), plus sign (+), minus sign (-), and quotation marks (" ") does something important. Type each line exactly as you see it, except that you can use a question mark instead of the word PRINT, then check for errors in your typing. When you're ready, press ENTER to see what the statement prints.

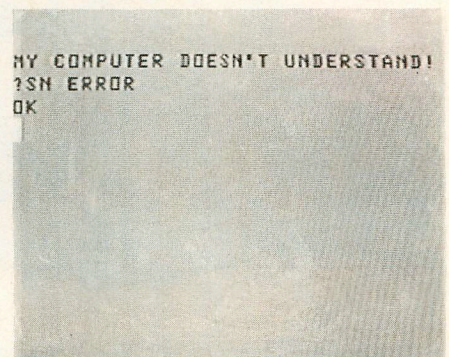
```
PRINT 12
PRINT 1,2
PRINT 1,2,3
PRINT 123,456
PRINT 12,3,4;5;6
PRINT "1 2 3 4 5 6"
PRINT "1,2,3;4;5;6"
PRINT "1 2 3"; "4 5 6", "7 8 9"
PRINT 1: PRINT 2: PRINT 3
PRINT 2 + 2
PRINT "2" + "2"
PRINT "2 + 2"
PRINT 4* - 2
PRINT 2+2+2*-4
PRINT "2 + 2 = "4
```

Do you understand all the different things the computer can do when you tell it to print numbers in a certain way? Are you remembering to use a question mark instead of the word PRINT? Keep practicing, and use numbers of your own until you're sure what the computer is going to do.

String Data

Now let's work with words, or what's usually called string data. Try typing, then ENTERing, this list:

```
PRINT "BACK TO SCHOOL"
PRINT "BACK"; "TO"; "SCHOOL"
PRINT "BACK"+"TO"+"SCHOOL"
PRINT "BACK "+"TO"+"SCHOOL"
PRINT "BACK TO", "SCHOOL"
PRINT "BACK":PRINT "TO":PRINT "SCHOOL"
PRINT "BACK";:PRINT "TO";:PRINT "SCHOOL"
```



The SN Error

Now try printing your name using the form of each of these examples, until you understand exactly what each statement does. After you start really getting the idea, practice putting numeric data (numbers) together with string data (words or numbers inside quotation marks (" ")) — it can be tricky, but you can do it. If SN? appears on the screen, it just means that the computer doesn't understand what you did — you made an error. Do it again, but try it another way.

Please turn to p. 41

Spellbinding?

Of Course!
And Educational Too!

Magic
Spells

Bumble
Games

Bumble
Plot

Moptown
Parade

Mop
Parade

Juggle's
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Magic Spells	90203C	\$40		90203D	\$55	
Moptown Hotel (3 programs)	90204C	\$30		90204D	\$35	
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Writing A Program

So far, you've typed a lot of PRINT statements, but each time you pressed the ENTER key the computer printed the line right away. If you wanted to print the line again, you had to re-type the statement. That's because you didn't store anything in the computer's memory. We need to write a computer program to do this — so let's do it! Type NEW, then type these lines, making sure you press the ENTER key after each one.

```
10 CLS
20 PRINT "I CAN USE THIS PROGRAM TO PRINT"
30 PRINT "ANYTHING THAT I PUT INSIDE THE"
40 PRINT "QUOTATION MARKS!"
50 END
```

Now type RUN, and press ENTER.
Type RUN again, and press ENTER.
Type LIST, and press ENTER.
Type RUN again, and press ENTER.
Type LIST again, and press ENTER.

Do you see how RUN and LIST work? Keep typing them until you do, because these commands work the same for every program you write. Now change the PRINT statements to say anything you want, by re-typing the line numbers (20,30,40) and then typing PRINT (or,?), and what you type next is up to you. When you re-type a line, the old program line is automatically replaced by your new line. When you want to write a new program, just type NEW (this erases the old one from the computer's memory), then type your new program. You can add more PRINT statements by adding more line numbers, but the statement that says END must always be last. Line numbers go from smallest to largest.

Have you had enough for now? I think it's probably about time for a peanut butter break. You've learned a lot for one lesson. Next month we'll learn more ways to use the PRINT statement and use a program that's a Hallowe'en treat.

In the meantime, write a program that lists your new school supplies, or your subjects in school, or anything else you can think of. Get lots of practice on your computer, but wash your hands first — peanut butter is sticky. Remember, a clean computer is a happy computer, and a happy computer is a clean... Okay! Okay!

See you next month!

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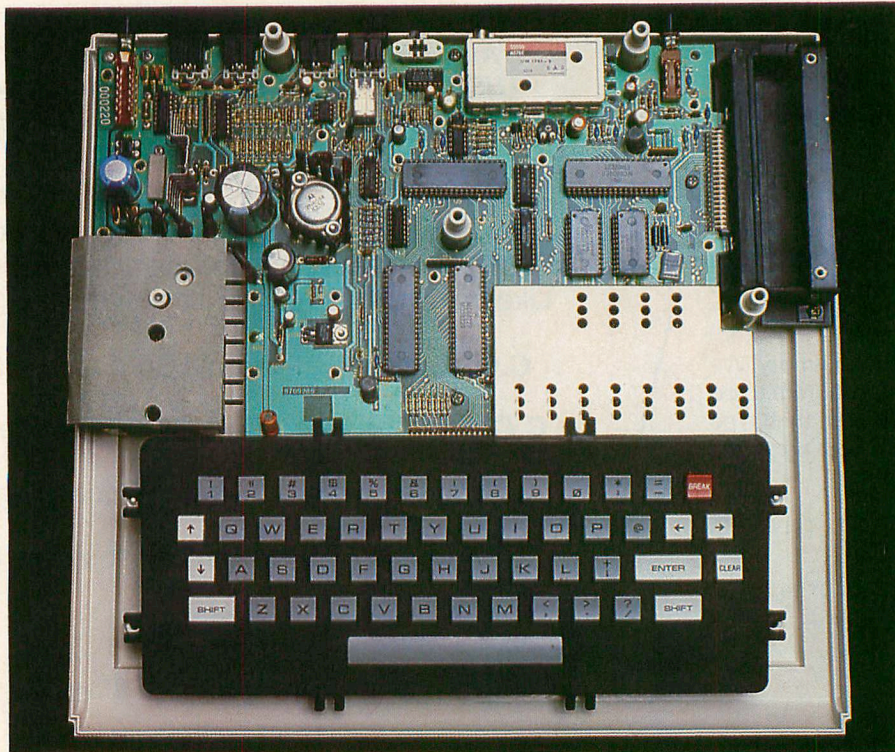


photo by Charley Freiberg

Color Basic ROM explained. The third of 12 articles.

Dissecting Your ROM

by Jake Commander

THIS MONTH'S DISASSEMBLY portion starts right out on the wrong foot: and *that's* all because of where we left off last time. The previous month's disassembly ended at a table containing all the values for shaping sinewaves output during a CSAVE. As this was a table and not actual opcodes, the disassembler gets out of sync and tries to make sensible opcodes where there aren't any. Eventually, after the end of the table, the disassembler gets back on its feet and makes good sense once more. Unfortunately, the first few opcodes of this month's listing remain out of sync because of that table. Just to make it clear, the comments contain the opcodes as they look to the CPU when it executes them from location A880.

The code includes the Set, Reset and Point commands for Color Basic. Don't forget that at this part of the ROM (the first 8K) we're analyzing non-Extended Basic, so we're only looking at low resolution graphics here.

Also, appropriately included with the lo-res *graphics commands* are the CLS commands. Here you can see the code that makes a CLS9 print the word

MICROSOFT. Remember, we have those guys to thank for this Basic, so a hidden message serves as a reminder lest we forget.

Also in this section is some code dealing with input/output through the peripheral interface adapter (PIA) at location U8 on the Tandy schematic. Here we're dealing with square wave output for the Sound command, coupled with the Audio On/Off command.

The final code proper reads the value from the joystick input via the analog to digital (A/D) converter in the PIA. This works by sending out a voltage and comparing it with the voltage input from the joystick. If the voltage output is too high,

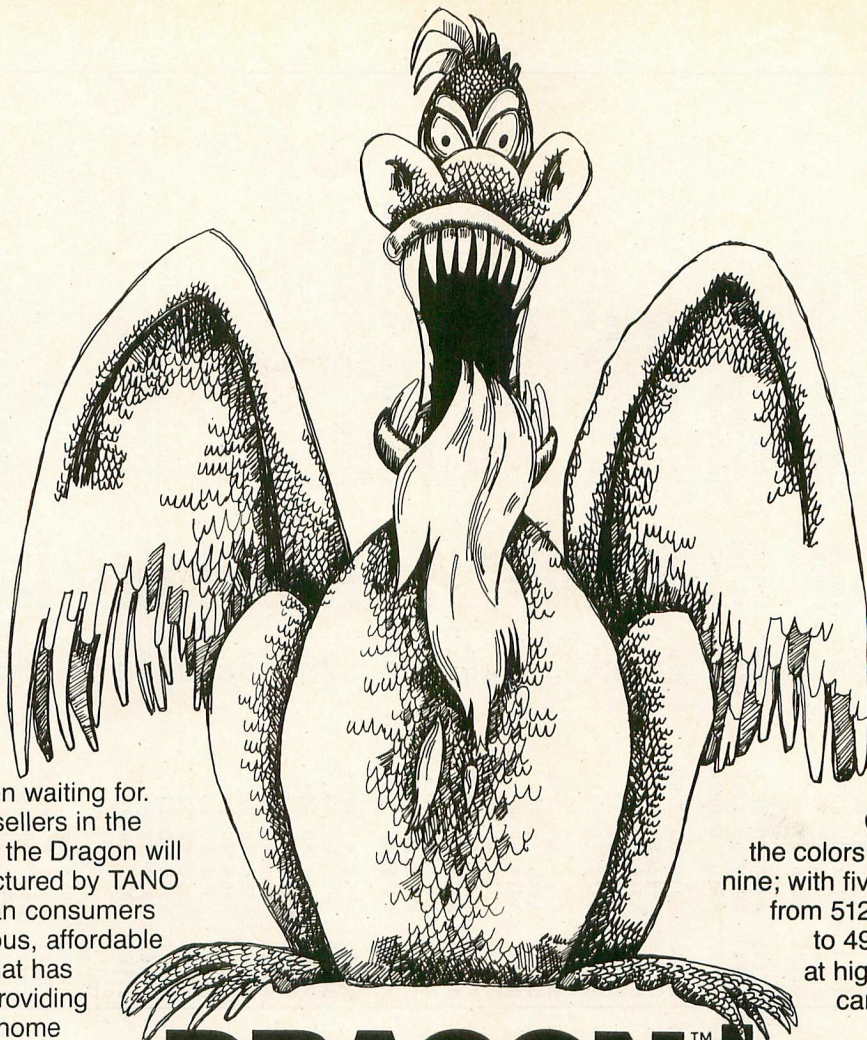
a lower one is tried (or vice versa) and a six-bit number is produced according to these comparisons. This is known as successive approximation.

Finally, we crunch into a table again. (This is the last of the big ones, anyway.) Amongst other things, this table contains the vocabulary for Color Basic. Each word is stored in ASCII with the last character of each word having its high bit set on to act as a delimiter. This contrasts with most other MicroSoft vocabulary tables I've seen, which usually have the high bit set on at the beginning character of each word in the table—the Color Computer method makes a lot more sense to me. Following the vocabulary table is another table, this time containing jump addresses for the execution of many of those words contained in the vocabulary table.

Finally, you'll see a few all-too-familiar error codes with some accompanying nasty words such as ERROR and BREAK.

Next month the disassembler gets back on the rails and stays there for miles while we pass through the land of FOR... NEXT loops and error processing. ■ ■ ■

Listing begins on p. 44



This, quite literally, is the color computer America has been waiting for. One of the best sellers in the United Kingdom, the Dragon will soon be manufactured by TANO to serve American consumers who want a serious, affordable computer; one that has proven itself at providing educational and home management applications as well as fun and games. To meet this challenge, the Dragon was born. With a standard 64K of RAM. A professional typewriter-style keyboard guaranteed for 20 million key operations. And an impressive array of options which include disk controller and drive, a printer, audio cassette recorder, a modem (RS-232 serial I/O), joysticks, game cartridges and a free BASIC training manual.

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*Microsoft™ is a registered trademark of Microsoft Corp.

And full editing features allow you to insert, delete or change at will. Oh yes — don't forget the colors! The Dragon features nine; with five different resolutions from 512 points of text (16x32) to 49,152 points (256x192) at high resolution. And you can view these amazing phenomena through either your composite video color monitor or VHF TV.

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```

SET
01045 A87F 6A 8D3F34 DEC $3F34,PC ;*****
01046 A883 10BD ;This block of code
01047 A885 B7 3835 ;disassembles incorrectly.
01048 A888 10C1 ;The following block is
01049 A88A 08 22 ;the correct interpretation.
01050 A88C 48 ;*****
-----
A880 8D3F BSR ;-----
A882 3410 PSHS ;->Get valid co-ords & vid. addr
A884 BD B7 38 JSR ;Save video address
A887 35 JSR ;->Syntax check", " compute #<256
A888 10 C1 08 PULS #8 ;Restore video address
A88B 22 48 BHI ;Is color greater than 8?
;FC Error if so
;-----
01051 A88D 5A DECB ;Offset color value to zero
01052 A88E 2B 05 BMI ;-> If spec=0 (black)
01053 A890 86 10 LDA ;Initialize color bits
01054 A892 3D MUL ;* specified color
01055 A893 20 08 BRA ;get byte from video co-ord
01056 A895 E6 84 LDB ;-> If alpha
01057 A897 2A 03 BPL ;Else zero the color bits.
01058 A899 C4 70 ANDB #70 ;If alpha, zero whole byte.
; (hidden CLRB at A89C)
01059 A89B 21 5F BRN CLRB
01060 A89D 34 04 PSHS B
01061 A89F 8D 6C BSR ;-> Syntax check for ")"
01062 A8A1 A6 84 LDA ;Get byte from video.
01063 A8A3 2B 01 BMI ;Retain it if a graphic byte
01064 A8A5 4F CLRA ;Else zero it.
01065 A8A6 84 0F ANDA ;extract the pixel info
01066 A8A8 9A 86 ORA ;Update it w/ the new pixel info
01067 A8AA AA E0 ORA ;add color bits
01068 A8AC 8A 80 ORA ;set graphic bit on
01069 A8AE A7 84 STA ;put it back on screen
01070 A8B0 39 RTS

RESET
01071 A8B1 8D 0E BSR ;-> Get valid x,y co-ords,
;video address & pixel bits
01072 A8B3 8D 58 BSR ;-> Syntax check for ")"
01073 A8B5 4F CLRA ;Get color bits = black
01074 A8B6 E6 84 LDB ;set byte from video co-ordinate
01075 A8B8 2A F2 BPL ;->If alpha,set whole byte black
01076 A8BA 03 86 COM ;Reverse pixel info
01077 A8BC D4 86 ANDB ;Mask out specified pixel
01078 A8BE E7 84 STB ;Put it back on video
01079 ABC0 39 RTS
01080 A8C1 BD B26A JSR ;-> Syntax check for "("
01081 A8C4 BD 19D JSR ;-> RAM vector
01082 A8C7 BD B70B JSR ;-> Compute # < 256
01083 A8CA C1 3F CMPB #3F ;Is X co-ordinate > 63?
01084 A8CC 22 07 BHI ;FC Error if so
01085 A8CE 34 04 PSHS B
01086 A8D0 BD B738 JSR ;Save X co-ordinate.
01087 A8D3 C1 1F CMPB #1F ;->Syntax chk for ", " get #<256
;Is Y co-ordinate > 31?

Clear to end of line
01137 A92D 9F 88 STX <$88 ;Reset cursor location
01138 A92F E7 80 ,X+ ;Character to screen
01139 A931 8C 05FF CMPX #S05FF ;Done all?
01140 A934 23 F9 BLS $A92F ;Continue if not
01141 A936 39 RTS
01142 A937 8D EF BSR ;CLS
01143 A939 8E A165 LDX #$A165 ;=> "MICROSOFT"
01144 A93C 7E B99C JMP ;Print it
01145 A93F BD B26D JSR ;-> Syntax Check ", "
01146 A942 BD B70B JSR ;Compute #<256
01147 A945 5D TSTB ;Is it zero?
01148 A946 26 3C BNE $A984 ;If > zero, RTS
01149 A948 7E B44A JMP ;FC Error if zero

SOUND
01150 A94B 8D F5 BSR ;-> Compute #>0,<256
01151 A94D D7 8C STB <$8C ;Save pitch
01152 A94F 8D EE BSR $A93F ;Syntax Chk ", " compute #>0,<256
01153 A951 86 04 LDA #4 ;Duration * 4
01154 A953 3D MUL ;Save length
01155 A954 DD 8D STD ;PIA U8 Port B control byte
01156 A956 B6 FF03 LDA $FF03 ;IRQ enabled to timeout
01157 A959 8A 01 ORA #1 ;note on field IRQ's
;Update Control byte
01158 A95B B7 FF03 STA $FF03
01159 A95E 0F 08 CLR <8 ;Update Control byte
01160 A960 8D 40 BSR $A9A2 ;-> Reset SEL1 and SEL2
01161 A962 8D 12 BSR $A976 ;-> Turn sound on.
01162 A964 8D 1F BSR $A985 ;Audio level (bottom)
01163 A966 86 FE LDA #SFE ;Audio level (up)
01164 A968 8D 1D BSR $A987 ;Audio level (top)
01165 A96A 8D 19 BSR $A985 #2
01166 A96C 86 02 LDA #2 ;Audio level (down)
01167 A96E 8D 17 BSR ;Is note timed out?
01168 A970 9E 8D LDX <$8D ;If not, do another pulse
01169 A972 26 F0 BNE $A964

AUDIO OFF
01170 A974 4F CLRA ;Turn audio off
01171 A975 8C 8608 CMPX #S8608 ;or on (8C = mask)
01172 A976 86 08 LDA #8 ;On/Off status to stack
01173 A97A B7 FF23 STA ;PIA U4 Port B control byte
01174 A97D 84 F7 ANDA #SF7 ;Reset six-bit sound enable
01175 A97F AA E0 ORA ;S+ ;set/Reset six-bit sound enable
01176 A981 B7 FF23 STA $FF23 ;Update control byte
01177 A984 39 RTS

Timed Output through D/A
01178 A985 86 7E LDA #S7E ;Zero Audio level
01179 A987 B7 FF20 STA ;D/A O/P from A
01180 A98A 96 8C LDA <$8C ;Pitch delay
01181 A98C 4C INCA ; Delay
01182 A98D 26 FD BNE $A98C ; loop
01183 A98F 39 RTS

```


Continued from page 45

01232	A9FA 2B 03	BMI	\$A9FF		01344	AAB9 45				
01233	A9FC E0 E4	SUBB	S		01345	AABA D7 43				;E/W/C
01234	A9FE 8C EBE4	CMXP	#\$EBE4		01346	AABC 4C	STB	<\$43		;L
-----	A9FF EB E4	ADDB	S		01347	AABD 4F	INCA			;O
01235	AA01 A6 E0	LDA	,S+		01348	AABE 41	CLRA			;A
01236	AA03 44	LSRA			01349	AABF C4 43	ANDB	#\$43		;D/C
01237	AA04 81 01	CMPA	#1		01350	AAC1 53	COMB			;S
01238	AA06 26 E6	BNE	\$A9EE		01351	AAC2 41				;A
01239	AA08 54	LSRB			01352	AAC3 56	RORB			;V
01240	AA09 54	LSRB			01353	AAC4 C5 4F	BITB	#\$4F		;E/O
01241	AA0A E1 1F	CMPB	-1,X		01354	AAC6 50	NEGB			;P
01242	AA0C 27 04	BEQ	\$AA12		01355	AAC7 45				;E
01243	AA0E 6A E4	DEC	S		01356	AAC8 CE 434C	LDU	#\$434C		;N/C L
01244	AA10 26 D9	BNE	\$A9EB		01357	AACB 4F	CLRA			;O
01245	AA12 E7 82	STB	,X		01358	AACC 53	COMB			;S
01246	AA14 EC E1	LDD	,S++		01359	AACD C5 4C	BITB	#\$4C		;E/L
01247	AA16 5A	DECB			01360	AACF 4C	INCA			;L
01248	AA17 2A CC	BPL	\$A9E5		01361	AAD0 49	ROLA			;I
01249	AA19 39	RTS			01362	AAD1 53	COMB			;S
01250	AA1A 81 3A	CMPA	#\$3A		01363	AAD2 D4 53	ANDB	<\$53		;T/S
01251	AA1C 24 0A	BHS	\$AA28		01364	AAD4 45	ANDB	<\$52		;E
01252	AA1E 81 20	CMPA	#\$20		01365	AAD5 D4 52	COMB			;T/R
01253	AA20 26 02	BNE	\$A24		01366	AAD7 45				;E
01254	AA22 0E 9F	JMP	<\$9F		01367	AAD8 53	COMB			;S
01255	AA24 80 30	SUBA	#\$30		01368	AAD9 450				;E
01256	AA26 80 D0	SUBA	#\$D0		01369	AADA D4 43	ANDB	<\$43		;T/C
01257	AA28 39	RTS			01370	AADC 4C	INCA			;L
01258	AA29 BC 7ABC	CMXP	\$7ABC		01371	AADD D3 4D	ADDD	<\$4D		;S/M
01259	AA2C EE BC93	LDU	(-\$6D,PC)		01372	AADF 4F	CLRA			;O
01260	AA2F 01				01373	AAE0 54	LSRB			;T
01261	AA30 12	NOP			01374	AAE1 4F	CLRA			;O
01262	AA31 BF 1EBF	STX	\$1EBF		01375	AAE2 D2 53	SBCB	<\$53		;R/S
01263	AA34 78 B750	ASL	\$B750		01376	AAE4 4F	CLRA			;O
01264	AA37 B6 81B4	LDA	\$81B4		01377	AAE5 55				;U
01265	AA3A ED B716	STD	\$B716		01378	AAE6 4E	ANDB	#\$41		;N/A
01266	AA3D BE A0B6	LDA	\$A0B6		01379	AAE7 C4 41				;D/A
01267	AA40 8C A5CE	CMXP	#\$A5CE		01380	AAE9 55	LSRA			;U
01268	AA43 A9 C6	ADCA	A,U		01381	AAEA 44	ROLA			;D
01269	AA45 B6 ABB6	LDA	\$ABB6		01382	AAEB 49				;I
01270	AA48 C8 B6	EORB	#\$B6		01383	AAEC CF				;O/
01271	AA4A CF				01384	AAED 45	ASLB			;E
01272	AA4B A8 F5	EORA	(B,S)		01385	AAEE 58				;X
01273	AA4D A5 64	BITA	4,S		01386	AAEF 45	ADDD	#\$534B		;C/S K
01274	AA4F B4 EE79	ANDA	\$EE79		01387	AAFO C3 534B	ROLA			;P
01275	AA52 B9 C579	ADCA	\$C579		01388	AAF3 49	NEGB			;I
01276	AA55 B9 BC7B	ADCA	\$BC7B		01389	AAF4 50	LDB	#\$54		;F/T
01277	AA58 BA CC7B	ORA	\$CC7B		01390	AAF5 C6 54				;A
01278	AA5B BB 917F	ADDA	\$917F		01391	AAF7 41	EORA	-\$0C,U		;B
01279	AA5E 01				01392	AAF8 42	COMB			;O/
01280	AA5F 1D	SEX			01393	AAF9 A8 54				;S
01281	AA60 50	NEGB			01394	AAFB CF				;U
01282	AA61 B2 D546	SBCA	\$D546		01395	AAFC 53	SBCB	#\$54		;B/T
01283	AA64 B2 D446	SBCA	\$D446		01396	AAFD 55	ASLA			;H
01284	AA67 4F	CLRA			01397	AAFE C2 54	LDU	#\$4E4F		;E
					01398	AB00 48	ANDB	<\$53		;N/O
					01399	AB01 45				;T/S
					01400	AB02 CE 4E4F				
					01401	AB05 D4 53				

01285	AA68	D2	47		SBCB	<\$47		R/ G	AB07	54	LSRB	
01286	AA6A	CF						O/	AB08	45	SUBB	<\$4F
01287	AA6B	52					R	E	AB09	D0	RORA	
01288	AA6C	45					E		AB09	46	LDB	#\$AB
01289	AA6D	CD					M/		AB0C	C6		
01290	AA6E	A7	45				E		AB0E	AD	AA	
01291	AA70	4C					L		AB10	AF	DE	
01292	AA71	53					S		AB12	41		
01293	AA72	C5	49				I		AB13	4E		
01294	AA74	C6	44				D		AB14	C4	4F	#\$4F
01295	AA76	41					A		AB16	D2	BE	\$BEE
01296	AA77	54					T		AB18	BD	BC53	\$BC53
01297	AA78	C1	50				P		AB1B	47	ASRA	
01298	AA7A	52					R		AB1C	CE	494E	#\$494E
01299	AA7B	49					I		AB1F	D4	41	ANDB
01300	AA7C	4E					N		AB21	42		
01301	AA7D	D4	4F				O		AB22	D3	55	ADDD
01302	AA7F	CE	494E				N	I	AB24	53	COMB	<\$52
01303	AA83	50					P		AB25	D2	52	SBCB
01304	AA83	55					U		AB27	4E		
01305	AA84	D4	45				E		AB28	C4	53	ANDB
01306	AA86	4E					N		AB2A	49	ROLA	#\$53
01307	AA87	C4	4E				D		AB2B	CE	5045	LDU
01308	AA89	45					E		AB2E	45		#\$5045
01309	AA8A	58					X		AB2F	CB	4C	ADDB
01310	AA8B	D4	44				T	D	AB31	45	LDU	#\$5354
01311	AA8E	49					I		AB32	CE	5354	
01312	AA8E	CD					M		AB35	52		
01313	AA8F	52					R		AB36	A4	56	ANDA
01314	AA90	45					E		AB38	41		
01315	AA91	41					A		AB39	CC	4153	LDD
01316	AA92	C4	52				D	R	AB3C	C3	4348	ADDD
01317	AA94	55					U		AB3F	52		
01318	AA95	CE	5245				N	R	AB40	A4	45	ANDA
01319	AA98	53					S		AB42	4F		CLRA
01320	AA99	54					T		AB43	C6	4A	LDB
01321	AA9A	4F					O		AB45	4F		CLRA
01322	AA9B	52					R		AB46	59	ROLB	
01323	AA9C	C5	52				E		AB47	53	COMB	
01324	AA9E	45					E		AB48	54	LSRB	
01325	AA9F	54					T		AB49	CB	4C	ADDB
01326	AAA0	55					U		AB4B	45		
01327	AAA1	52					R		AB4C	46	RORA	
01328	AAA2	CE	5354				N	S	AB4D	54	LSRB	
01329	AAA5	4F					O		AB4E	A4	52	ANDA
01330	AAA6	D0	50				P	P	AB50	49	ROLA	
01331	AAA8	4F					O		AB51	47	ASRA	
01332	AAA9	4B					K		AB52	48	ASLA	
01333	AAAA	C5	43				E	C	AB53	54	LSRB	
01334	AAAC	4F					O		AB54	A4	4D	ANDA
01335	AAAD	4E					N		AB56	49	ROLA	
01336	AAAE	D4	4C				T	L	AB57	44	LSRA	
01337	AAAO	49					I		AB58	A4	50	ANDA
01338	AAAB	53					S		AB5A	4F	CLRA	
01339	AAAB	D4	43				T	C	AB5B	49	ROLA	
01340	AAAB	4C					L		AB5C	4E		
01341	AAAB	54					E		AB5D	D4	49	ANDB
01342	AAAB	61					A		AB5F	4E		
01343	AAAB	7	D2	4E			R	N				<\$49

Please turn the page

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01461	AB61 45	ROLB						01514	ABBE 4C	INCA									
01462	AB62 59	ANDA	\$0D,U					01515	ABBF 42	COMB									
01463	AB63 A4 4D							01516	ABCO 53	LSRA									
01464	AB65 45							01517	ABCL 44	LSRA									
01465	AB66 CD	JSR	7,U					01518	ABCM 44	BLE	\$ABF5								
01466	AB67 AD 47	LDX	A,X					01520	ABCS 2F 30	LSRA									
01467	AB69 AE 86	LDX	'--S					01521	ABCE 44	LSRA									
01468	AB6B AE E3	LDX	'--S					01522	ABEC 54	LSRB									
01469	AB6D AE E3	LDX	'--S					01523	ABEC 4D	TSTA									
01470	AB6F AE E3	LDX	'--S					01524	ABEC 4F	CLRA									
01471	AB71 AF 14	STX	-\$0C,X					01525	ABCA 53	COMB									
01472	AB73 AE E0	LDX	S+					01526	ABCB 4C	INCA									
01473	AB75 B8 F7AF	EORA	\$F7AF					01527	ABCC 53	COMB									
01474	AB78 42							01528	ABCD 53	COMB									
01475	AB79 AF F5	STX	(B,S)					01529	ABCE 54	LSRB									
01476	AB7B AE 02	LDX	2,X					01530	ABCF 43	COMA									
01477	AB7D B0 F8B3	SUBA	\$F8B3					01531	ABD0 4E	RORA									
01478	AB80 4E							01532	ABD1 46	LSRA									
01479	AB81 B0 46AE	SUBA	\$46AE					01533	ABD2 44	LSRA									
01480	AB84 75							01534	ABD3 41	CLRA									
01481	AB85 AD E4	JSR	S					01535	ABD4 4F	LSRA									
01482	AB87 AE C0	LDX	U+					01536	ABD5 44	ROLA									
01483	AB89 AE 09	LDX	9,X					01537	ABD6 4E	CLRA									
01484	AB8B B7 57AE	STA	\$57AE					01538	ABD7 49	RORA									
01485	AB8E 30 B7							01539	ABD8 4F	RORA									
01486	AB90 64 AE							01540	ABD9 46	TSTA									
01487	AB92 41	JSR	-9,X					01541	ABDA 4D	CLRA									
01488	AB93 AD 17	ANDA	(-\$5C,X)					01542	ABDB 4E	ROLA									
01489	AB95 A4 98A4							01543	ABDC 4F	LSRA									
01490	AB98 4C	INCA						01544	ABDD 49	COMB	\$AC28								
01491	AB99 A5 F6	BITA	(A,S)					01545	ABDE 45	LSRA									
01492	AB9B A4 16	ANDA	-\$0A,X					01546	ABDF 44	COMB									
01493	AB9D B7 5EA8	STA	\$5EA8					01547	ABE0 53	BRA									
01494	ABA0 80 A8	SUBA	#\$A8					01548	ABE1 20 45	CLRA									
01495	ABA2 B1 A910	CPMA	\$A910					01549	ABE3 52	NEG	<\$20								
01496	ABA5 A7 BDA94B	STA	(-\$56B5,PC)					01550	ABE4 52	ROLA									
01497	ABA9 A9 90	ADCA	X+					01551	ABE5 4F	BRA	\$ABED								
01498	ABAB A5 3E	BITA	-2,Y					01552	ABE6 52	TST	<\$4F								
01499	ABAD A5 EC4E	BITA	\$4E,PC					01553	ABE7 00 20	TST	<0								
01500	ABBO 46	RORA						01554	ABE9 49	TST	<\$42								
01501	ABB1 53	COMB						01555	ABEA 4E	TST	<\$30								
01502	ABB2 4E							01556	ABEB 20 00	LSR	A,U								
01503	ABB3 52							01557	ABED 0D 4F	NOP									
01504	ABB4 47	ASRA						01558	ABEF 4B										
01505	ABB5 4F	CLRA						01559	ABFO 0D 00										
01506	ABB6 44	LSRA						01560	ABF2 0D 42										
01507	ABB7 46	RORA						01561	ABF4 52										
01508	ABB8 43	COMA						01562	ABF5 45										
01509	ABB9 4F	CLRA						01563	ABF6 41										
01510	ABBA 56	RORB						01564	ABF7 4B										
01511	ABBB 4F	CLRA						01565	ABF8 00 30										
01512	ABBC 4D	CLRA						01566	ABFA 64 C6										
01513	ABBD 55	TSTA						01567	ABFC 12										



Talk Together

Just bought an MC-10? Don't have any software for it? Oh, yes you do!

LET'S FACE IT — like a lot of you out there, I'm a computer freak. Sure, I put good promotional copy on my book jackets — "Avocations are sailing, mathematical games, ham radio, Eastern European folk dancing, alligator wrestling, and driving Grand Prix race cars" — but, in fact, you'll see me in the wee hours hacking away on the Color Computer and other equipment. Lately, though, things have gotten somewhat boring. Even sophisticated Radio Shack equipment gets stale.

It was one of those boring mornings not long ago, when I forsook the computer room for brush-up steps on a Polish mazurka. I had just brought out my peasant costume when I happened to glance at the paper. "New for '83," the ad said. The Radio Shack MC-10 computer system!

Several hours later I was the apprehensive owner of an MC-10. Apprehensive, primarily because of its size. Shades of the Timex/Sinclair TS1000! Can this computer really *do* anything?

Inside the MC-10

An hour later I had hooked up the system, run some short benchmarks, and gotten my first impressions — the Basic isn't bad — not as powerful as the Color Computer, but not bad. The graphics were not too impressive — 64 by 32 elements in color is a far cry from the Color

by William Barden, Jr.

Computer. And no assembly language hooks such as USR and VARPTR!

Eight hours later I had revised my impressions. Shards of tin lay around me — I had cut off the shielding over the printed circuit board inside the MC-10. The wastebasket was stuffed with partial sketches and pieces of notepad paper. Bleary-eyed, I summarized what I had found:

- Item: The MC-10 uses a 6803 microprocessor. It's better than the older 6800, although not as powerful as the Color Computer's 6809. Believe it or not, it has a hardware multiply instruction and some other goodies.

- Item: The 8K ROM Basic is mounted on a socket. The socket has enough pins that a larger ROM can be installed!

- Item: The graphics are controlled by a 6847 Video Display Generator chip, the same chip that's in the Color Computer! A high-resolution 256 by 192 color graphics is possible with this chip, but not implemented in the Basic.

- Item: There are more Basic commands in the MC-10 than the manual describes. Among the existing commands are USR for machine-language linkage, EXEC for transferring control to machine-language subroutines, CLOADM for loading ma-

chine-language programs, and VARPTR for finding the location of variables.

- Item: The cassette recording technique appeared to be compatible with that used on the Color Computer!

Color Computer and MC-10 Cassette Compatibility

The last item interested me the most. Would it be possible to transfer programs from the MC-10 to the Color Computer and vice versa? It seemed plausible.

The first step was to try some tapes. I cut an MC-10 tape and loaded it into the Color Computer. There it was! It loaded fine. The Basic line numbers were correct, but the Basic commands were not as expected. (Why? We'll get to that in a second...) Going the other way around, cassette files from the Color Computer loaded into the MC-10. Again the line numbers and numbers of lines were all right, but the Basic commands were different.

Up to this point I had verified that the recording formats of the MC-10 and Color Computer were the same. Here's how each works: The Color Computer uses a digital-to-analog converter to produce a sine wave output of either 1200 or 2400 cycles per second (hertz), as shown in Figure 1. The MC-10 doesn't

Continued from page 49

use a "dac," but its output is a square wave of the same frequency. As a matter of fact, the Model III/IV in high-speed cassette mode also uses the same recording technique as the MC-10. The cassette tape file formats were also the same — the same header data for the file name, and so forth.

Now I knew I could eventually transfer files between the MC-10 and the Color Computer, using the cassette recorder as an intermediary device. This scheme is not too elegant compared to transferring data over RS-232C lines, but it would certainly be handy to use the editing, re-numbering, and other features of the Color Computer on MC-10 Basic programs. And, as stoic as my constitution is, my cramped fingers could benefit from the larger keyboard of the Color Computer.

Tokenism

For those of you who are uninitiated into the mysteries of Microsoft Basic architecture, let me explain how I knew I could eventually get that supercilious Color Computer talking to his baby brother...

All Microsoft Basics are similar. Microsoft presumably cranks them out on an assembly-line basis in Bellevue on a Digital Equipment VAX system using a combination of automatic and manual methods. It's efficient to use the same structure, and certainly cost effective as far as development time. The structure of Microsoft Basic program lines is shown in Figure 2.

All Basic program lines are stored in a contiguous area in memory. This really means that the second line follows the first immediately, the third follows the second, and so forth. Although there could be gaps between the lines, there usually aren't. The first byte of the next line starts one byte after the last byte of the previous line.

Each Basic line has three parts. The first part is a header. This header consists of four bytes. The first two bytes are the starting address of the *next* line in binary. The last line of the program has a next line pointer of 0, to signify the end of the program. The next two bytes are the line number in binary.

The third part of the line is a terminating 0 byte. It defines the end of the line.

The second part of the line is the text of the line itself. For example, if you have the line:

```
100 FOR I=1 TO 1000
```

Please turn to p. 52

Figure 1. Color Computer vs. MC-10 Cassette Wave forms

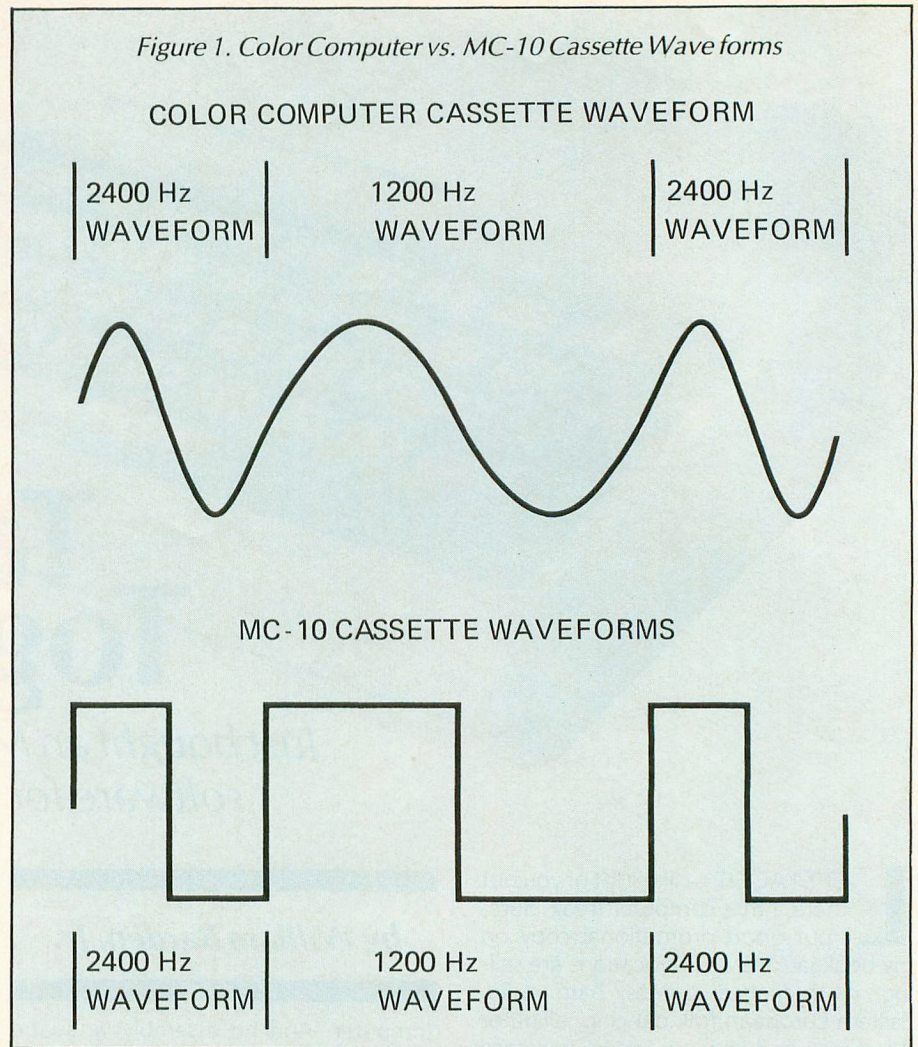
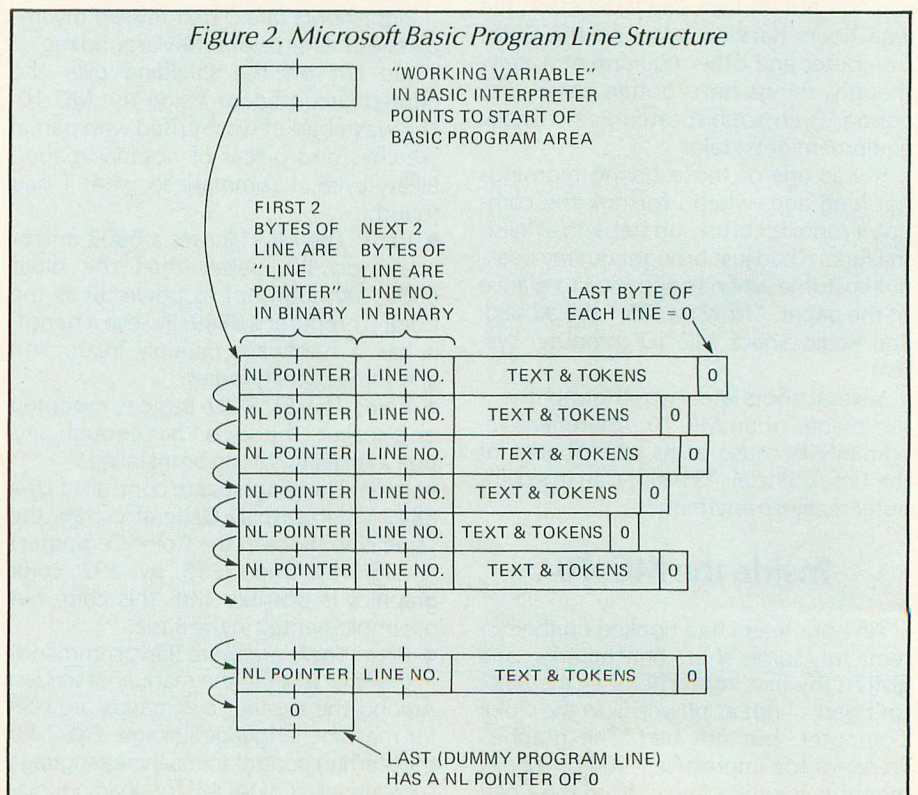


Figure 2. Microsoft Basic Program Line Structure





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MDISK — Hal Snyder's latest breakthrough for the 64K Color Computer! MDISK lets you use the upper 32K of memory for rapid storage and retrieval of programs and data. Whether you own an actual disk drive or not, MDISK puts the 'hidden' 32K to work for you as a 'virtual disk,' with capability to save and load up to 15 programs, view a directory of files stored in 'page 1', kill unwanted page 1 files, execute BASIC or machine language directly from MDISK, chain to a BASIC program while preserving data already created, and more. These functions are available not only under manual keyboard control, but from programs in progress as well, permitting high-speed swapping of programs or data. Unlike many 64K utilities, MDISK doesn't copy BASIC to RAM. This greatly increases the amount of workspace available to you (by 22K in a disk system). MDISK is written in position independent code, and will work on disk or tape based 64K systems. Full documentation included.

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the "FOR I=1 TO 1000" would be in the second, or central, part of the line.

If you were a software house designing Basic interpreters, how could you make memory storage more efficient? One way is by "compressing" data. If you had text that frequently used 128 words, ranging from "aardvark" to "zebra," you might consider assigning a special code to each of the 128 words, say 128 through 255. That way, the eight letters of aardvark could be compressed into a single byte of, say, 153. You would have saved seven characters (seven bytes) each time "aardvark" was used.

So it is with Basic commands. There are only so many Basic commands, and each is assigned a special code, called a "token." In the Color Computer, for example, the token for the long Basic command RESTORE is a code of 143, saving six characters, or bytes.

If you look at a Basic program in memory, you'll find that each Basic command uses a token to save memory storage. You'll see the normal text interspersed with Basic tokens, as shown in Figure 3.

One important point about the tokens, by the way: tokens are almost always values in the range of 128 through 255. The reason for this is that values in the range of 0 through 127 represent ASCII characters — normal printable or displayable characters of 0-9, A-Z, a-z, and special characters such as # or %.

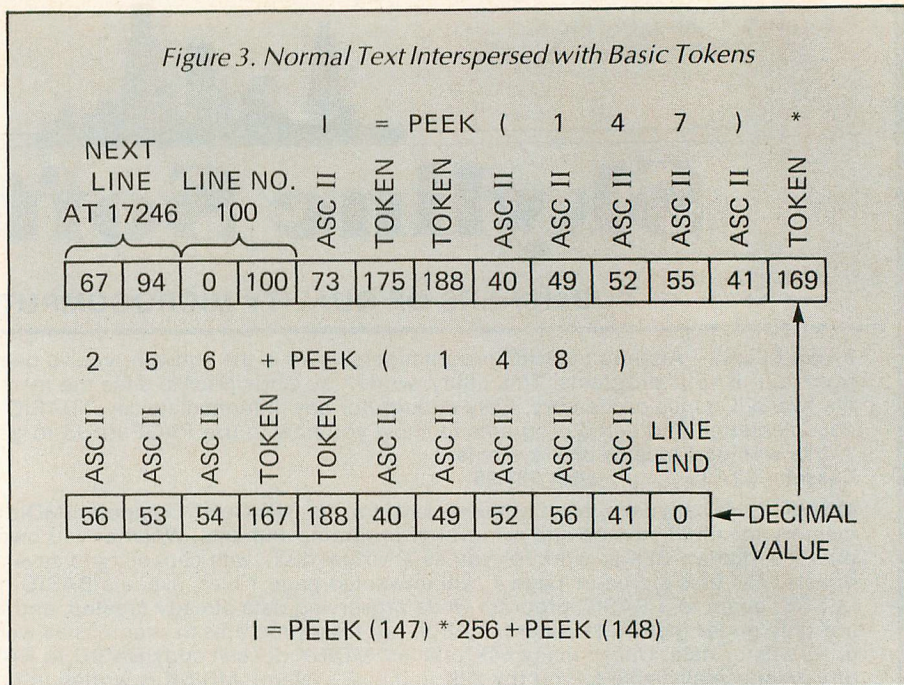
The main problem, then, is to decode those Basic tokens in both the Color Computer and MC-10 so we can translate from one to another.

Disassembling Basic

How do you compile a list of tokens on a Microsoft Basic computer? One obvious way is to put in all the possible combinations of Basic commands, find the area in RAM where the Basic program is stored, and then display the tokenized version of the line, compiling a list of Basic tokens by manual methods. For example, suppose you started with a NEW command and then entered the Basic lines:

```
100 REM $#
110 FOR I=0 TO 65535
120 A$ = CHR$(PEEK(I)) + CHR$(PEEK(I+1))
130 IF A$ = "$#" THEN PRINT I
140 NEXT I
```

This short Basic routine searches all the memory space, ROM and RAM, for the occurrence of the two unique characters \$#. Every time that particular combination is encountered, the address at which



they are found will be printed out. It's a way of locating the start of the Basic program area.

This program might produce two or three locations at which this particular character string was found, but you could then further define the area by trying additional unique characters. Knowing where the character string was, you can work back one location to find the start of the first Basic line, the REM token, which you could define by a PEEK. From that point it's easy to substitute other Basic commands and compile a list.

This manual method is pretty tedious. I used a much nicer technique to find the tokens for the MC-10, one that I had used on the Color Computer and other Radio Shack systems before. The day was flying by, but I had to uncover the secrets of the MC-10. I executed this program:

```
100 FOR I=0 TO 65535
110 A=PEEK(I): IF (A<32) OR (A>127) THEN 130
120 PRINT CHR$(PEEK(I));
130 IF I-INT(I/256)*256=0 THEN PRINT I
140 NEXT I
```

This short piece of code will spew out all ASCII characters in memory on the screen, interspersed with every multiple of 256 memory locations. I ran it and saw a display of characters that looked like this:

```
FOGOTOGOSUREIDATPR
```

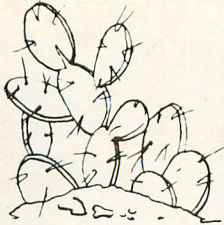
This represented the Token Table found in every Microsoft Basic. It's generally a sequential listing of all tokens to be found in the computer system, even undocumented tokens! In some cases this

will be one large table. In other cases, such as the Color Computer, there may be two or more segments of the symbol table.

One unique feature of the Token Table: the first or the last character of every Basic keyword is set to an ASCII character plus 128. This is done to delimit or denote the end of each keyword, compacting the table. That's why the delimiting character will not print in the code above.

In the case of the MC-10, the Token Table (in my version) is located at ROM location 57413 (\$E045 where \$ stands for hexadecimal). (This area is also addressable by using addresses 8192 bytes lower in the \$C045 area.) It's one large block of tokens, as shown in Table 1. You'll note that there are several undocumented tokens, such as USR and EXEC, that hold the promise of big plans for the small MC-10.

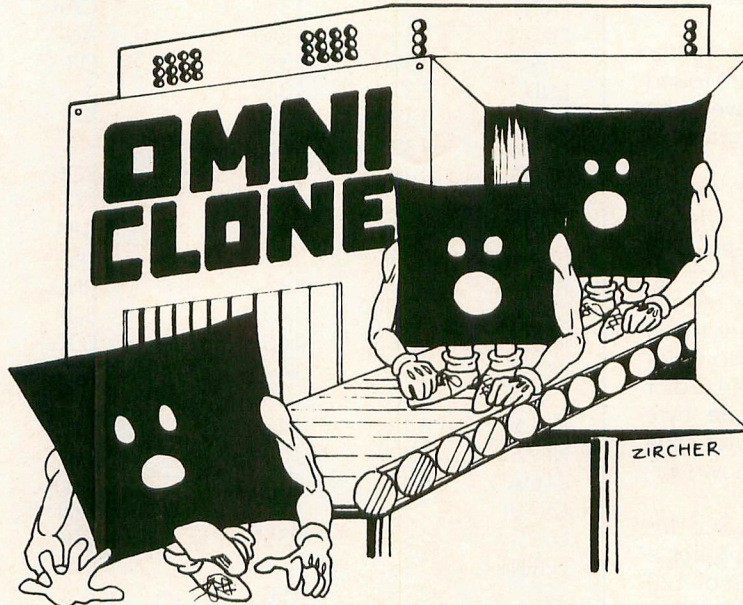
Table 1 not only shows the MC-10 tokens, but also lists the corresponding Color Computer tokens. Note that some of the Color Computer tokens are two values (two bytes) long. The Color Computer has a lot of tokens, and it was necessary to extend the token representation into two-byte values simply because the range of 128 through 255 couldn't hold them all. In the case of two-byte tokens, the Basic keyword is compressed into a two-byte value, the first of which is a value of 255 (\$FF). The Color Computer tokens start at 43622 (\$AA66) in my system and are shown in tabular form in Table 2, along with the corresponding MC-10 tokens.



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Cross-Referencing Tokens

At this point I had forgotten completely about my folk dancing. Dusk was settling in as I wrote down the token values. Only my allegiance to Radio Shack computer systems kept me going.

The next thing I did was to compile a cross-reference of Basic keywords and the token values for both the MC-10 and the Color Computer. This is shown in Table 3. I was glad I did this, for I detected several problems.

First, there are many Color Computer Basic commands that are not (yet) found on the MC-10. These would have to be detected in any translation program, of course.

There are also certain MC-10 tokens that have to translate into two-byte tokens. This poses certain problems. The proper way of doing this would be to expand the MC-10 program line by one byte to fit in the Color Computer token when going from MC-10 code to Color Computer code, and shrink the Color Computer program line by one byte when going from Color Computer code to MC-10 code. I'll show you how I circumvented this, shortly.

The next problem is one of GOSUBs and GOTOs. In the Color Computer a GOTO is represented by a token of 129 for GO, and a token of 165 for TO. In the MC-10, there is a single token for GOTO, a 129. In the Color Computer a GOSUB is represented by GO and SUB, for two tokens of 129 and 166. In the MC-10, GOSUB is a single token of 130. Here again, the problem is fitting two bytes into a one-byte area and vice versa in the translation.

After a hefty bite of kielbasa, left over from the beginning of the mazurka, I was ready to tackle the conversion. The results of my marathon all-night session are shown in Program Listings 1 and 2. Let's look at the Color Computer version first (Listing 1).

The Data statements in Program Listing 1 represent a duplicate of the data in Table 2. Rather than listing the Color Computer tokens, however, there are two tables, one for one-byte Color Computer tokens, and one for two-byte Color Computer tokens.

The one-byte tokens are stored in a 128-byte array called T1. The first entry in this array corresponds to Color Computer token 128, the next for token 129, and so forth. Each entry holds the corresponding MC-10 token, or a 0 value for "no MC-10 token."

The two-byte tokens are stored in a 128-byte array called T2. The first entry

Please turn to page 59

Table 1. MC-10 Basic Tokens

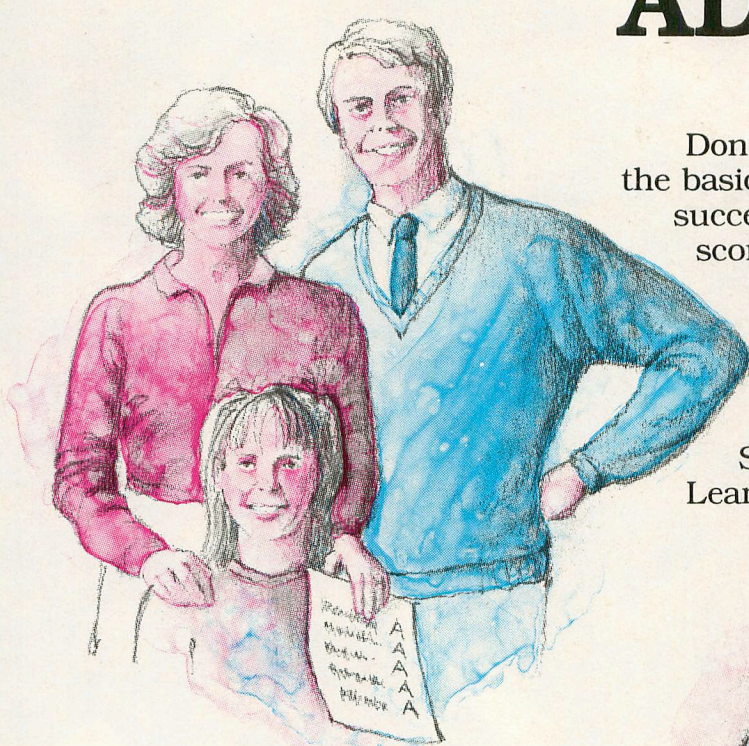
TOKEN	VALUE	COLOR COMPUTER VALUE	TOKEN	VALUE	COLOR COMPUTER VALUE
FOR	128	128	STEP	165	169
GOTO	129	—	OFF	166	170
GOSUB	130	—	+	167	171
REM	131	130	-	168	172
IF	132	133	*	169	173
DATA	133	134	/	170	174
PRINT	134	135	CARET	171	175
ON	135	136	AND	172	176
INPUT	136	137	OR	173	177
END	137	138	>	174	178
NEXT	138	139	=	175	179
DIM	139	140	<	176	180
READ	140	141	SGN	177	255,128
LET	141	186	INT	178	255,129
RUN	142	142	ABS	179	255,130
RESTORE	143	143	USR	180	255,131
RETURN	144	144	RND	181	255,132
STOP	145	145	SQR	182	255,155
POKE	146	146	LOG	183	255,153
CONT	147	147	EXP	184	255,151
LIST	148	148	SIN	185	255,133
CLEAR	149	149	COS	186	255,149
NEW	150	150	TAN	187	255,150
CLOAD	151	151	PEEK	188	255,134
CSAVE	152	152	LEN	189	255,135
LLIST	153	155	STR\$	190	255,136
LPRINT	154	—	VAL	191	255,137
SET	155	156	ASC	192	255,138
RESET	156	157	CHR\$	193	255,139
CLS	157	158	LEFT\$	194	255,142
SOUND	158	160	RIGHT\$	195	255,143
EXEC	159	162	MID\$	196	255,144
SKIPF	160	163	POINT	197	255,145
TAB(	161	164	VARPTR	198	255,157
TO	162	165	INKEY\$	199	255,146
THEN	163	167	MEM	200	255,147
NOT	164	168			— — —

Table 2. Color Computer Tokens

TOKEN	VALUE	MC-10 VALUE	TOKEN	VALUE	MC-10 VALUE
FOR	128	128	RUN	142	142
GO	129	—	RESTORE	143	143
REM	130	131	RETURN	144	144
'	131	—	STOP	145	145
ELSE	132	—	POKE	146	146
IF	133	132	CONT	147	147
DATA	134	133	LIST	148	148
PRINT	135	134	CLEAR	149	149
ON	136	135	NEW	150	150
INPUT	137	136	CLOAD	151	151
END	138	137	CSAVE	152	152
NEXT	139	138	OPEN	153	—
DIM	140	139	CLOSE	154	—
READ	141	140	LLIST	155	153

Please turn to p. 58

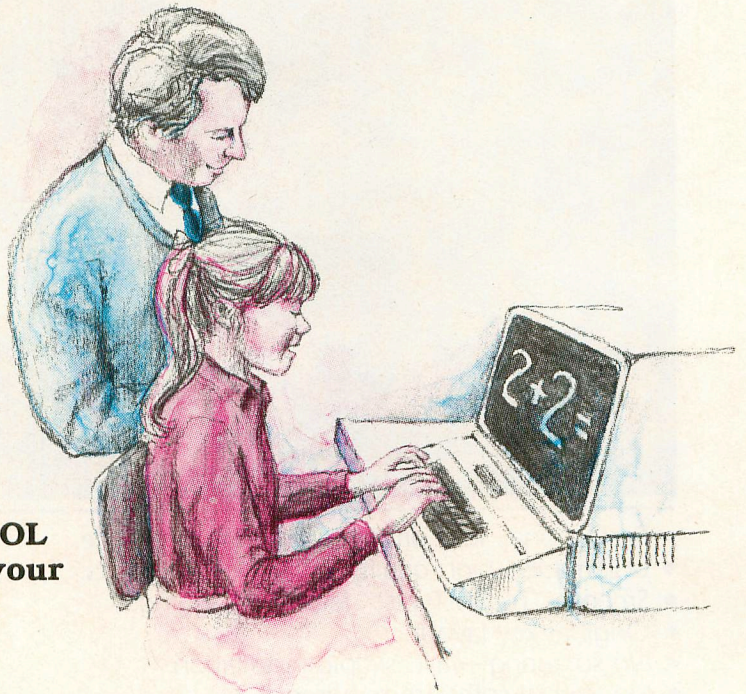
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Table 2 continued from p. 54

TOKEN	VALUE	MC-10 VALUE	TOKEN	VALUE	MC-10 VALUE	TOKEN	VALUE	MC-10 VALUE
SET	156	155	DEF	185	—	LEN	255,135	189
RESET	157	156	LET	186	141	STR\$	255,136	190
CLS	158	157	LINE	187	—	VAL	255,137	191
MOTOR	159	—	PCLS	188	—	ASC	255,138	192
SOUND	160	158	PSET	189	—	CHR\$	255,139	193
AUDIO	161	—	PRESET	190	—	EOF	255,140	—
EXEC	162	159	SCREEN	191	—	JOYSTK	255,141	—
SKIPF	163	160	PCLEAR	192	—	LEFT\$	255,142	194
TAB(	164	161	COLOR	193	—	RIGHT\$	255,143	195
TO	165	162	CIRCLE	194	—	MID\$	255,144	196
SUB	166	—	PAINT	195	—	POINT	255,145	197
THEN	167	163	GET	196	—	INKEY\$	255,146	199
NOT	168	164	PUT	197	—	MEM	255,147	200
STEP	169	165	DRAW	198	—	ATN	255,148	—
OFF	170	166	PCOPY	199	—	COS	255,149	186
+	171	167	PMODE	200	—	TAN	255,150	187
-	172	168	PLAY	201	—	EXP	255,151	184
*	173	169	DLOAD	202	—	FIX	255,152	—
/	174	170	RENUM	203	—	LOG	255,153	183
CARET	175	171	FN	204	—	POS	255,154	—
AND	176	172	USING	205	—	SQR	255,155	182
OR	177	173	* * * * *	* * * * *	* * * * *	HEX\$	255,156	—
>	178	174	SGN	255,128	177	VARPTR	255,157	198
=	179	175	INT	255,129	178	INSTR	255,158	—
<	180	176	ABS	255,130	179	TIMER	255,159	—
DEL	181	—	USR	255,131	180	PPOINT	255,160	—
EDIT	182	—	RND	255,132	181	STRING\$	255,161	—
TRON	183	—	SIN	255,133	185			
TROFF	184	—	PEEK	255,134	188			

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Continued from p. 54

in this array corresponds to Color Computer token 255, 128, the next for 255, 129, and so forth. Each entry holds the corresponding MC-10 token, or a zero value for no MC-10 token.

Assume that the conversion program is at lines 1 to 99 and that the Color Computer program to be converted to MC-10 format is somewhere above in Lines 100 through 59999. The first action is to move the Data values into the two arrays, T1 and T2.

Now the starting address of the Basic program area is put into variable PL. PL always points to the next byte of the program area lines to be processed. The starting address of the Basic program area can be found in RAM location &H19 (\$19 or decimal 25). Variable NL is set equal to PL. NL holds the next line pointer value from the current Basic program line.

The Process One Line subroutine processes one line of the Basic program. For each line, these actions occur:

- The next line pointer value is read from the first two bytes of the line and put into variable NL.
- The line number of the line is read from the next two bytes of the line and put into variable LN.

Please turn page

Table 3. Cross Reference Listing,
Color Computer and MC-10 Tokens

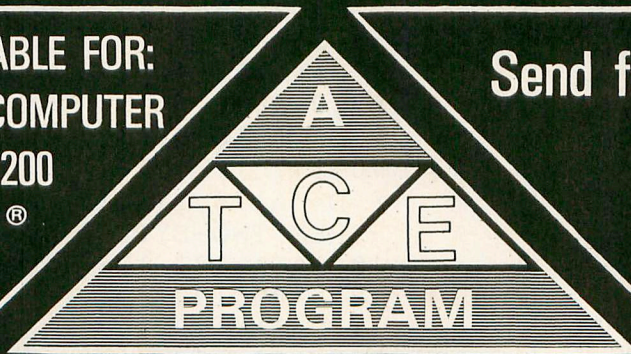
TOKEN	COLOR COMPUTER	MC-10	TOKEN	COLOR COMPUTER	MC-10
'	131	—	DIM	140	139
+	171	167	DLOAD	202	—
-	172	168	DRAW	198	—
*	173	169	EDIT	182	—
/	174	170	ELSE	132	—
CARET	175	171	END	138	137
<	180	176	EOF	255,140	—
=	179	175	EXEC	162	159
>	178	174	EXP	255,151	184
ABS	255,130	179	FIX	255,152	—
AND	176	172	FN	204	—
ASC	255,138	192	FOR	128	128
ATN	255,148	—	GET	196	—
AUDIO	161	—	GO	129	—
CHR\$	255,139	193	GOSUB	—	130
CIRCLE	194	—	GOTO	—	129
CLEAR	149	149	HEX\$	255,156	—
CLOAD	151	151	IF	133	132
CLOSE	154	—	INKEY\$	255,146	199
CLS	158	157	INPUT	137	136
COLOR	193	—	INSTR	255,158	—
CONT	147	147	INT	255,129	178
COS	255,149	186	JOYSTK	255,141	—
CSAVE	152	152	LEFT\$	255,142	194
DATA	134	133	LEN	255,135	189
DEF	185	—	LET	186	141
DEL	181	—			

Please turn the page

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- If the next line pointer is 0, the last program line has been processed.
- If the line number of the current line is under 100, a line of the conversion routine itself is being processed and no conversion is done.
- The next byte of the line is tested.
- If this byte is a zero, the end of the line has been reached and the subroutine returns back to the main code.
- If this byte is less than 128, it is an ASCII character and not a token. In this case PL is bumped by one to point to the next byte of the line. A special case of a literal string ("THIS IS A LITERAL STRING") is detected also. All data within the string is ignored. (This is most important in the MC-10 version of the program, in which graphics characters can be embedded in strings; graphics characters are greater than 128 and would look like tokens if they were processed.)
- If this byte is not 255 or 129 (GO), the corresponding MC-10 token is found from array T1 and POKEd into the current byte, unless the corresponding token is a zero. If the MC-10 token is a zero, an error message of "NO CORRESPONDING MC-10 TOKEN" is displayed and the program stops.

● If the byte was a 255, an ASCII blank is POKEd into the token byte. The next value of the two-byte token is then picked up, and the corresponding MC-10 token is picked up from array T2 and POKEd into that byte. POKeing a blank character causes no problem, as Basic program lines can have extraneous blanks anywhere except in literal string values.

● If the byte was a 129 (GO), the action is similar to a two-byte Color Computer token — a blank is stored for the GO, the next token value is picked up, and the GOSUB or GOTO token for the MC-10 is stored in the second byte.

The conversion continues a line at a time until a next line pointer of zero (end of program) is found. For each line processed, a period is displayed.

To run the conversion program, the program to be converted must start at Line 100 or above. Simply Run it and all program lines will be converted. After the conversion you'll be able to list the converted lines, but they will have MC-10 tokens — garbage as far as the Color Computer is concerned. Delete all lines under 100 and then CSAVE the converted program to cassette. The result is a program in MC-10 format, loadable by

TOKEN	COLOR COMPUTER	MC-10	TOKEN	COLOR COMPUTER	MC-10
LINE	187	—	REM	130	131
LIST	148	148	RENUM	203	—
LLIST	155	153	RESET	157	156
LOG	255,153	183	RESTORE	143	143
LPRINT	—	154	RETURN	144	144
MEM	255,147	200	RIGHT\$	255,143	195
MID\$	255,144	196	RND	255,132	181
MOTOR	159	—	RUN	142	142
NEW	150	150	SCREEN	191	—
NEXT	139	138	SET	156	155
NOT	168	164	SGN	255,128	177
OFF	170	166	SIN	255,133	185
ON	136	135	SKIPF	163	160
OPEN	153	—	SOUND	160	158
OR	177	173	SQR	255,155	182
PAINT	195	—	STEP	169	165
PCLEAR	192	—	STOP	145	145
PCLS	188	—	STR\$	255,136	190
PCOPY	199	—	STRING\$	255,161	—
PEEK	255,134	188	SUB	166	—
PLAY	201	—	TAB(	164	161
PMODE	200	—	TAN	255,150	187
POINT	255,145	197	THEN	167	163
POKE	146	146	TIMER	255,159	—
POS	255,154	—	TO	165	162
PPOINT	255,160	—	TROFF	184	—
PRESET	190	—	TRON	183	—
PRINT	135	134	USING	205	—
PSET	189	—	USR	255,131	180
PUT	197	—	VAL	255,137	191
READ	141	140	VARPTR	255,157	198

Program Listing 1. Color Computer to MC-10 Program Converter

```

1 'COLOR TO MC10 CONVERTER
2 REM ONE-BYTE DATA
3 DATA 128,0,131,0,0,132,133,134
  ,135,136
4 DATA 137,138,139,140,142,143,1
  44,145,146,147
5 DATA 148,149,150,151,152,0,0,1
  53,155,156
6 DATA 157,0,158,0,159,160,161,1
  62,0,163
7 DATA 164,165,166,167,168,169,1
  70,171,172,173
8 DATA 174,175,176,0,0,0,0,0,141
9 REM TWO-BYTE DATA
10 DATA 177,178,179,180,181,185,
  188,189,190,191
11 DATA 192,193,0,0,194,195,196,
  197,199,200
12 DATA 0,186,187,184,0,183,0,18
  2,0,198
13 CLS: PRINT "CONVERTING"
14 DIM T1(127),T2(127)
15 REM INITIALIZE TOKEN ARRAYS
16 FOR I=0 TO 58:READ T1(I):NEXT

```

Listing continued on page 62

the MC-10. Important note: If you do not delete the lines under 100, the MC-10 will go screaming bonkers attempting to list the invalid tokens of the Color Computer program!

Program Listing 2 shows the antithesis of this conversion, a program to convert an MC-10 program to Color Computer format. It operates similarly.

Here we have only one array, T1. The first entry holds the corresponding Color Computer token value for MC-10 value 128, the next the Color Computer token value for MC-10 value 129, and so forth. The negative values represent Color Computer tokens which are two-byte tokens.

Initialization and conversion proceed pretty much the same as in the Color Computer program. The exceptions are negative values and GOSUBs and GOTOs.

If the byte in a line is found to be a token and the token value for the Color Computer is a negative value, then a test is made for a blank preceding the MC-10 token. There *must* be a blank preceding the token value to convert, otherwise a "NO SPACE BEFORE TOKEN" message is displayed and the program stops. If there is a preceding blank, a 255 is stored, followed by the Color Computer token.

A similar situation exists for the GOSUB and GOTO. If the MC-10 value is a 129 or 130, a 129 (Color Computer GO) is stored in the preceding blank, followed by a TO or SUB value. Here again, there *must* be a preceding blank before the MC-10 GOSUB or GOTO, otherwise an error message is displayed and the program stops.

To run the MC-10 conversion, the program to be converted must start at or above Line 100. Run it, and you'll see periods displayed as each line is converted. At the end of the conversion, delete all lines under 100 and CSAVE to cassette. The result is a cassette file that is loadable by the Color Computer and is in Color Computer token format.

There is one thing that the MC-10 to Color Computer conversion program won't do; any keyboard-generated MC-10 graphics character will not be properly converted unless within a string literal. Normally, though, such graphics characters would be within a string literal, as in 100 AS = "xxxx", where X is a non-printable graphics character.

By the time I had finished the two programs, the morning paper had been delivered and my wife was fixing coffee. Here I was 20 hours later with workable programs that made the MC-10 a little more usable. Unfortunately, however, the guitar player had left. Ah well, I could always provide my own accompaniment. Let's see, where had I put that peasant costume...

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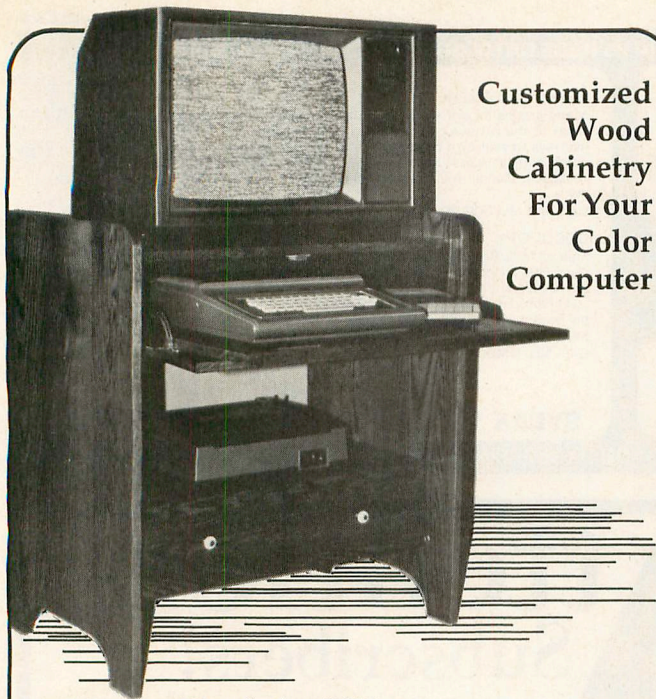


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```

17 FOR I=0TO 29:READ T2(I):NEXT
18 PL=PEEK(&H19)*256+PEEK(&H1A):
  NL=PL
19 GOSUB 22: PRINT ". ";: IF NL<>
0 THEN 19
20 PRINT "SUCCESSFUL TOKEN TRANS
LATION": STOP
21 ' SUBROUTINE: PROCESS 1 LINE
22 IF PL<>NL THEN A$="CATASTROPH
IC ERROR": GOTO 47
23 NL=PEEK(PL)*256+PEEK(PL+1): P
L=PL+2
24 LN=PEEK(PL)*256+PEEK(PL+1): P
L=PL+2
25 IF NL=0 THEN RETURN
26 IF LN<100 THEN PL=NL: RETURN
27 REM TRANSLATE TOKENS
28 ST=0
29 TN=PEEK(PL): PL=PL+1: IF TN=0
  THEN RETURN
30 IF TN=34 THEN ST=(ST+1)AND 1
31 IF ST=1 THEN 29
32 IF TN<128 THEN 29
33 IF TN=255 THEN 38
34 IF TN=129 THEN 42
35 TN=T1(TN-128): IF TN=0 THEN A
$="NO CORRESPONDING MC10 TOKEN":
  GOTO 47
36 POKE PL-1,TN: GOTO 29
37 REM TWO BYTE TOKEN HERE
38 POKE PL-1,32: TN=PEEK(PL): PL
=PL+1
39 TN=T2(TN-128): IF TN=0 THEN A
$="NO CORRESPONDING MC10 TOKEN":
  GOTO 47
40 GOTO 36
41 REM GOTO OR GOSUB HERE
42 POKE PL-1,32: TN=PEEK(PL): PL
=PL+1
43 IF TN=165 THEN POKE PL-1,129:
  GOTO 29
44 IF TN=166 THEN POKE PL-1,130:
  GOTO 29
45 A$="INVALID TOKEN AFTER GO":
  GOTO 47
46 REM ERROR HERE
47 PRINT: PRINT A$
48 PRINT "LINE NUMBER ";LN
49 STOP
  
```

*Program Listing 2.
MC-10 to Color Computer Program Converter*

```

1 'MC10 TO COLOR CONVERTER
2 REM ONE BYTE DATA
3 DATA 128,165,166,130,133,134,1
35,136,137,138
4 DATA 139,140,141,186,142,143
  
```



```

5 DATA 144,145,146,147,148,149,1
50,151,152,155
6 DATA 0,156,157,158,160,162,163
,164,165,167
7 DATA 168,169,170,171,172,173,1
74,175,176,177
8 DATA 178,179,180
9 REM TWO-BYTE DATA
10 DATA -128,-129,-130,-131,-132
,-155,-153,-151,-133,-149
11 DATA -150,-134,-135,-136,-137
,-138,-139,-142,-143,-144
12 DATA -145,-157,-146,-147
13 CLS: PRINT "CONVERTING"
14 DIM T1(127)
15 RE INITIALIZE TOKEN ARRAY
16 FOR I=0TO 72:READ T1(I):NEXT
17 PL= PEEK(147)*256+ PEEK(148):
NL=PL
18 GOSUB 21: PRINT ".": IF NL<>
0 THEN 18
19 PRINT "SUCCESSFUL TOKEN TRANS
LATION": STOP
20 'PROCESS ONE LINE SUBROUTINE
21 IF PL<>NL THEN A$="CATASTROPH
IC ERROR": GOTO 44
22 NL= PEEK(PL)*256+ PEEK(PL+1):
PL=PL+2
23 LN= PEEK(PL)*256+ PEEK(PL+1):
PL=PL+2
24 IF NL=0 THEN RETURN
25 IF LN<100 THEN PL=NL: RETURN
26 REM TRANSLATE TOKENS
27 ST=0
28 TN= PEEK(PL): PL=PL+1: IF TN=
0 THEN RETURN
29 IF TN=34 THEN ST=(ST+1)AND 1
30 IF ST=1 THEN 28
31 IF TN<128 THEN 28
32 IF T1(TN-128)<0 THEN 36
33 IF TN=129 OR TN=130 THEN 39
34 POKE PL-1,T1(TN-128):GOTO 28
35 REM TWO-BYTE TOKEN HERE
36 IF PEEK(PL-2)<>32 THEN A$="NO
SPACE BEFORE TOKEN": GOTO 44
37 POKE PL-2,255: POKE PL-1,-T1(
TN-128): GOTO 28
38 REM GOTO OR GOSUB HERE
39 IF PEEK(PL)<>32 THEN A$="NO S
PACE AFTER GOSUB OR GOTO": GOTO
44
40 POKE PL-1,129
41 POKE PL,T1(TN-128)
42 PL=PL+1: GOTO 28
43 REM ERROR HERE
44 PRINT: PRINT A$
45 PRINT "LINE NUMBER ";LN
46 STOP

```

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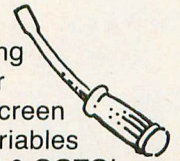
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*by Kerry Leichtman,
Color Staff*

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High-quality educational software took its own sweet time arriving. It seems, though, that the wait was worthwhile. The advertising pages of this magazine reflect its arrival. The quality of the ads alone suggests a more serious attitude toward the education of Color Computing youth.



photo by Charles Freling

One Software House

In October 1981, Tandy and the Children's Computer Workshop signed a contract for the development of a series of educational program packages: 10 for home education and 10 for schools. Children's Computer Workshop (CCW) is a division of Children's Television Workshop (CTW). Although CCW is striving for an identity separate from CTW, for recognition's sake I'll remind you that CTW is the organization responsible for such education phenomena as *Sesame Street* and *1-2-3 Electric Company*. Tandy went to the right people!

CCW hired two creative professionals to head up the projects: Daniel Oehlsen, project manager for home products, and Barbara Stewart, project manager for school products. On the school side, Tandy put very few boundaries on the project. "All Tandy stipulated was language arts and computer literacy for children in grades one and two. They left the rest up to us, which was very nice," said Barbara Stewart.

Even less direction was given to the home products. "The home project was much more open-ended," explained Dan Oehlsen. "We weren't asked to produce for specific areas, but rather just to create 10 products for the home. We settled on doing one set of preschool activities, and that was simple. We went to the Sesame Street goals and objectives for the past season and pulled out four areas and four Muppet characters to work with. The difference between the home and school projects is that we're designing software that is fun first and educational second. The school programs' orientation is the reverse."

The 10 games in the home series span the ages three to fourteen. "The first cluster is for kids three to six. They concentrate on preschool skill areas and use Muppet themes," Dan said. This package resembles the school programs in that they focus on a specific academic area. The next group, for ages seven and older, uses a different approach to child entertainment: "You've got to play cooperatively, rather than competitively with your partner." The third group is also for children ages seven and older, but is different in focus. These games require strategic planning and exploration. "They have some school information in them, so kids are doing a lot of incidental learning as they go along. But still, the emphasis is on fun."

All the home programs require a 16K tape-based system. The school programs require 32K and at least one disk drive.



Photo 1. Dan's on the right, and that's me on the left. Cooperation is the key to doing well.

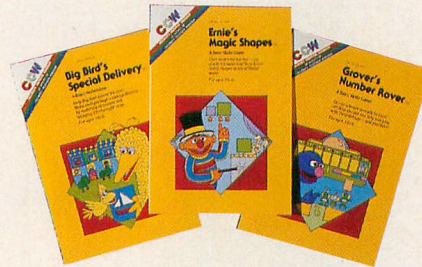


Photo 2. Packaging samples from CCW's preschool programs.

The preschool programs are titled, "Grover's Number Rover," "Cookie Monster's Letter Crunch," "Big Bird's Special Delivery," and "Ernie's Magic Shapes." The activities represented in these programs are the preschool concepts children are introduced to in preschool classrooms.

"They're the kind of activities that parents buy coloring books for. They are very basic, easily recognizable concepts for preschoolers. Our goal was to try to do some things using the computer that couldn't be done in another medium, with the philosophy that if it *can* be done in another medium then it *should* be done in another medium. Why buy \$300 worth of hardware to do something you could do with a coloring book?"

"Take Sesame Street for an example," Dan continued. "Sesame Street wasn't designed to replace school, but rather to give kids some supplementary instruction and ways to have fun with concepts taught in school. The idea is always that learning is fun."

I, Guinea Pig

Not knowing my educational background, Dan chose and loaded "Cookie Monster's Letter Crunch," and selected level one. It is a self-paced activity, and I mastered it quickly. "Not bad," I thought. We progressed to the hardest level. The game has four different levels, plus six sublevels, so you really have 24 different levels of activity, plus an editor which lets a parent or teacher add words if he or she likes.

The word "woman" flashed briefly on the screen. My mission was to remember the letters and find corresponding letters on the screen. My goal was to get the letters and put them in the Cookie Machine so the Cookie Monster can snack on them. When I forgot the word, pressing the spacebar displayed it again. In this advanced level I was racing against the clock. It is a very slow clock, all of the timing having been researched to a child's pace.

The games for the older kids include the traditional game themes of action and tension. "The catch being," said Dan, "that we've created environments that one can be most successful in if you cooperate with someone else. A child can play them by himself, but can do best when collaborating with a partner. That was our educational goal in the broadest sense when we set out to create these programs."

Let me set the scene for the next game Dan and I played. At the top of the screen are moving stars. At the bottom, two characters: Nutniks. Dan and I are the Nutniks. At opposite ends of our platform, we each have a trampoline sort of thing called star springs. We have to jump up and gather stars to power our sandwich machine. When we've gathered enough stars, a sandwich is created in the center of our platform. Since jumping to gather stars requires energy, we have to eat the sandwiches. If we eat too many sandwiches we become too fat to jump. Each time we jump, our Nutnik character gets thinner. When we eat he gets fatter. Dan warned me to watch out for Snarks: they like sandwiches, too. Dan will now take us through the game, Howard Cosell-style.

"I'm the green guy there, and you're the other one. If you push the action button as the stars go by, it'll launch you toward the stars." (CCW refers to the red joystick button as the action button rather than fire button. Back to Howard.) "Notice that as we catch the stars we are building a sandwich in the sandwich ma-

Continued on page 71

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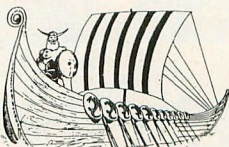


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by Dave Hooper and Mark Barnes from Prickly Pear

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One of the most popular arcade games ever... now available for your Color Computer! Just as in the arcade game, you must dodge heavy traffic and jump the moving logs in the stream to get home. Fantastic graphics. One or two players, use keyboard or joystick.

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COLOR CATERPILLAR

from Soft Sector Marketing

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from Spectral Associates

Pilot a chopper over varying terrain while destroying enemy bases with bombs and missiles. Destroy enemy fuel depots and win their fuel. Hi Res color graphics, machine language arcade game has three screens. Requires joysticks.

32511 16K Tape \$21.95



DOLLARS AND SENSE

from Spectral Associates

Smarten' up! What's more important than learning about money? This new educational game will teach your child about dollars and coins. Easily reinforces coin recognition and value. Let the kids count the change!

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MASTER CONTROL II

from Soft Sector Marketing

This is a BASIC language program designed to decrease typing time and error while providing direct control of motor, trace, audio and run. With Automatic Line Numbering and a custom key you can re-use or change at any time; plus 50 preprogrammed command keys. Can be used on a 32K system.

21340 16K/32K Tape \$24.95 \$21.21

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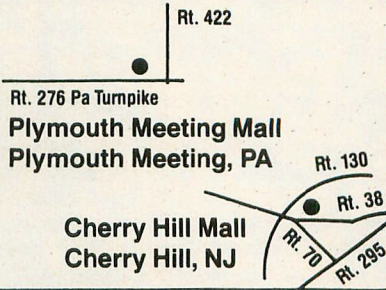
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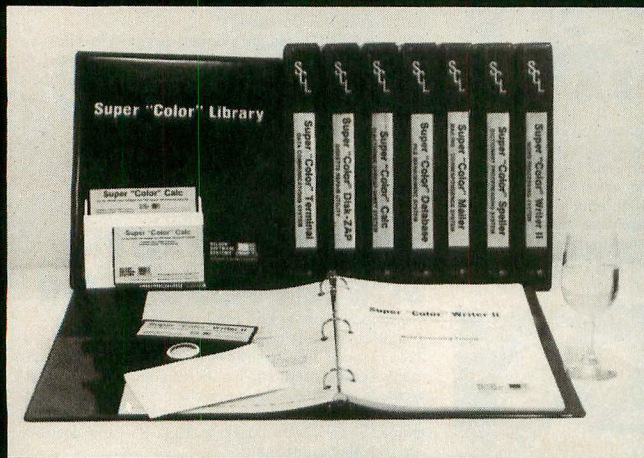
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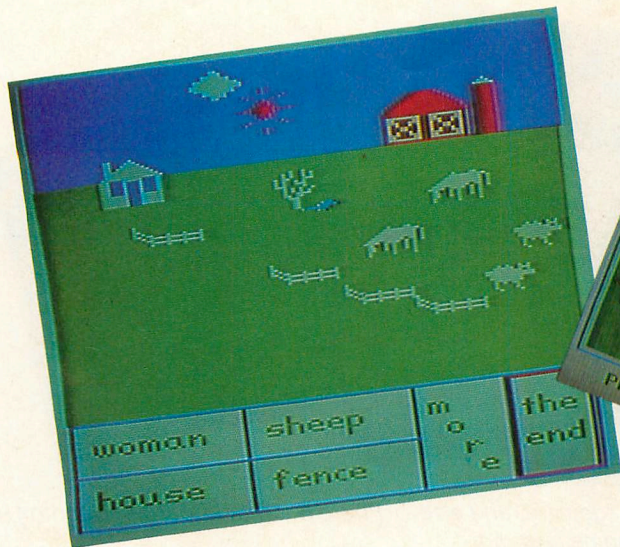


Photo 3. Barbara's farm scene. "It's important the screen graphics look like the objects they're supposed to be."

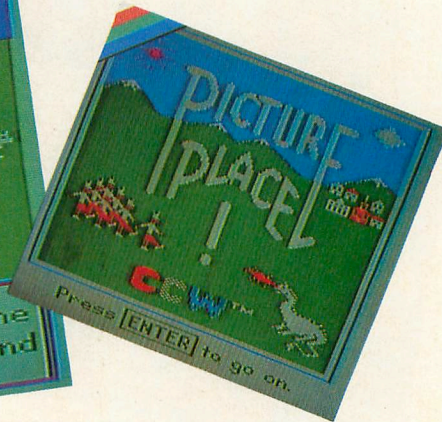


Photo 4. Opening screen for "Picture Palace."

chine. We can both play along by ourselves as long as we like, jumping and eating and jumping and so on. But actually, we're at an important place in the game now. We need to get those big stars, but neither of us can reach them.

You go over and stand on that star spring over there. No, don't press your action button!" (Oops.) "And I'll stand on this one. As that star goes from left to right, I'm going to press my button," (Wheeeee!), "and that launched you. Now you can launch me when this star goes by—but I can't get high enough because I'm fatter than you are. It's going to be real tough for us to get that star. So, why don't you eat that sandwich and see if you get fatter? Indeed you do! And I'm going to jump up and down to get skinnier. Now, if we can get that last star, we will have cleared the sky and magically we'll go to the next screen.

In the next screen, the stars move faster. At each level, the stars' speed increases to the point where collaboration becomes necessary. "What happens," said Dan, "is that the kids begin to talk to each other. And the game, which started out at a fairly slow pace, begins to get a bit frantic. Stars begin to whiz by. Now we have to accumulate a stack of sandwiches to fuel us because we are missing on many of our jumps. The sandwich deck can go as high as we want it to. We have to begin thinking about our resources.

"But there is another little trick. Go over there so I can launch you. There's one coming!—missed. You'd better eat that sandwich. This is what really happens. Kids talk to each other the way we are."

The third round introduces a common cause. "We continue to accumulate sandwiches, but now we're going to have to watch out for Snarks. The more sandwiches there are, the more likely a Snark will come and eat a sandwich. As we go up in rounds the Snarks come more frequently. But because the stars are moving faster, we're missing a lot,

*"No, don't press
your action
button!
(Oops!)"*

we're trying to build up sandwiches so we can get to the next round. But the Snarks are also going for them. We can either eat all the sandwiches, which might make us too fat to jump, or we can jump up and catch a Snark so that it disappears.

"When we're both really thin and have no sandwiches left, we can't catch any stars and the game ends. We get a score at the end. We are the Nutniks, and have made eight sandwiches, and the Snarks have zero. We were really playing against the Snarks."

Quality Management

All of CCW's programs have been extensively researched and field tested by consultants, teachers, educational researchers, and CCW people. Of course, one of the aspects of the testing was to

see if the age groups the game is meant for could handle the instructions and possess the motor skills needed to play. Another aspect of the testing was to see how much kids enjoyed the games. Testing was done in private homes, schools, summer camps, computer camps, and in CCW's offices. "The worst thing you can do to the consumer is give him something the kids are going to play a couple of times and then put on the shelf forever," Dan said.

School Games

The same extensive testing and research took place in the school product division. But, where Dan's division placed a special emphasis on longevity, Barbara Steward made sure her products were teacher friendly. "We developed two separate product lines—one in the area of English arts, and one in the area of computer literacy, for children in the first and second grades. We narrowed the field down to three ideas for each package. Within the package's box are three learning modules and a teacher's guide. The folder has 10 reproducible spirit masters, or worksheets, for the teacher. It also has five activity cards and a game board. The idea behind these components, in addition to supporting the software, is that teachers are familiar with these kinds of ancillary materials. So for teachers, those who are afraid of computers and software, it is a familiar learning aid. And for the children, all of the pieces in the folder highlight the same learning goals, so there are different ways to practice the same skills."

Please turn the page

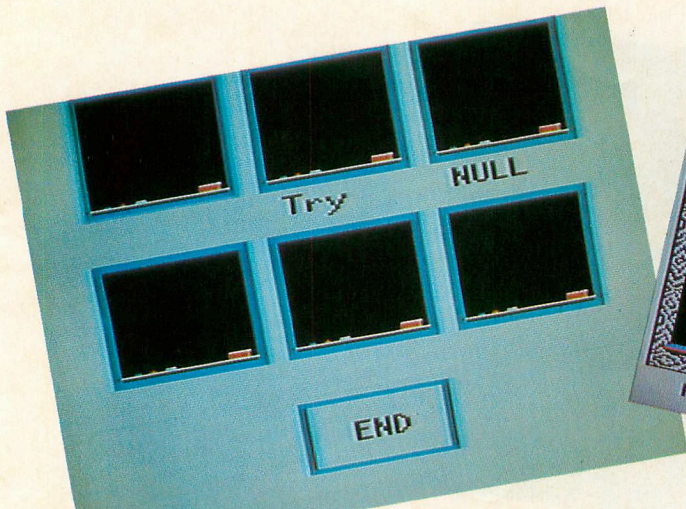


Photo 5. Word processing, data file management, and electronic mail concepts make this an outstanding program.

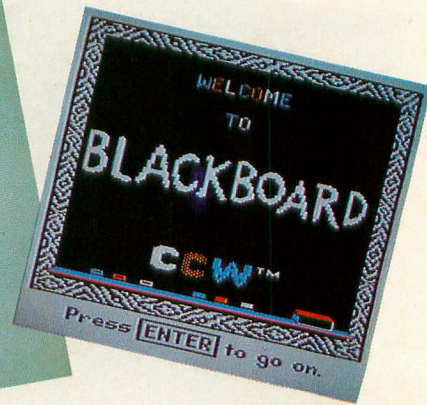


Photo 6. "Blackboard's" opening screen.

The language arts box has three activities. "Picture Palace" highlights beginning vocabulary. "Roll-A-Word" is a rhyming, word-family linguistic patterning game. And "Bagasarus" is a reading comprehension game that uses a dinosaur as the main character.

"Picture Palace" gives the student a choice of three background scenes. Once a scene is chosen the computer randomly selects 24 words from a pool of 40 words related to the selected scene, and four words from each of the scenes not selected, which allows for a certain amount of fantasy.

Barbara chose the nature scene. A farm scene appeared on the screen, with four words and a red-box cursor. "To play the game you put the cursor on the word you want and press Enter. Then you place the cursor at a location on the screen where you want the picture of that word to appear, and press Enter again. From the child's point of view, he or she is building a picture. From the teacher's point of view, as the child attaches the word with the cursor, and moves it, his attention is focused on that word. When he presses Enter, the association between the word and picture is reinforced."

Picture-words can be moved, eliminated, and used over and over. The child can create a whole field of flowers. To get more words, the cursor is placed on the More box, and Enter is pressed again.

"Even though the joystick is used to roam the scene for places to put the picture, we felt that the Enter key has, from a computer literacy point of view, a certain function, and we wanted kids to use that right away. We tested to make sure kids would be able to recognize and use the Enter key.

"Another of the issues we looked at when we were researching this particular activity is that it's very important the screen graphics actually look like the object they're supposed to be. So we took all the images out of context and showed them to children and asked them what they were, and then made changes in the art as necessary."

"We took all the images out of context and showed them to children..."

One of the more amazing programs developed by the school division is called "Blackboard." It is by far the best approach to introducing children to the power and flexibility of computers that I have ever seen. "Blackboard" has the child doing some basic word processing, file management, message sharing, and math. There is also a section called Color-It, which is a drawing tool. The philosophy behind Blackboard was that we wanted to show what can be done with the computer in terms of self-expression and also some uses of the computer in terms of the beginnings of electronic mail and file management."

All CCW's school packages come with what is called a learning manager, for

teacher's use. It lets them control the activities taking place and is very teacher friendly.

Barbara explains "Blackboard": "The learning manager in this one allows the teacher to create a class. Then kids have to find their name amongst the others. Our programmer, Chris, created a class for me to demonstrate with. I, as a student, will pretend I'm Big Bird. The first thing I see is six blackboards. I will find the one with my name on it, Big Bird, and write a message using the word processor. I am also able to change my color chalk by pressing a key. Now a teacher can come up to the screen and say, 'Oh, that's very nice, but you need to begin a sentence with a capital letter.' I use the Enter key, scroll to the top again, find the right color chalk, and correct my mistake by deleting the wrong letter and putting in its capital."

As Blackboard's levels increase, so does the child's use of the computer's capabilities. At level three the child is given the option of sharing the contents of his blackboard with his classmates. The Computer prompts, "Do you want to share this with your friends?" If he answers "yes," the word Share appears next to the Blackboard's title, and other students know they are allowed to read it. By the time the student gets to level three, he has used a word processor to create a file, and by marking the file Share, he has had his first introduction to E-mail.

Children's Computer Workshop's programs for Tandy should be available by September first. If I were still a child, this and many of the other education programs on the market would make me glad to be back at school. If I were still a child...



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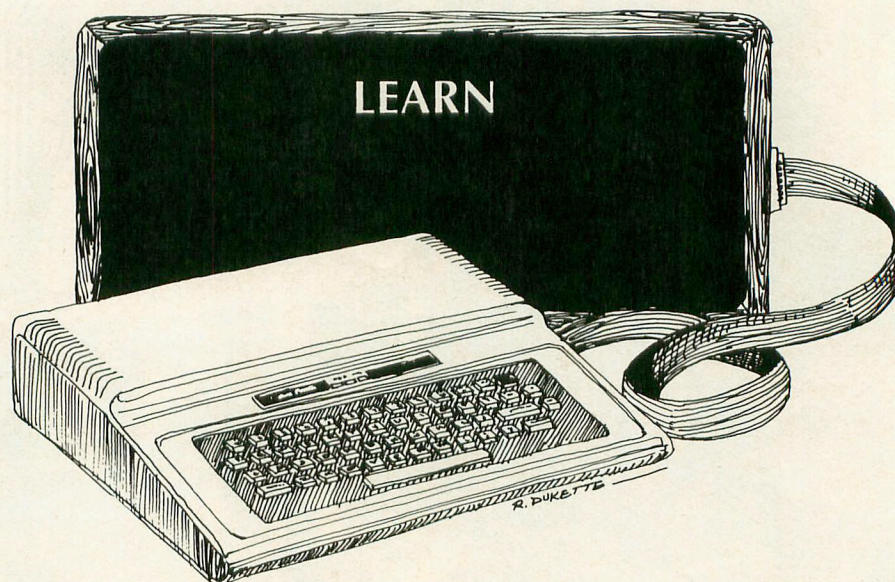
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GOTO SCHOOL



IT IS BECOMING increasingly apparent that educators are awakening to the potential of the Color Computer for educational purposes. First and foremost in the favor of this computer is its economical cost, which allows school purchasers the opportunity to obtain larger quantities of equipment for one price, thereby affording more students the opportunity to work directly with the computer. Also, Radio Shack gives a 20 percent discount to approved schools; this discount extends to software purchases as well.

For the home educator, the reduction in price has certainly made a purchase of the Color Computer very attractive.

There is a more important reason for the growth of the Color Computer in education, however. The reason can be found in the pages of this magazine: just look at the list of advertisers, and what they have made available for educational Color Computer use! There are word processing programs, tutorials, authoring programs, problem-solving activities, and a variety of others. In the near future I will tell you more about some of the dealers who have done an exceptional job of developing educational software. At this time, I suggest you review the advertising to see what is available. The Radio Shack Education Department is the largest supporter in the country for educational uses of the Color Computer.

by Dr. Paul Kimmelman

The list of existing programs (Logo, Color Chemistry, Author, etc.) will only be surpassed by the programs to be released in the near future. Bill Gattis, Education Director for Radio Shack, has been publicly encouraging the educational use of the Color Computer. That can only translate into many new benefits for owners.

Looking At Software

Programs from Bertamax can supplement any school curriculum program. I am very impressed with the variety and quality of the offerings from Bertamax.

Tom Mix has also become established in the game and educational software markets. These products are excellent and well-documented.

Finally, Follett Library Publishing Co. has established a specialized education computer software department directed by Andy Larson. Programs that have received a great deal of positive attention but were originally marketed for the Apple computer have now been converted and are ready for Color Computer users. The programs — Moptown, Bum-

ble Games, Bumble Plot, and Juggles' Rainbow — are all excellent. More on Follett in the future.

If you have educational software and would like me to review it, please send it to me in care of: GOTO School, P.O. Box 8276, Akron, OH 44320. It is not my intention to slight anyone, yet I want to recommend those programs that will best serve Color Computer user's educational needs.

America's Educational Challenge — Part II

Last month I discussed Part I of Radio Shack's effort to help America's educators through distribution of books and a certificate for a filmstrip or slide/cassette program to every school in the United States. Part I was devoted to educational applications of microcomputers. This month I will discuss Part II, *Introduction to Microcomputers*.

If you are an experienced computer user this review will not be very useful. For beginners, however (and many teachers who have not had an adequate opportunity to work with computers), my comments should help. Remember — the filmstrip or slide program is available for \$5 (to cover shipping and handling) from Radio Shack *for any school*. This is a real bargain!

B5 Software

B5 believes the Computer is a unique teaching tool and deserves quality software. Our programs are based on sound learning principles and make learning fun.

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for your TRS-80* COLOR COMPUTER* & TDP-100
with Extended Basic

CLOCK †



Grades 1-4. Helps children practice telling time. 4 skill levels: hour, quarter hour, 5 minute and 1 minute intervals. Options include reading hours and minutes separately on the large graphic clock with synchronized hands. After 10 correct answers a small mouse ascends to the tune of Hickory, Dickory, Dock.
16K Cass \$24.95 32K Disk \$26.95

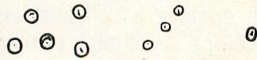
MATHFACT †

Grade 1-5. Motivates students to learn their facts. All 4 math operations are in the program. Student selects the desired operation then the desired addend, subtrahend, factor or divisor, or then can request a mixed presentation within each operation. 2 skill levels, all drills timed and scored. If all facts are answered correctly, students can play a quick number game as a reward.
16K Cass \$16.95 32K Disk \$18.95

ABC'S

Grades K-1. The child types the letters in the alphabet to the tune of the alphabet song. The reward is a graphic and sound display.
16K Cass \$9.95 16K Disk \$11.95

MONEY †



Grade 2-4. Provides an opportunity to count coins. 5 skill levels range from counting only dimes, nickels and pennies to counting various combinations of all coins which can total more than one dollar. The program uses graphic coins. If a series of 3 problems are answered correctly a rocket ascends to the moon. If 1 or more are incorrect, the rocket crashes instead.
16K Cass \$19.95 16K Disk \$21.95

HANGWORD & SCRAMBLE

Grades 1-8. Presents 2 word games. Hangword is similar to the old favorite, Hangman. Blanks appear and students guess letters for the blanks. Wrong guesses build the graphic display of the word 'Sorry'. Scramble displays the word with the letters scrambled. Students guess the word and spell it correctly. Input own words with this program or purchase data tapes. See data tape listing. Printer use optional.
16K Cass \$14.95 32K Disk \$16.95

SKIP COUNTING

Grades 1-4. Helps the child learn to count by 1's, 2's, 5's, 10's, 100's, or any number desired. The user selects the parameters by giving the number to count by and the beginning and ending number of each sequence. The student can practice at whatever level needed, and each lesson has a graphic reward.
16K Cass \$16.95

DATA TAPE LISTINGS

Data Tapes may be used with other B5 programs. They cannot be used alone.

BORROW †

Grades 2-4. Allows the student to reinforce subtraction skills. Problems appear in large graphic numerals. Small boxes above the numerals allow for regrouping procedures. 7 skill levels. A happy face appears on the screen for each correct answer. After 10 completed problems, a Pac-Man-type creature munches a numeral down.
16K Cass \$19.95 32K Disk \$21.95

SPELLING

Grades 1-8. Very flexible as it allows you to input your own choice of words and store them on tape files. You may also purchase data tapes for this program. See data tape listing. Words flash on the screen from .1 to 10 seconds, then student types the word. The score is given after each entry and the student is rewarded with a graphic display of words and a song. Printer use optional.
16K Cass \$16.95 32K Disk \$18.95

Use with Keyboard Program
KEYBOARD PHONIC DRILL - Letter, word and sentence finger drills using common vowel and consonant combinations. \$8.95

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GRADE LEVEL SPELLING - Over 300 words on each tape. Each lesson follows a phonic rule. Available in Grades 2,3,4,5 or 6 levels. \$8.95 per grade level

SPACE WORDS - Over 300 words to challenge and motivate the superior speller. Grades 4-8. \$8.95

ADULT WORDS - Most often misspelled words. Highly challenging. \$8.95

Use with Questions Program
NOUNS AND VERBS - 4 lessons on nouns and 4 on verbs. Grades 3-5. \$8.95

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Complete Series of 4 \$39.95

CARRY †

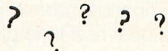
Grades 2-4. A program designed to help students to practice addition. Uses same format as Borrow. 4 skill levels.
16K Cass \$19.95 32K Disk \$21.95

KEYBOARD



Grades 1-6. Helps familiarize student with keyboard. A graphic keyboard enables user to locate keys quickly. Home keys are identified and proper fingering may be taught. Lessons are built around alphabet, finger, word and sentence drills. At the end a graphic reward is given. 32K version has lengthier timed drills. Both 16K and 32K versions can use data tapes for further practice. See data tape listings.
16K Cass \$19.95 32K Cass \$24.95 32K Disk \$26.95

QUESTION



Grades 1-8. Asks questions with multiple choice or true and false answers. Fits any curriculum because you can input the questions and answers. Graphic reward is a blinking robot. Also designed for use with data tapes. Printer use optional.
16K Cass \$19.95 32K Disk \$21.95

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QTY.	DATA TAPES	AMT.
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In Part II the computer is defined as a programmable machine that can store and process the information we give it. It (computer) can follow our instructions exactly, and solve problems quickly and accurately. More important, a computer cannot think for itself or make value judgements.

Using a computer to solve problems involves three main steps, INPUT, PROCESSING, OUTPUT. The *keyboard* is the main device used for input. Other peripheral devices used for input are *cassette recorders, disk drives, and modems.*

The *video display* is the computer's main output device. A *printer* is also an example of an output device.

Data (information) is temporarily stored in the computer's memory. *ROM* (read only memory) uses instructions without altering them. *RAM* (random access memory) allows the user access to it. When the computer is turned off, you lose anything stored in RAM.

A *bit* is one binary digit, 0 or 1. Eight bits comprise one *byte.*

Programming is what we do to communicate with the computer. You don't have to know programming to use a computer, however. Many programs are available to the computer user that need only be loaded into the computer and run.



Another portion of Part II describes how to use the computer. I assume all of you have done this, so let's not waste any valuable time or space. If you are having a problem, refer to your user manual or call your dealer.

There are several program and authoring systems for teachers sold by Radio Shack. By the time you read this article, "Color Author" should be available. This is an excellent program for teachers, and can be easily learned and used. We'll discuss Author in more detail in the future.

I mentioned Color Logo in last month's

article. This programming language should have its biggest year in education this year. The growth of its popularity is amazing.

The filmstrip or slide/cassette program sent to every school, if requested, is an outstanding effort on the part of Radio Shack to help quickly educate our nation's teachers in the use of computers.

Our Education Address

We want to expedite our review of educational software and respond to your questions and suggestions. I will attempt to respond to all questions if you will enclose a self-addressed, stamped envelope. I will also publish a sample of each month's questions and suggestions. Please note the address: GOTO School, Dr. Paul Kimmelman, P.O. Box 8276, Akron, OH 44320.

Color Logo

As I noted previously, the growth in Logo's popularity is amazing. I recommend Logo for all educational computer users. While there are many outstanding programs available for educational use, Logo is the appropriate program to emphasize the concept that the user should

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TEXPROIII (TEXT EDITOR/PROCESSOR)

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

C-C BUS

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Connect the C-C BUS to the ROM port (requires S-cable) and instantly have six software selectable expansion slots. Expand memory beyond 64K, add a parallel port, EPROM programmer, digitizer...you name it, and software select the one you want to use without having to turn your computer off to change cartridges. The C-C BUS is compatible with any size system and automatically senses when you are in the 64K mode, preventing any contention problems. The C-C BUS is supplied complete with a **built in power supply**, connection cable, and molded plastic cover.

P-C PAK

\$79.95

Free up your serial port for communication by add-

ing this fully buffered Centronics compatible parallel printer port. The board can be supplied with an optional real time clock (\$69.00) or both for \$122.95.

MEM-PAK

\$114.00

16K RAM/ROM expansion board. Use it to expand RAM beyond 64K (using the C-C BUS) or put your programs/utilities in ROM for instant loading.

PROTO-COCO

\$10.95

Build your own expansion projects on this prototyping board that will fit in a disk controller case when you are finished. Included is a manual with several expansion ideas.

ACCESSORIES

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program the computer. An especially nice feature of Color Logo is the doodle mode, which lets young children, who cannot read, program by using an overlay on the keyboard and one-key commands.

Beginning next month, a Logo section will be a regular part of this column. George Gerhold, co-author of Color Logo, has kindly shared with me some of the programs his college students have written. A listing of some of those programs will appear in the October issue. Also, suggestions on how to use Logo at home and in the classroom will be featured.

To obtain some interesting materials on Logo, I suggest you write for the following information: A bibliography of Logo memos is available from the Massachusetts Institute of Technology for \$1.25. The address is: MIT Logo Group, 43-7th Floor, 545 Technology Square, Cambridge, MA 02139.

Also, a fine organization for Logo users exists. The organization is the Young Peoples' Logo Association. The address is: YPLA, 1208 Hillside, Richardson, TX 75081. The YPLA director is Jim Muller; he has a sincere interest in Color Logo as well as the other Logo versions.

Please send me your ideas; the Logo exchange via this magazine will help all of us.

Static Electricity

As more computer labs are developed, more of us discover that static electricity can become a problem. To combat this problem, Computerware Inc. (located at 315 South Third St. in Stillwater, MN 55082) has developed the TouchMat. The TouchMat is a static-dissipative mat that sits on your table directly under the computer. It "pulls" static off the human body without hard sparking through a grounding cord.

Books

Most of us educate ourselves about computers. Therefore, it is important to be knowledgeable about what materials are available for Color Computer users specifically, and computer use in general.

A recently released book, *Top-Down Basic for the TRS-80 Color Computer*, was written for the computer user who has some experience with Basic commands and wants to create understandable, organized programs. The book was written by Ken Skier, and is available from Byte Books/McGraw Hill.

Skier demonstrates how to design a program from the top down, how to structure programs so they can be maintained and extended as desired, how to

write readable programs that are easy to understand, and how to write programs that run.

The book also includes a practical guide on how to design a user interface for games, animation, and educational programs. There are many sample program explanations, including an arithmetic tester, a clock with hands, fancy clocks, an X,Y function plotter, and games.

That concludes this month's article. I am certain that this Back to School issue will be more than enough to get an exciting school year started. This year will find more computers in our schools than ever before; I am sure the same statement will hold true for parents using computers at home to help educate their children. This brings up a philosophical dilemma — what about the implications of home educational computer use and the schools? I will discuss this in the future, but before I do, I'd like to hear your thoughts. Should a program like Color Chemistry be made available to students who are not in high school, just because chemistry is traditionally a subject for high school juniors? What about algebra?

Also next month, Logo, educational software vendors, and a lot more.

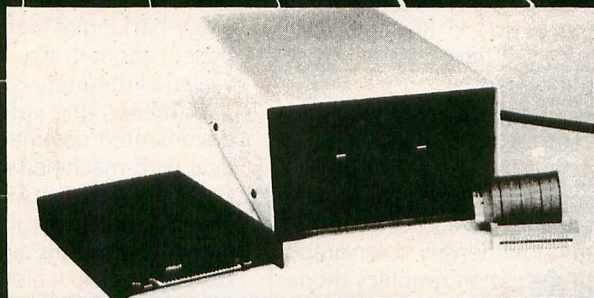
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101

Custom Color

Give your MC-10 something to think about.

WHAT? A DINKY LITTLE piece of computer junk from Radio Shack? Who cares? You might care, when you find out:

- It costs about \$120 (less from some dealers, and expect occasional Radio Shack sales) with 4K of static RAM (about 3.2K, since the video calls for 512 bytes, and the system another 200 or so).

- It has a 6803 processor (one of the so-called "second generation" micro-processors), almost as powerful as the Color Computer's third-generation 6809. The 6803—part of the 6801 family—uses direct port inputs to the CPU.

- The keyboard uses these direct port inputs to the 6803, a nice touch.

- The unit is crystal-controlled from a 3.58MHz crystal in the RF modulator, which also provides the necessary clocking for the color video.

- The 6847 video display generator (VDG) is identical to the Color Computer's, meaning the characters per line (32) and lines per screen (16) are the same format and have the same 5x7 characters and low-density color graphics. The high-resolution graphics modes also work (more later).

- The MC-10 uses the same RS-232 printer and cassette ports as the Color Computer, and the same cassette and printer speeds and formats as well.

- Its Microcolor Basic is virtually identical to Color Basic. Following the Sinclair and VIC-20 leads, key words and some graphics can be typed directly from the keyboard. For me, however, the substitution of a control key for the left shift key is disturbing.

by Dennis Kitz

- It has a 34-pin expansion port for future who-knows-what. There is, however, no provision for internal Basic or RAM expansion, though I have heard some Basic ROMs are in sockets. If the computer becomes popular, I would imagine some outboard RAM would appear, or Radio Shack would do some piggy-backing of memories. If you're impatient about it, stay with me; secrets revealed a little later.

- There are at least five undocumented commands, four of which deal with machine language programs: CLOADM, EXEC, VARPTR, USR and OFF. The first three work just fine; USR apparently needs some direction (there is no DEFUSR to help it along), and OFF strikes me as a leftover from Color Basic's AUDIO and MOTOR commands. Want to see the keywords and lots of other stuff? Run this:

```
10 FOR X = 49152 TO 65535
20 PRINT CHR$(PEEK(X))AND127OR32);
30 NEXT
```

- Also, the instruction booklet says POKE will only work with video memory. Wrong: it will work anywhere. Want to

change the cursor blinking character? POKE 17026,201... just for one example.

- The MC-10 won't load Color Computer programs directly, since the keywords are "tokenized" quite differently. But never fear; the Color Computer's "A" option CSAVE can be used if the program isn't too long in ASCII form (?OM errors abound in my tests). Some POKEing around is still needed to get line information straight, but it looks to be valid. (For another method, see Bill Barden's rundown of the MC-10 this month).

- Interference is remarkably low, even with a TV resting on the back of the computer. Heavy internal shielding is the lesson Radio Shack learned well from the Model 1, and, in my experience, they have learned it better than any manufacturer.

Listen, this is no one's dream computer, especially for \$100, but I'll take it just for parts! I have always liked Micro-soft's implementation of Basic for Tandy, and I like it once again here. When Radio Shack says that the MC-10 is part of their "Color Computer family," it is true: Basic, processor, video display and style.

Tear It Up

Even though the MC-10 is intended as a minimal computer, the 4K of memory is not satisfactory. Besides, I suspected that the high-resolution graphics modes could be used, but the highest resolution (256 x 192) requires 6144 bytes of memory, 2K more than the machine is designed with. Why not bring it up to 8K?

Please turn to page 80

Continued from page 78

I thought it would be an easy task, until I ran smack into the ghost—Radio Shack had used the phantom memory technique again! (Refer to "Custom Color," April, 1983, for more on phantom addressing.) In fact, memory was so incompletely decoded that there was already a change inside my MC-10 to correct an unanticipated flaw.

This analysis is just backwards engineering, mind you, but here is what it looks like to me. Judging from the unmodified circuit board, RAM was phantom-tomed every 4K address block. Figuring that the MC-10 wasn't really being sold as an expandable machine, the hardware designers probably considered that saving an electronic part or two would be a good move. This decision resulted in memory not only appearing at \$4000 to \$4FFF, but also seeming to appear at \$5000 to \$5FFF, \$6000 to \$6FFF, and \$7000 to \$7FFF. Have a look at Figure 1, the original decoding scheme. Notice the output of the memory demultiplexer are binary 00, 01, 10, and 11. The 01 line alone was used to decode the memory, and 01 represents the most-significant two bits of \$4000 to \$7FFF.

Enter Microsoft, author of Tandy's Basic. Microsoft's power-up memory test technique is simple, fast and reliable.

Here's how it works: It starts at the first memory location to be tested, reads the binary information from that memory location, and saves it in the CPU. Next it complements that binary data (changing all 1's to 0's and all 0's to 1's), and stores that information in the memory location being tested. It reads it back. If it reads back exactly what it just stored, then that memory location passes the test. It finally restores the original value to memory, leaving it as found.

In case you missed what makes that a valid memory test, recall that the original number living in that memory location was read, saved, complemented, stored, read back, and re-stored. In order to pass the test, every bit of that memory location must be capable of storing a 1 or a 0 (the original value) or its complement, a 0 or a 1. That covers all the possibilities... and defines good memory.

Phantom addressing makes this scheme fail. The Microsoft memory test does not have a larger perspective, so to speak; once it has read a location, it goes on to the next one. If the address it just read was, say, \$4FFF (the end of the MC-10's 4K of memory) and the next one is out of range at \$5000, what happens? \$5000 still tests all right because it is a functional *phantom of \$4000*. It isn't "real," but Microsoft's test believes it is!

Please turn to page 83

MC-10 Color Computer — Parts Definition

Symbol	Device	Function
U1	MC6803P	CPU
U2	74LS373	Address/Data Latch
U3	B364	8K x 8 BASIC ROM
U4	74LS155	Memory Decoder
U5	74LS367	Address Buffer
U6	74LS367	Address Buffer
U7	74LS245	Data Buffer
U8	74LS174	General Latch
U9	D4016	2K x 8 RAM
U10	D4016	2K x 8 RAM
U11	MC6847	VDG
U12	74LS14	General Inverter
U13	74LS32	General OR Gate
U14	MC14503	Sound Output
U15	LM339	Cassette Input
U16	HA17741	
U17	7805	5-Volt Regulator
U18	74LS74	Master Clock
U19	74LS76	General Flip-Flop
Inside RF modulator unit:		
—	MC1372	Video Modulator

Table 1. Parts list and definitions of the MC-10; clock is generated inside RF modulator.

\$0000-\$00FF	6803 internal RAM
\$0100-\$3FFF	Not used
\$4000-\$41FF	Screen RAM
\$4200-\$4FFF	System and user RAM
\$5000-\$5FFF	Not used
\$6000-\$6FFF	Phantom of RAM
\$7000-\$7FFF	Not used
\$8000	VDG and sound latch
\$8001-\$BFFF	4095 latch phantoms
\$C000-\$DFFF	BASIC ROM
\$E000-\$FFEF	Phantom of ROM
\$FFFO-\$FFFF	System vectors

Table 2. Generalized memory map of the MC-10. Areas not used as phantom can be internally modified for expansion.

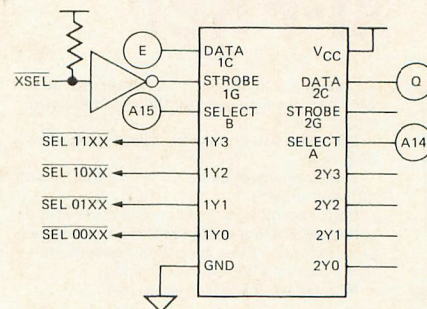


Figure 1. On-board memory decoding of the MC-10, before the Radio Shack correction.

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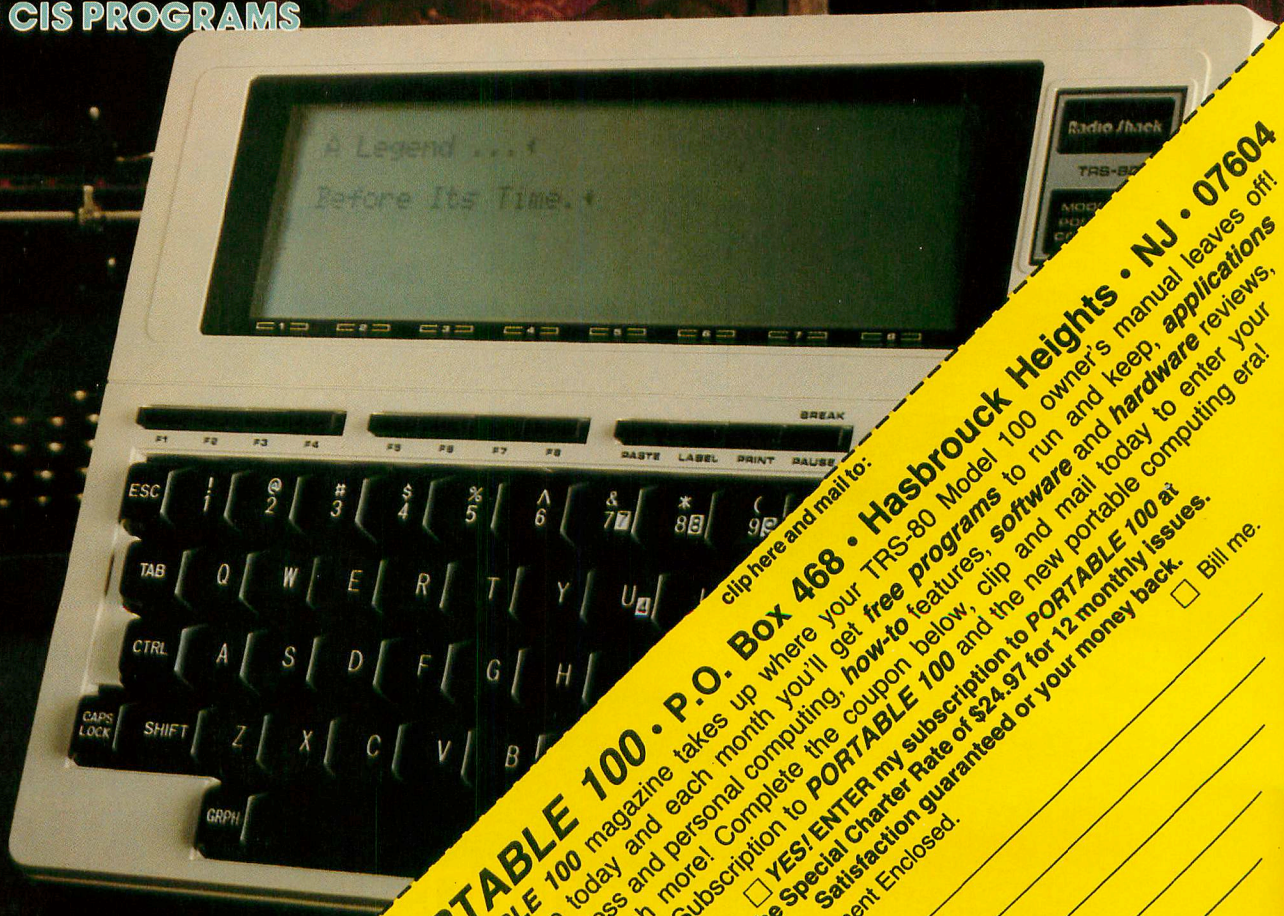
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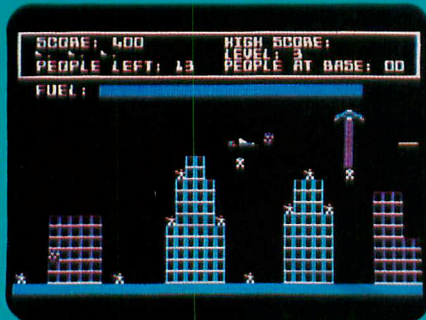
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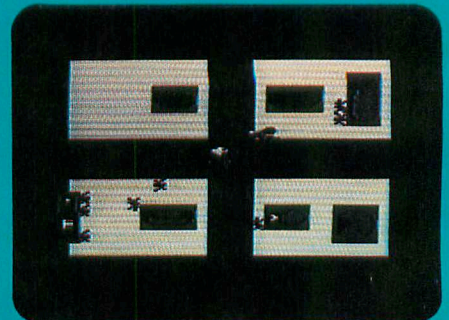
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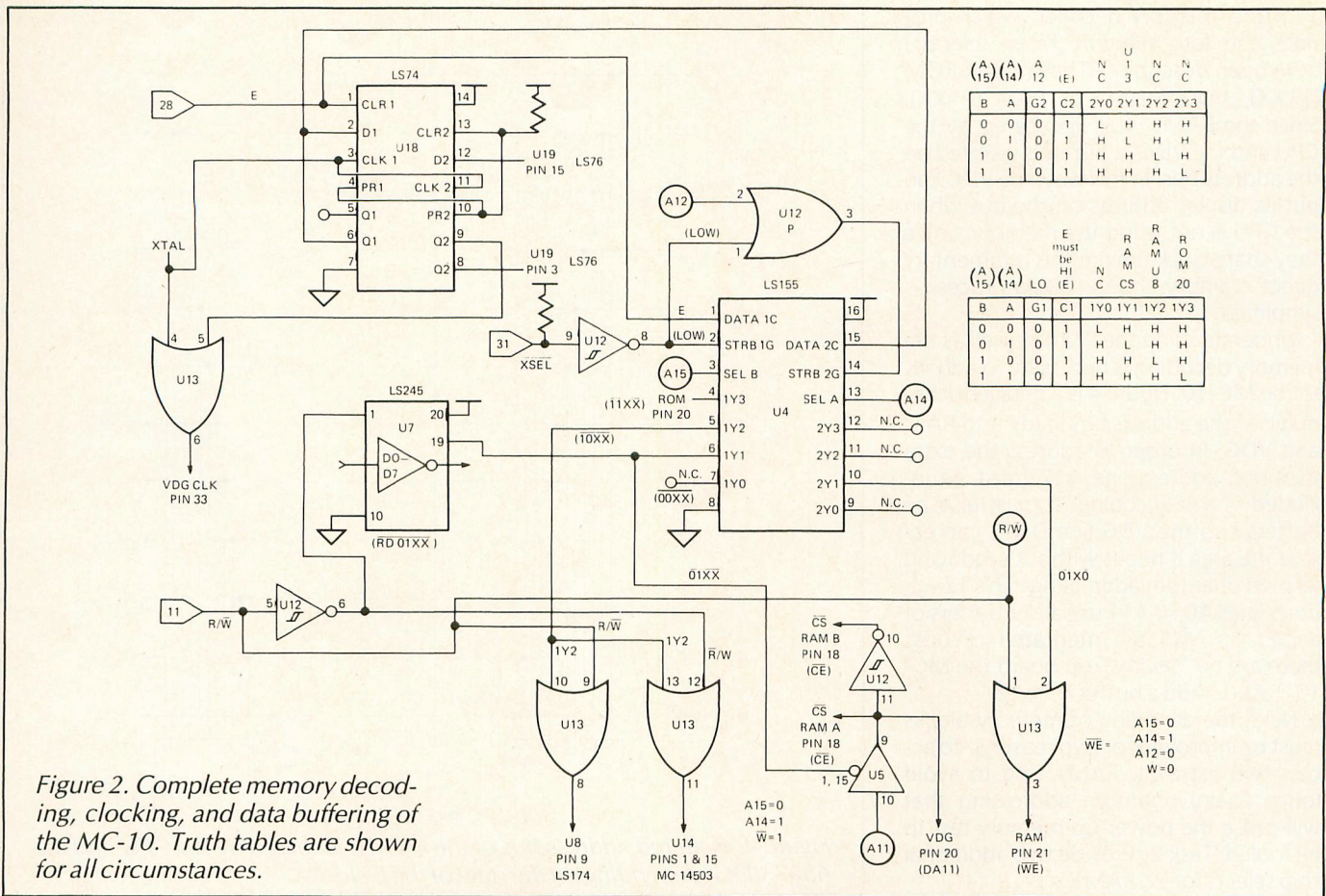
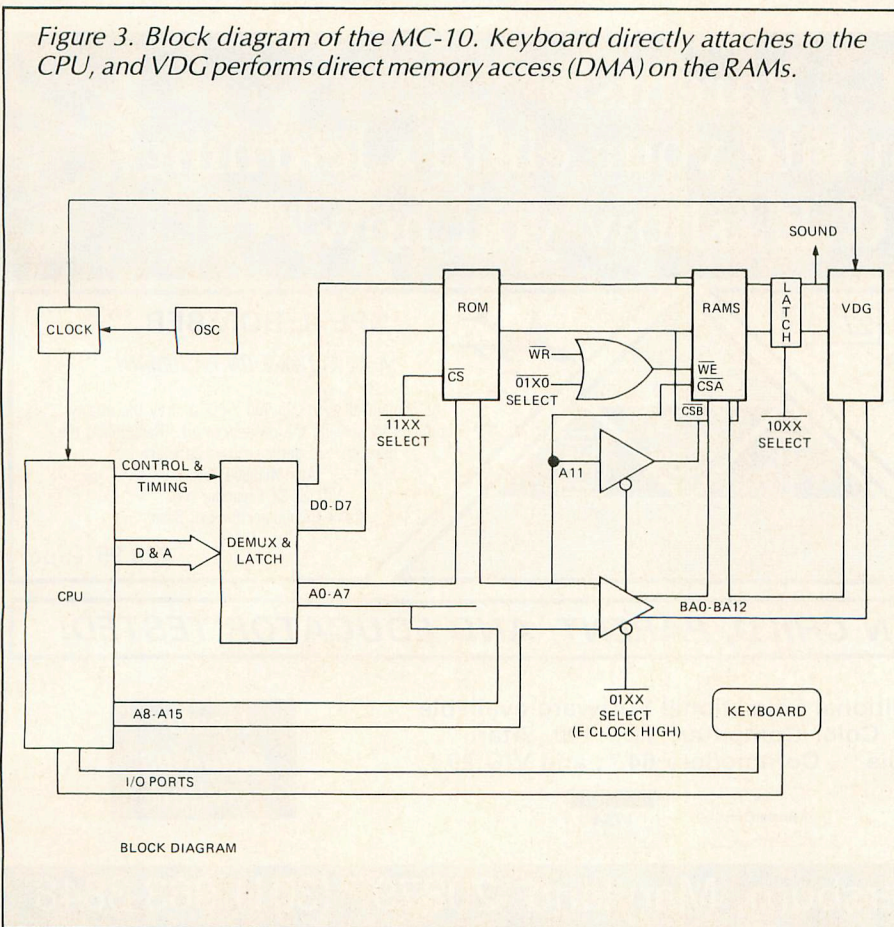


Figure 2. Complete memory decoding, clocking, and data buffering of the MC-10. Truth tables are shown for all circumstances.

Figure 3. Block diagram of the MC-10. Keyboard directly attaches to the CPU, and VDG performs direct memory access (DMA) on the RAMs.



Continued from page 80

Incomplete addressing results in 16K of memory being reported for use by Basic.

So, inside my MC-10 is a piggybacked chip which includes address line 12 in the scheme. (The complete parts list is shown in Table 1.) It takes the 01XX decoding and refines it to 01X0 (X means unused). Memory is still phantom, but only in two blocks: \$4000 to \$4FFF, and \$6000 to \$6FFF, both of which have binary most-significant-nibbles of 01X0. Memory is deselected (turned off) when the address changes to \$5000 or \$7000, since their most-significant-nibble is 01X1. The simple memory test finds no memory at \$5000, and reports the proper 4K value to Basic.

This incomplete decoding has its uses—to add 4K more of memory, for example. But first, an outline of the memory map is in order (See Table 2).

The place to put extra RAM is in that \$5000 to \$5FFF bank. Figure 3 is a block diagram of the MC-10 system. The CPU's lower address and data lines are combined, and must be demultiplexed via timing and control signals. Data lines feed ROMs and RAMs, and are latched to select the VDG mode and sound output. Address lines run directly to the ROM and

Please turn the page

also to a memory decoder, which provides the four memory block selects I have been describing. These select ROM (11XX), VDG (10XX) or RAM (01XX). Since the RAMs must be shared by the CPU and the VDG, a buffer is inserted on the address bus. In this way, the VDG can put its display address on the bus when the CPU is not using the memory. Since they share clock timing, this rudimentary direct memory access (DMA) process is simplified.

Understanding the DMA as well as the memory decoding is necessary to add 4K to the MC-10. Figure 4 is a detailed schematic of the address bus leading to RAM and VDG. In order to address the extra memory, address line A12 must be included in the decoding. It must also be buffered so the VDG line DA12 can access the area it needs without producing its own phantom addressing! The 12 address lines A0 — A11 use all 12 buffers of a pair of 74LS367 integrated circuits; there are no "spares" on board the MC-10. Task 1: Add a buffer for A12.

Next, the decoding of memory blocks must be improved for two reasons: to access two extra 2K RAMs, and to avoid (once again) phantom addressing that will cause the power-up memory test to be fooled. Task 2: Provide two additional chip selects for 2K RAMs.

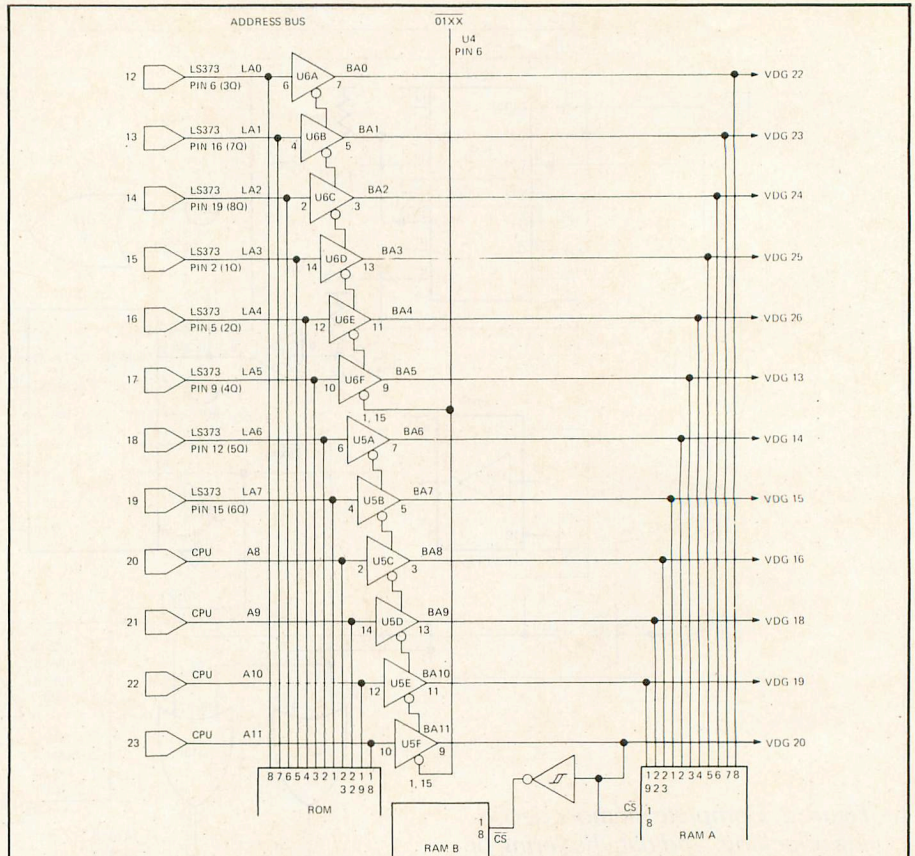


Figure 4. Buffered address bus of the MC-10 is shared by the CPU and the 6847 VDG, depending on the state of the E clock.

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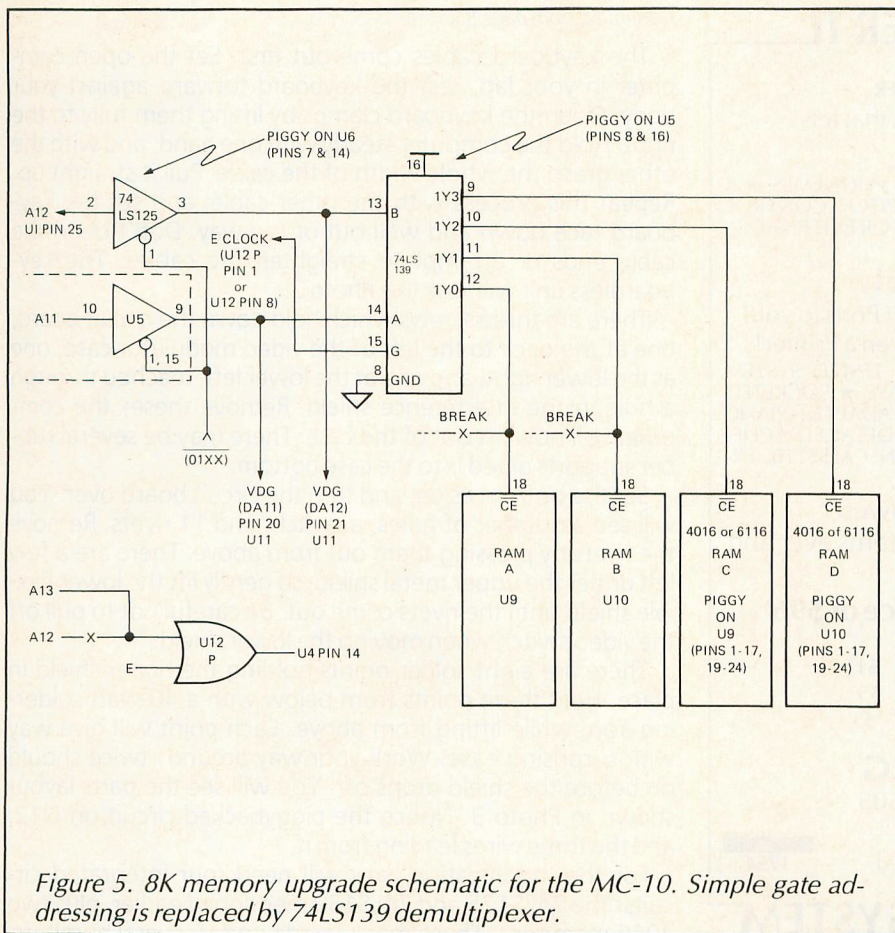


Figure 5. 8K memory upgrade schematic for the MC-10. Simple gate addressing is replaced by 74LS139 demultiplexer.

The result is the schematic in Figure 5. An additional buffer is provided for line A12 in the form of a 74LS125, and the memory selection is performed by a 74LS139 demultiplexer activated by the E clock, and decoding A11 and A12 into four 2K blocks. However, recall that there is an on-board modification (by the time you read this, the board may be revised—look carefully) to prevent access at \$5000 to \$5FFF, so that the memory test may be correctly performed. By moving this connection from A12 to A13, all the memory from \$4000 to \$5FFF can be accessed, while a new memory denial at \$6000 to \$7FFF is created.

Inside the MC-10

Disconnect the power and video cables. Four screws hold the case bottom on the computer; three are visible, and the last is underneath the inevitable warning label. The case snaps together at the sides with plastic tabs, so after the screws are removed, grasp it at the back and split it firmly. Do not pull the unit open: There is a keyboard cable inside. Once the unit is split, rock the keyboard forward, and you will see the insides, as shown in Photo 1.

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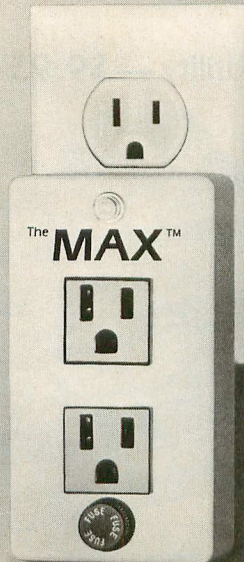
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Continued from page 85

The keyboard cables come out first. Set the open computer in your lap, rest the keyboard forward against your body. Open the keyboard clamps by lifting them fully to the right. Hold the computer steady with one hand, and with the other grasp the whole width of the cable. Pull it straight up. Repeat this process with the other cable, and set the keyboard face down and well out of the way. Don't bend the cable ends or attempt to straighten the cables. The keyboardless unit will look like Photo 2.

There are three screws which hold down the circuit board, one at the back to the left of the video modulator case, one at the lower right, and one at the lower left, reached through a hole in the interference shield. Remove these; the computer will now lift out of the case. There may be several rubber supports glued into the case bottom.

Set the bottom aside, and turn the circuit board over. You will see a number of holes, a switch, and 11 rivets. Remove the rivets by pressing them out from above. There are a few left under the upper metal shield, so gently lift the lower flexible shield until the rivets come out. Be careful not to pull off the video switch when moving the lower shield.

There are eight solder points holding the upper shield in place. Heat these points from below with a 40-watt soldering iron, while lifting from above. Each point will give way with surprising ease. Work your way around; twice should do before the shield drops off. You will see the parts layout shown in Photo 3. Notice the piggybacked circuit on U12, and the three wires leading from it.

For the modification, you will need four integrated circuits: the 74LS125 and 74LS139 mentioned earlier, plus two 4016 memories. These masquerade under several numbers, including AM9128, D4016, etc. They are 2K x 8 static RAMs.

Bend all the pins of the 74LS139 up and parallel with its body except pins 8 and 16. Mount the 74LS139 on U5, with the notch pointing in the same direction, and solder power pins 8 and 16 to U5. Bend all the pins of the 74LS125 up and parallel with its body except pins 7 and 14. Bend these slightly so this 14-pin integrated circuit fits on U5, which is a 16-pin device. Mount it in the same direction as U5, and solder pin 7 to U5 pin 8, and pin 14 to U5 pin 16.

Now mount the two memories. Bend up only pin 18, and solder pins 1-17 and 19-24 to U10 and U9, respectively. Be very careful when soldering to the memories below—do not get them too hot, do not create solder bridges, and make sure all pins are soldered. Use a magnifying glass to verify all connections are clean and tight.

Now turn the board over. Locate the traces leading from pin 18 of each memory chip. Cut each trace through with a sharp tool; this removes the select lines from the memories. Return the board to the top side.

There are three wires leading from Radio Shack's corrective piggyback. Remove the wire leading to a plated-through hole at the lower edge of the board. Verify that this is the hole leading to the CPU (U1) pin 25. Move it to the CPU pin 24. Now route the following wires (this order is probably the easiest).

P means piggybacked IC:

1. U5 pin 1 to U6P pin 1.
2. U6P pin 2 to U1 pin 25.
3. U5P pin 15 to U12 pin 8.

Please turn to page 90

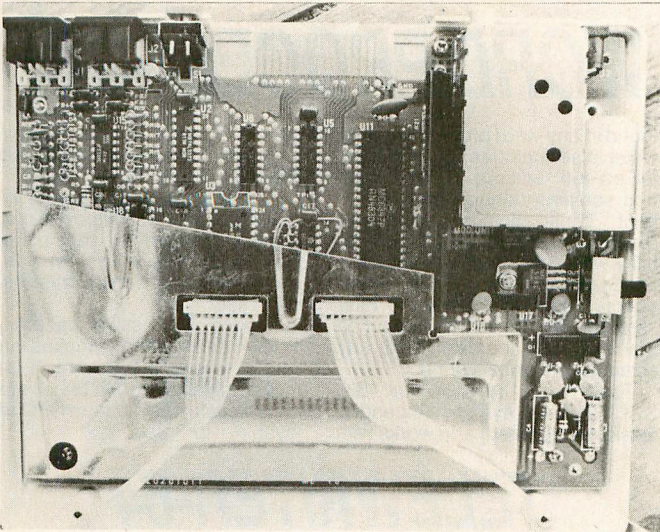


Photo 1. View inside the MC-10 as it is just opened. Clockwise from back: cassette/serial jacks, reset switch, expansion bus, RF modulator, on/off switch, power supply, RF interference shield, keyboard cables and connectors.

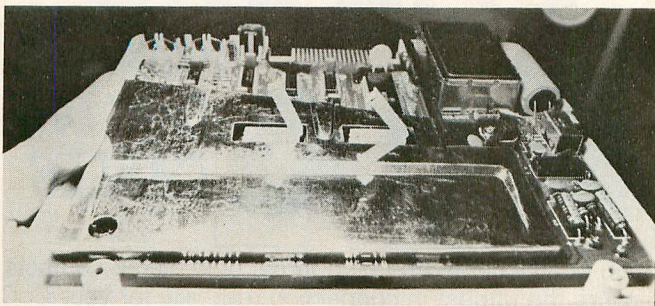


Photo 2. Keyboard cables lift out of snap connectors.

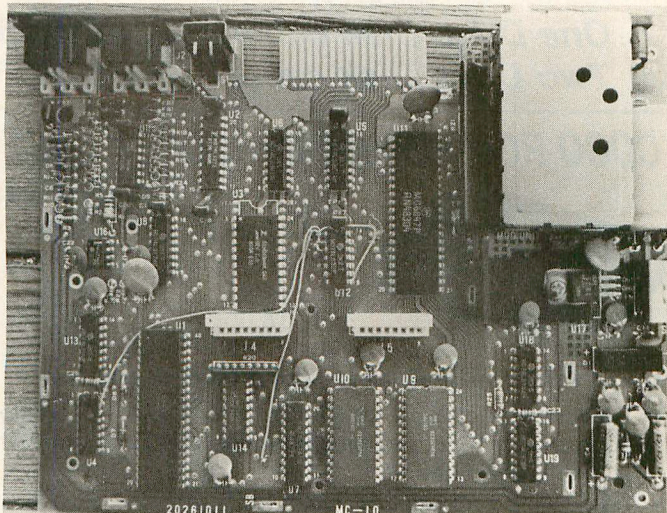


Photo 3. Underneath the shield, revealed 6803 CPU at front left; 8K Basic ROM in center; 6847 VDG to left of RF modulator; two D4016 RAMs up front. Note the Radio Shack piggyback in place.

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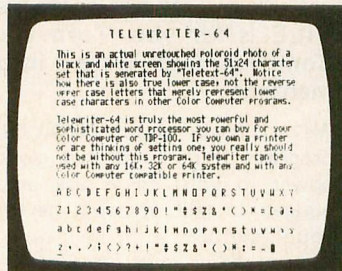
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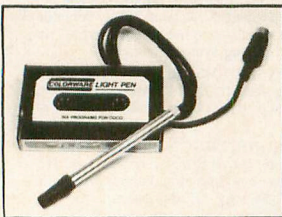
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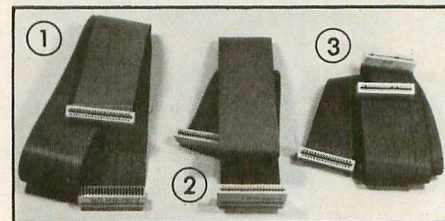
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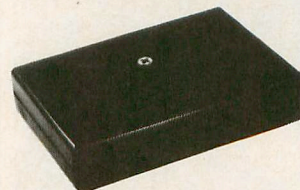


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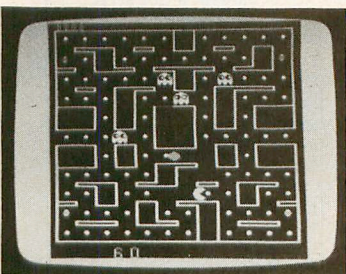
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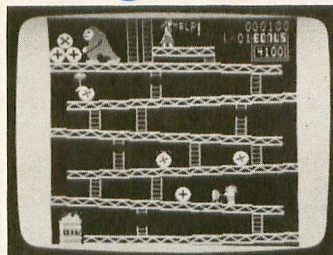
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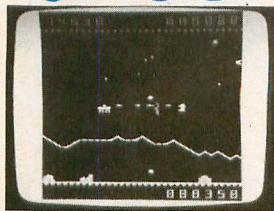
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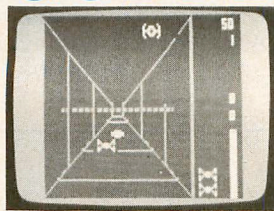
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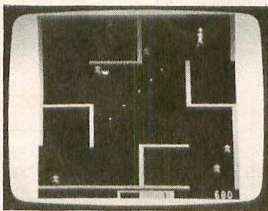
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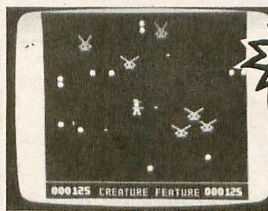
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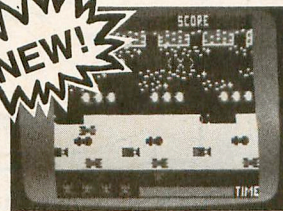
ANDROID ATTACK

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

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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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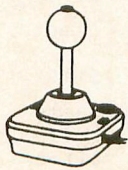


This one has received outstanding reviews. Its unique design fits the hand beautifully and it has the truly fast and positive response needed for high speed play. Actually out-performs some joysticks that cost \$50 or more.

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Table 3. Table of Mode Control Lines (Inputs)

A/G	A/S	INT/EXT	INV	GM2	GM1	GM0	ALPHA/GRAPHIC MODE SELECT
0	0	0	0	x	x	x	Internal Alphanumerics
0	0	0	1	x	x	x	Internal Alphanumerics Inverted
0	0	1	0	x	x	x	External Alphanumerics
0	0	1	1	x	x	x	External Alphanumerics Inverted
0	1	0	x	x	x	x	Semigraphics - 4
0	1	1	x	x	x	x	Semigraphics - 6
1	x	x	x	0	0	0	64 x 64 Color Graphics
1	x	x	x	0	0	1	128 x 64 Graphics
1	x	x	x	0	1	0	128 x 64 Color Graphics
1	x	x	x	0	1	1	128 x 96 Graphics
1	x	x	x	1	0	0	128 x 96 Color Graphics
1	x	x	x	1	0	1	128 x 192 Graphics
1	x	x	x	1	1	0	128 x 192 Color Graphics
1	x	x	x	1	1	1	256 x 192 Graphics

Table 4. VDG latch assignments through U8, latched by writing data to any address from \$8000 to \$BFFF.

D7 Sound Output	D6 Color Set	D5 A*/G	D4 GM0	D3 GM1	D2 GM2 & INT*/EXT	D1 Not Used	D0 Not Used
-----------------------	--------------------	------------	-----------	-----------	-------------------------	-------------------	-------------------

Text continued from page 86

4. U5P pin 14 to U12 pin 11.
5. U6P pin 3 to U5P pin 13.
6. U11 pin 20 to U12 pin 11.
7. U11 pin 21 to U5P pin 13.
8. U5P pin 12 to U9 pin 18.
9. U5P Pin 11 to U1O pin 18.
10. U5P pin 10 to U9P pin 18.
11. U5P pin 9 to U10P pin 18.

The modification is now complete. The resulting wiring is shown in Photo 4. Before testing, have a friend proofread the wiring with you. When you are sure it is correct, you are ready to test.

To test the computer, clear an area and set it down on a cloth. Insert the video and power cables and turn it on; your screen should clear red briefly (about 1/2 second), then return the start-up message on a green screen. If you see a flash of @ symbols before sign-on, or if there is no sign-on message, double check all your wiring.

Short of a bad memory chip or poor construction, there is little that can go wrong with this modification. The MC-10 is a simple machine, and its memory area is also stable, strong, and straightforward. It is hard to damage it.

The next test requires the keyboard. Remove power, and insert the keyboard cables in place; be sure not to bend the cable ends as you insert them. Restore power and PRINT MEM; you should get 7238. If you get 3142, something didn't take. If you get 11334 or 15430, don't get excited; that's not what you have. Check your wiring. If you get ?OM error, or if the machine locks up, make sure the 74LS139 pins are wired down. Finally, from command mode, enter this line: DIM A\$(100,10). If you get an "OK" response, you win. Your upgrade is ready to work for you. If, however, the screen turns red and fills with identical odd characters, your wiring is bad in the piggybacking or shorted somewhere to one (or more) memory pin 18.

Oh yes: now put it all back together—the upper shield first, then the lower shield (all 11 rivets), the screws, the case. You're set; except for the label, it looks like it came off the shelf. PRINT MEM the next time you want to impress your users group!

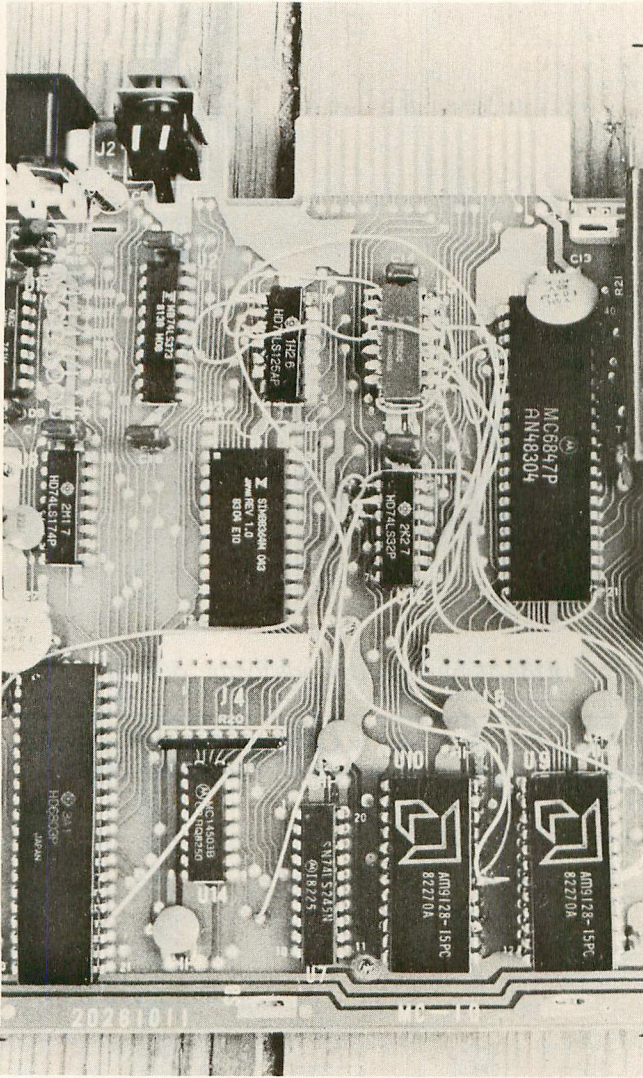


Photo 4. The 8K memory upgrade in place. Wiring is straight forward, although piggybacking two memory chips requires great care.

Parts List

Parts list for 4K upgrade:

U6P	74LS125	A12 buffer
U5P	74LS139	Memory selector
U9P	D4016	2Kx8 RAM
U10P	D4016	2Kx8 RAM

Complete set of four integrated circuits, wire and solder available for \$25 from Green Mountain Micro, Roxbury, Vermont 05669.

Please turn the page

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High-Resolution Graphics

Now that you have 8K of memory, you have access to all the high-resolution graphics modes. Just for a first try, do this: POKE 32768,255.

There. Excited? I was. Have a look at Figure 7; this is the schematic of the VDG. As noted earlier, the address bus is taken over by the VDG when it needs to access the display memory. The other item of interest in this schematic is the data latch, which not only selects the sound output, but also determines the VDG modes. These modes are summarized in Table 3.

GM2 and the INT*/EXT line are tied together, as are A*/G and D7, and INV and D6. This is an efficient connection scheme for the 256 data values, since only 64 characters are available inside the VDG:

D7	D6	Result
0	0	Normal alphanumerics
0	1	Reverse alphanumerics
1	0	Semigraphics-4
1	1	Semigraphics-4

VDG latch assignments through U8 are shown in Table 4. To go through the list of possibilities completely, try this:

```

10 INPUT "Speed";Q
20 FOR X = 0 TO 127 STEP 4
30 POKE 32768,X
40 FOR N = 1 TO Q : NEXT
50 NEXT
    
```

And finally, to try the sound output from Basic by directly manipulating the latch, do this:

```

10 X=32768:Y=128:Z=0
20 POKE X,Y:POKE X,Z:GOTO 20
    
```

The MC-10 is a surprisingly versatile single-board computer. As a Basic computer, it looks like an interesting introductory machine. Since it can be expanded, and since features such as serial interface and reliable cassette storage are standard, I feel it can serve as a remarkable laboratory computer or process controller. This preview should get you started with some options and upgrades. Look in future "Custom Color" columns for regular tours through this excellent miniature personal computer.

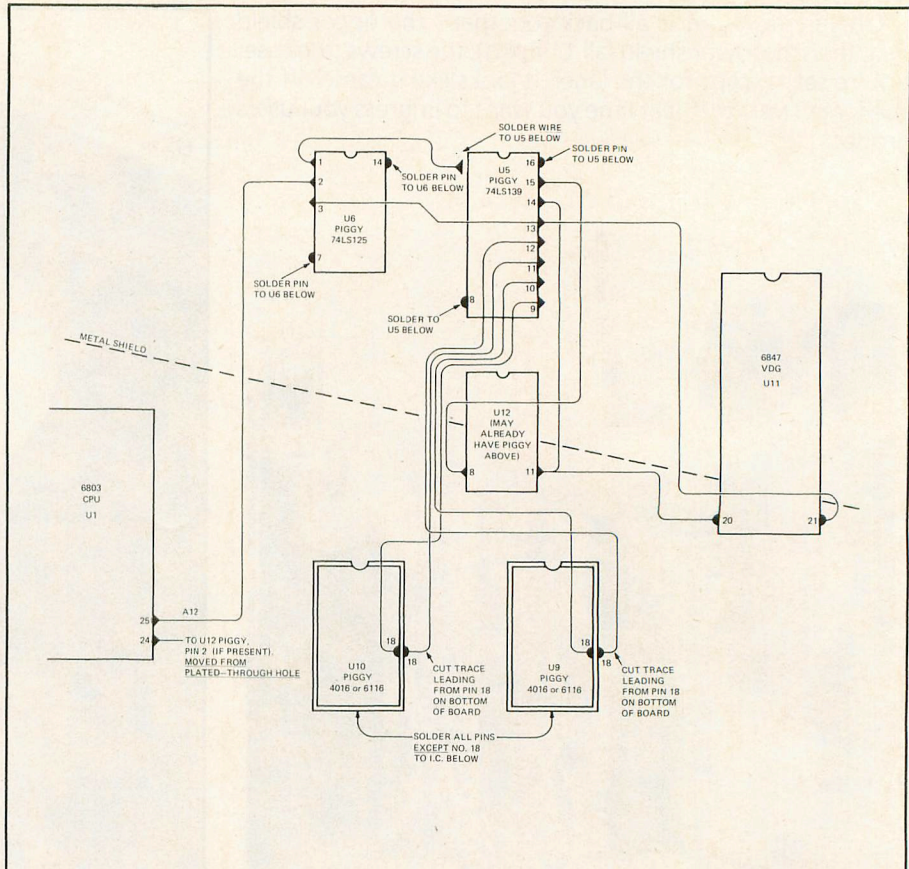


Figure 6. Wiring diagram of the 8K memory upgrade for the MC-10.

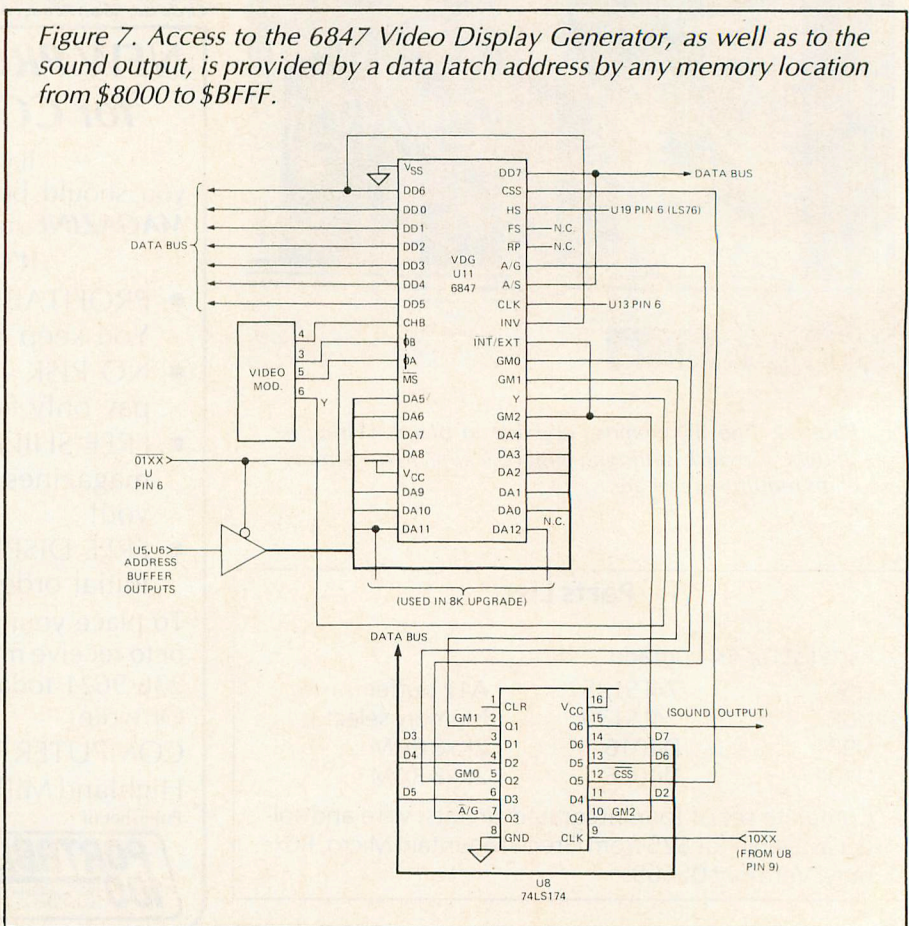
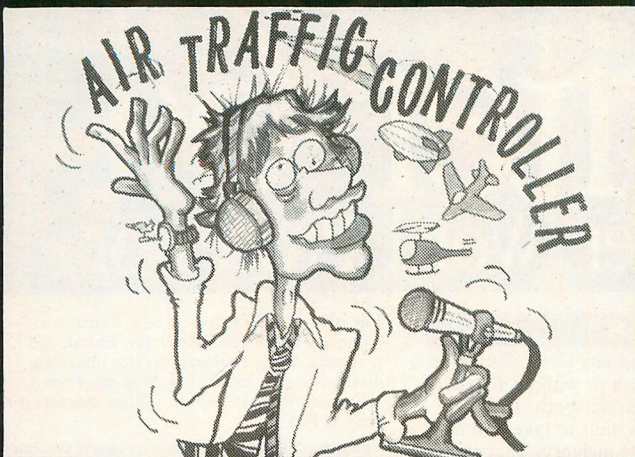


Figure 7. Access to the 6847 Video Display Generator, as well as to the sound output, is provided by a data latch address by any memory location from \$8000 to \$BFFF.



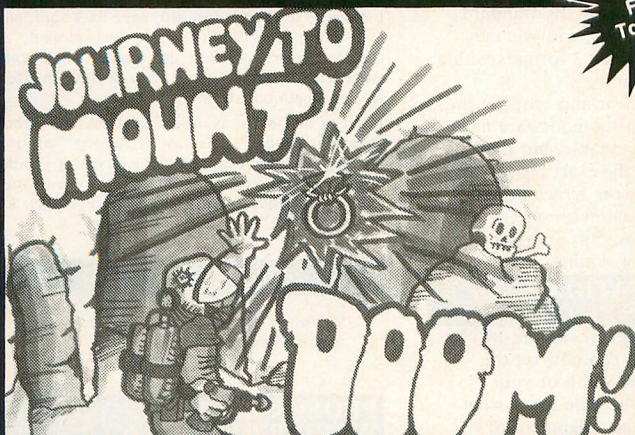
Air Traffic Controller is a computer model of an air traffic control situation in which Remotely Piloted Vehicles (RPV's) are operated by the controller in landing on and taking off from designated runways.

32K Extended Basic
 TAPE 28.95 DISK 31.95



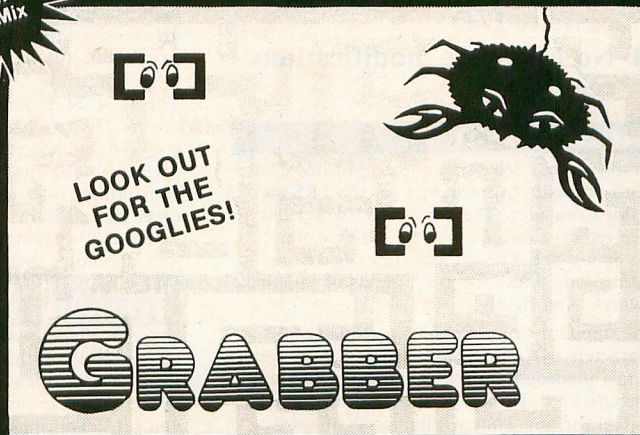
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THE ORIGINAL

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

TELEWRITER-64

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

64K COMPATIBLE

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.

*...truly a state of the art word processor...
outstanding in every respect.*

— The RAINBOW, Jan. 1982

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Telewriter-64 costs \$49.95 on cassette, \$59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.) To order, send check or money order to:

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

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The Jargon Generator

Talk to bureaucrats, technocrats and pseudocrats in their own language.



by Glenn B. Knight

This Thesaurus of government phrases is sub-titled "The Jargon Generator," since it creates its own little language...

For those who still cling to the hope that English will some day again become the language of our government, the Thesaurus does offer one option — you can choose the noun you wish to use. The screen will display the 10 nouns in the data bank, and you will be allowed to choose one of those or type in a more appropriate noun of your own choosing. The program will then go on and find two modifiers for you and display the complete phrase on screen.

For the novice programmer this is a mini tutorial. I have found I learn more about Color Basic by typing and debugging other people's programs than by any of the more traditional methods.



16K
Color Basic

The Program

Note the 500-series lines—they contain two small subroutines which are reused throughout the program. By making repeated functions into a subroutine, you save memory.

Memory can also be saved by leaving out most spaces. The spaces are in this program to make it easier to read — when I type them into my gray box, I leave out the spaces or I go back over it with a stripper utility and remove them. With a 16K or larger machine, memory is not critical in this program, but I will still renumber for my final copy. RENUM1,1,1 will save about 100 or so bytes, and speed it up a nanosecond or two. Memory saving is simply a good habit to get into.

The Main Menu is located within the 100-series. You may find the branching method in Lines 175 – 190 of interest. This shows how to make the program continue without pressing Enter, and in converts a string to a number in the process. Lines 855 – 860 do the same thing without the string-to-number conversion.

By leaving off the pretty heading, omitting spaces and dropping most of the bells and whistles, you could probably get this to work even on a 4K machine.

Typing (the correct phrase is probably *keyboarding*, but that sounds like jargon to me) this or any other program should be a learning experience. But don't forget the *subtle purpose of this particular program* — Eschew Obfuscation.

Program begins on page 96



THE OFTEN-MALIGNED government bureaucrat deserves some respect. He or she is the reigning champion of the artform called *gobble-dygook* — that incomprehensible sub-language that most of us would rather see die off.

It is the bureaucrat who writes regulations and reports in which phrases such as *integrated monitored projections* and *optional third-generation time-phase* spice up the otherwise dull rhetoric. The non-elected government officials tend to cloud every possible issue. They faithfully follow the English non-standard which says, "Why use only one well-chosen word when a half-dozen multi-syllabic expressions will do?"

But now, we Color Computer owners have a way to fight back. For years we have been trying to get government officials to speak and write English, only to be bombarded with "protective-coating specialist" for painter and "direct-application environmental enhancement technician" for street-sweeper.

By breaking their code we have been able to select 30 representative and truly bureaucratic words which our trusty Color Computer turns into random three-word phrases to use when we communicate with government officials. Since most of what bureaucrats have to say is meaningless to begin with, it doesn't matter that your phrase is totally unrelated to your subject. The key fact to remember is that a government official will never admit he or she doesn't understand the phrase; he will just brush off the brief confusion it caused. Your letter or report will rise on the pompous scale.

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Program Listing. Jargon Generator

```

100 CLS3'MAIN MENU*****
105 SOUND100,10
110 PRINT@192,"THESAURUS OF GOVERNMENT PHRASES"
112 PRINT@294,"(THE JARGON GENERATOR)";:GOSUB 500
115 PRINT@389,"(C) 1983, GLENN B KNIGHT";:GOSUB500:CLS4
120 PRINT"THIS PROGRAM WILL CREATE A PHRASE WHICH CAN BE ADDED TO A
125 PRINT"GOVERNMENT REPORT TO ADD A RING OF AUTHORITY" : GOSUB 500
130 PRINT:PRINT"IT DOES NOT MATTER AT ALL THAT THE PHRASE MAKES ABSOLUTELY NO SENSE. NO BUREAU CRAT WILL"
135 PRINT"ADMIT THAT HE OR SHE DOES NOT UNDERSTAND WHAT IT MEANS":GOSUB 500:GOSUB 500
145 CLEAR150
150 PRINT:PRINT"DO YOU PREFER:"
160 PRINT"<1> A PURELY RANDOM PHRASE","<2> TO SELECT THE NOUN"
170 PRINT"* PRESS NUMBER OF YOUR CHOICE"
175 A$=INKEY$:IFA$=""THEN175
177 A=VAL(A$)
180 ON A GOTO 200,600
190 GOTO175
200 CLS'RANDOM PHRASE GENERATOR
205 RESTORE
210 PRINT@171,"OBFUSCATING"
215 GOSUB 550
220 N=RND(10)
230 FORX=1 TO N
240 READ N$:NEXT
245 RESTORE
250 B=RND(20)
260 IF B<11 THEN GOTO 250
270 FORX=1 TO B
280 READ B$:NEXT
285 RESTORE
290 IFP$<>""THEN GOTO 800
300 P=RND(30)
310 IF P<21 THEN GOTO 300
320 FORX=1 TO P
330 READ P$:NEXT
340 GOTO 800
500 FORX=1 TO 999:NEXT:SOUND210,5:RETURN

```

```

550 Z=RND(75):IFZ<10 THEN 550
560 FORY=1TOZ
570 S=RND(255):SOUND S,3
580 NEXT Y
590 RETURN
600 CLS 'SELECTED NOUN*****
605 RESTORE

610 FORQ=1 TO 30
620 READ Q$
630 IF Q<21 THEN GOTO 640 ELSE P
RINTQ$
640 NEXT
650 PRINT:PRINT"TYPE A NOUN FROM
THE ABOVE LIST OR TYPE IN YOUR
OWN NOUN TO BE USED."
660 INPUT P$
665 RESTORE
670 GOTO 200
800 CLS0'DISPLAY ROUTINE*****

810 PRINT:PRINT:PRINT"YOUR INTEG
RATED RESPONSE PHRASE IS:
815 SOUND200,5
820 PRINT@162,N$:PRINT@196,B$:PR
INT@230,P$
830 GOSUB 500:PRINT@384,"ANOTHER
PHRASE? (Y OR N)"
855 T$=INKEY$:IF T$=""THEN 855
860 IFT$="Y" THEN GOTO 145

870 FORX=255 TO 1 STEP-15
871 SOUND X,1
872 NEXTX
890 END
900 DATAINTEGRATED,TOTAL,SYSTEMA
TIZED
910 DATAPARALLEL,FUNCTIONAL,RESP
ONSIVE
920 DATAOPTIONAL,SYNCHRONIZED,CO
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OKAY PARENTS: you finally have that magical tool known as a microcomputer at home for your kids to use. You've read everywhere that it will be essential for their education, that in order for them to stay competitive with kids from other parts of the country they must become "computer literate." So what does that mean?

As an elementary educator, my definition includes "the ability to program in at least two languages." For the foreseeable future, one of those languages will be Basic. Although I do have many fourth graders composing imaginative programs in Basic, I feel it is just too complicated a language for the average child under the age of eleven to use in meaningful ways. Also, most manuals are written for adults. When your children are ready for Basic, write to *Creative Publications, 604 6th St., Charleston IL 61920*, for information on their excellent series of self-teaching manuals entitled "*Creative Programming for Young Minds*."

Meanwhile, let your kids explore the rich world of discovery learning by investing \$49.95 to purchase the Color Logo ROMpak (requiring 16K) from Radio Shack. Programming purists may term Color Logo a "system." To me it is nothing less than a bonafide language, offering a much easier entry to programming than Basic. Color Logo procedures (programs) provide an introduction to procedural thinking, visual thinking, spatial organization, and geometric design.

Logo has become more than a name for a continually developing family of computer languages. It also represents a philosophy of education which gives users control over their own learning. The language is designed to transform computers into flexible tools to aid in learning, playing, and exploring. Users become active discoverers, decisions-makers, and problem solvers within a non-threatening setting. Unlike most other programming languages designed solely by engineers and computer scientists, Logo was originally designed by people whose major interest was the process of human

by *J. Craig Dickinson*



learning. When you watch your children use Color Logo, take time to watch the expressions of intensity and delight on their faces. You will soon conclude that the developers have indeed succeeded in producing a computer language that urges children to examine their own thinking processes in a fun and gratifying setting.

All versions of Logo are billed as "easy to learn." I recently read that a nursery school program at West Virginia University has been offering simple programming instruction since February to 3- and 4-year-old children using a version of Logo. Even though the language is decidedly more inviting than Basic, don't expect to plop your offspring in front of the computer with the manual while you run errands. The Radio Shack documenta-

tion, though well designed, suffers from the fatal flaw of packing too much information on a single page using the smallest possible print. My advice is to keep the kids hands off the manual for awhile. By reading selected sections of the manual and acting as a helper (not a teacher), you can guide your children into an enthusiasm for Logo from day one.

Here's how you can best help:

1. Read pages 5 and 6 of the manual to learn how to get started.

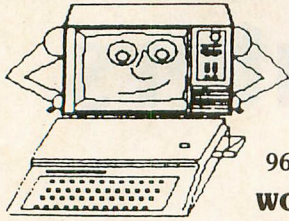
2. Read pages 13 and 14 so you can explain to your child about the four Logo modes (Break, Edit, Run, and Doodle).

3. Now skip to page 53 of the manual and begin with the Doodle mode. Be sure the provided overlay is in place on the keyboard. Now collaborate with your child to discover that the ten digital keys can be used to control the turtle (Logo name for the cursor) to make geometric designs. Most children enjoy producing abstract designs at first. They delight in Breaking out of the Doodle mode and running the procedure they have named. (Note: Parents of preschoolers will enjoy the "one key doodle" feature. Take the time to play with it yourself before introducing the program to the child.)

4. Now let your children play. The art of being an effective Logo helper is knowing when to intervene. My experience suggests that as little intervention as possible is best. In my classroom, I say many times each day when asked a computer question, "I don't know. Why don't you ask the computer?" Educational research indicates that kids will ask the computer more questions than they will a teacher. Let them; limit your guidance in the Doodle mode to suggestions of possible topics: "Draw me a house... a flag... a boat... a truck."

5. When they inevitably ask, "What else can we do?", return to pages 10 and 11 in the manual to introduce your kids to Logo "primitives." These are the fundamental commands that move the turtle in the Run mode, or are used as statements in the **framework of a procedure.**

Please turn the page



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Continued from page 99

The following procedure, written in the Edit mode, will form a rectangle:

```
TO BOX
FD 60 RT 90
FD 40 RT 90
FD 60 RT 90
FD 40
END
```

FD is the abbreviation for forward, and the turtle will accommodate by moving forward the designated number of turtle steps. RT causes the turtle to turn right the named number of degrees. (There is no need to explain the concept of degrees to a child. The more Logo is used, the more the feeling for degrees becomes naturally ingrained).

Have your child next construct a triangle by typing in the following:

```
TO TRIANGLE
FORWARD 30 RT 120
FORWARD 30 RT 120
FORWARD 30
END
```

Next ask your child if a house can be drawn by using the two programs now in memory. They will see that a house can be broken down into two parts, a box and a triangle. Return to Edit mode and form a third program:

```
TO HOUSE
BOX
TRIANGLE
END
```

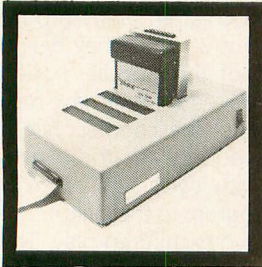
This is exciting! Imagine using two subprocedures (BOX and TRIANGLE) to form another procedure. This is, however, a set-up; the outcome is not what was expected. The child comes face to face with a programming bug. Reassure

Program 1. Rocket Ship

```
TO LIFTOFF
COLORSET 1 BG 0 PC 1
```

```
SX 240 LT 60 FD 80 BK 80
LT 60 FD 80 RT 30 FD 50
RT 90 FD 20 LT 90 FD 40
FD 20 RT 90 FD 10 RT 90
FD 20 BK 30 LT 90 FD 10
RT 90 FD 30 BK 30 LT 90
FD 10 RT 90 FD 30 BK 20
LT 90 FD 10 RT 90 FD 60
LT 90 FD 20 RT 90 FD 50
RT 30 FD 50 RT 60 FD 30
SX 60 SY 76 RT 90 FD 6
RT 10
REPEAT 4 (FD 6 RT 10)
SX 60 RT 45 SY 116 LT 90
REPEAT 4 (FD 6 LT 10)
HT
END
```

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him or her by commenting that in computer programming you almost never get it right the first time.

This is the crucial step: Logo can definitely help your kids become better learners. Part of being a good learner is learning to get past the fear of making mistakes. Mistakes are one of the profoundest ways of learning.

When in trouble, I usually recommend what most experienced Logo helpers do — play turtle. Have the child walk through the procedure as the turtle would, or draw it on paper. I have found that it is best for the beginner to find their own ways to do things. The trick of assisting in Logo, and in teaching many aspects of computer programming, is to learn to make a suggestion and then be comfortable with the learner who rejects it. Urge your beginner to debug the house procedure by understanding how that dumb turtle messed up. The child must teach the turtle to do what is required.

6. At this point you may do well to return to the manual and let your child experiment with some of the programs listed there. Stay close for explanation and translation, especially with the section variables. You will find many kids enjoy experimenting with color and screen position (SX and SY). Program 1 was written by fifth grader Darren Ranco.

Darren's rocket ship illustrates a more intuitive approach to a project, as he saw the project as a totality and as the sum of its parts. Many children do prefer to draw

the entire design. When working with your child and it becomes clear that part of the design is finished, or when a good stopping point is reached, give that part a name and teach it to the computer. In this way, the idea that a large procedure can be built from subprocedures can be introduced gradually without imposing in advance.

7. The next question your child will ask is likely to concern the possibility of merging a program in Doodle mode with a program using Logo primitives. The opportunities here are enormous. Program 2 combines stars drawn in the Doodle mode with a planet formed by repeating a box program until it forms a circle.

8. Of all the powerful ideas that Logo introduces to children, recursion stands out as the one idea that particularly evokes excitement. Recursion is writing procedures that call themselves. An analogy often quoted is: if a genie appears and offers you three wishes, you should use your third wish to wish for three more wishes.

Part of the power of recursion rests in the fact that simple programs can lead to such varied, unexpected results. Take the program called POLYSPI:

```
TO POLYSPI :SIDE :ANGLE
  FORWARD :SIDE
  RIGHT :ANGLE
  POLYSPI (:SIDE . 3) :ANGLE
END
```

In the Run mode type in POLYSPI 0 90. The turtle moves:

```
FORWARD 0
RIGHT 90
FORWARD 3
RIGHT 90
FORWARD 6
RIGHT 90
FORWARD 9
RIGHT 90
```

which produces a square-like spiral. Try:

```
POLYSPI 5 120
POLYSPI 5 144
```

(To keep this figure on the screen, type: NOWRAP while in the Run mode).

Recursion is endlessly fascinating for kids and adults alike.

The computer has tapped my potential as a learner more than any other medium. It is a tool for me to teach, and for my children to teach. When we teach the machine to do what we want it to do, we can understand it. Color Logo is an excellent medium for teaching computers and experiencing the thrill of learning. ■ ■ ■

Program 2. Stars and Circles

```
TO RECTANGLE
  REPEAT 4(FD 30 RT 90)
END

TO CIRCLE
  REPEAT 20(RECTANGLE RT 15)
  HT
END

TO MOON
  REPEAT 15(CIRCLE RT 1)
  HT
END

STARS
  *PROGRAM IN DOODLE MODE TO
  DRAW STARS

TO SPACE
  BG 0 PC 1
  STARS
  PC 2
  MOON
END
```

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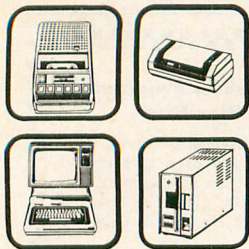
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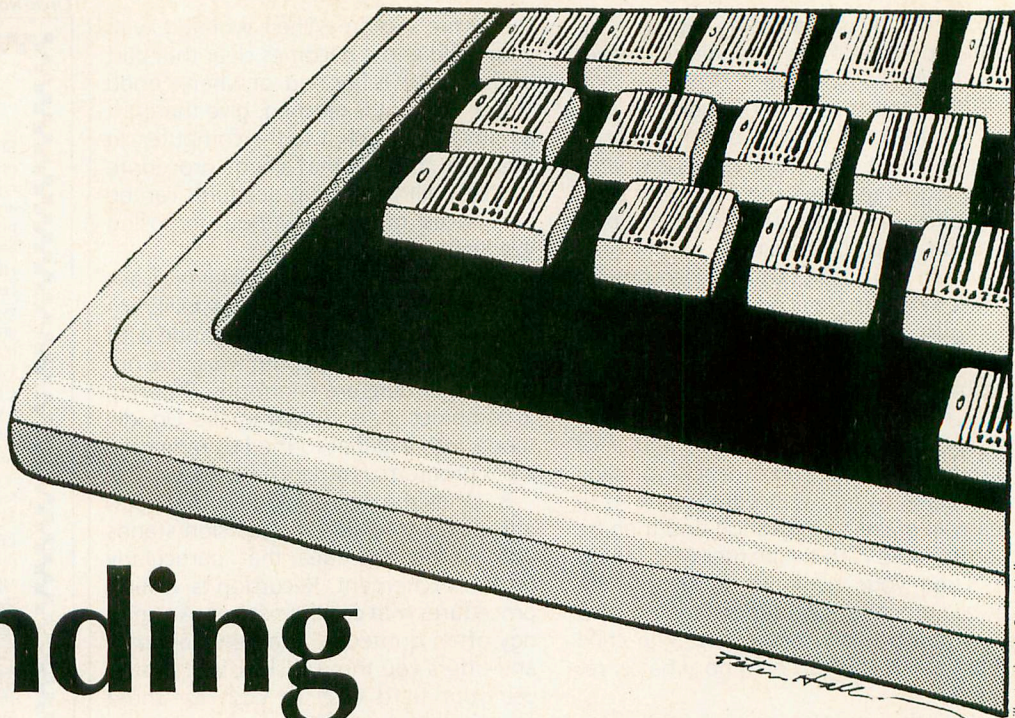


Illustration by Peter Hall

Refunding

Saving money's important—now you can save time saving money.

NOW THAT YOU own a computer, how can you justify its expense? One way is to prove to your spouse that it saves time and money. My wife enjoys "refunding" as a way to beat the system and save money on purchases. This national pastime requires saving labels, box tops and other proofs of purchase and sending them in for cash once you've accumulated a required number. Some people earn hundreds of dollars per year this way. If there's one thing a computer does well, it's data handling and sorting.

This article describes two programs written to keep an inventory of proofs of purchase. The first is primarily intended for cassette storage; the second is for disk-based systems. This kind of work uses a lot of memory, and at least 32K is really necessary. A 16K machine can be used, but can handle only about 300 proofs of purchase. The 32K disk version easily handles over 1000 items. A printer is a must with these programs.

Cassette Program

Program Listing 1 is for cassette-based systems. Line 10 clears sufficient string space below the machine-language Sort Routine. Lines 20 – 250 POKE the String Sort Routine into memory. This program was described by Goodwin in the December, 1982 *80-U.S. Journal*. Line 260

by B.H. Alsop

dimensions the string and string pointer arrays I and I\$. With the string space cleared and a dimension size of 612, very little memory is left in my 32K machine. Lines 270 – 310 read the Data state-

ments which contain the proofs of purchase. The pointer array I is also initialized. Lines 320 – 430 set up the variable start pointers and number of items to sort through. Line 450 executes the Sort Routine. Lines 500 – 570 send out the alphabetized listing to the printer, along with its position in the input data array.

Now, what do you do with the listing? I hand it to my wife; she then goes down the list to see if she has X labels of a particular size of ketchup, or whatever, collects the coupons from her pile of card-

Please turn the page

Program Listing. Cassette Refunding

```

10 CLEAR 9000,&H7F62
20 FOR I=&H7F63 TO &H7FFF
30 READ J
40 POKE I,J
50 NEXT I
60 DATA 134,127,30,139,151,255
70 DATA 15,252,220,239,221,245
80 DATA 220,241,221,247,220,243
85 DATA 221,249,158,247,166,132
90 DATA 151,253,236,2,31,2,166
100 DATA 5,151,254,236,7,31,1
110 DATA 30,18,150,254,39,6,150
120 DATA 253,39,28,32,6,150,253
130 DATA 166,128,161,160,39,45
140 DATA 37,12,39,22,32,8,158

```

Listing continues

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Color Computer/103

board boxes, and sends them off to the manufacturer for a \$3 refund. The items are then scratched off the list. Once a month we both sit down at the computer, add new proofs to the files, and delete those sent in over the previous month. The second field printed out in the listing makes deletion easy; it refers to the Data Statement number if you enter only one item per Data Statement. The whole program, including the Data Statements, is then saved and rerun.

Disk-Based Program

The cassette program has several faults, besides using tape as the storage medium. First, the double dimension statements in Line 260 used 10 bytes of storage for each proof. I needed the extra storage for more proofs. Also, the Sort Routine run time increased as the square of the number of items. The Print Routine was also slow. By using direct access disk files, a different Sort Routine and a new Printing Routine, all these faults could be corrected. The resulting program sorts quickly, prints more quickly and allows deletions to be made more easily. Over a thousand 40-character strings can be stored, with memory left over.

Lines 10 and 20 set up the storage and set aside about 15K of memory for strings and the machine language Sort Routine. Lines 50 – 70 POKE the object code into memory. (This program is a 32K version of Barden's *TRS-80 Microcomputer News* article of June, 1982. The misprints in the original article have been corrected.)

Line 30 calls the input subroutine. Subroutine Lines 540 – 690 read the BUND/DAT input file from the previous run into A\$(I); print out the data on the screen, kill the input file; create a back-up (BUN/BAK); and then return.

Lines 130 – 160 read in new Data Statements. Data Statements can be placed between Lines 700 and 5000. The stop in Line 5000 stops the data reading. The Data Deletion Routine (Lines 490 – 530) is called NEXT. This routine simply replaces the entry in A\$(N) by an empty string. The index N is obtained from the previous run's listing.

The Sort Routine is called from Line 210. Line 280 calls the File Store Routine (Lines 400 – 480), and then the program prints out the sorted A\$(I) array. Fifty items per page are printed; the first two columns contain the sorted string array index and the array string. The next two columns contain the same data for A\$(

Continued from page 102

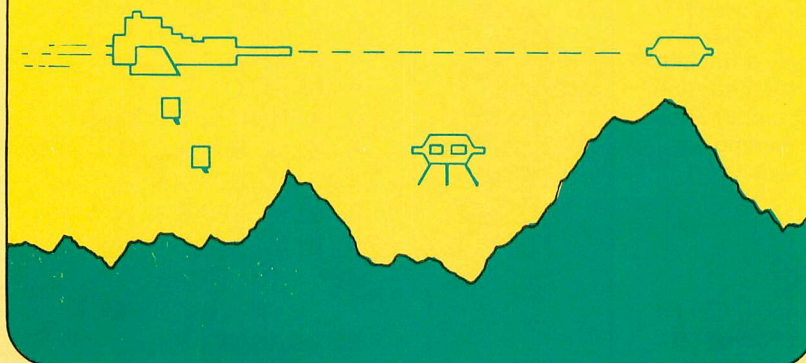
```

145 DATA 247,141,55,158,249,141
150 DATA 51,134,1,151,252,204,0
160 DATA 5,211,247,221,247,204
170 DATA 0,5,211,249,221,249
175 DATA 158,245,48,31,159,245
180 DATA 38,178,150,252,38,160
190 DATA 150,255,31,139,57,10
200 DATA 254,39,6,10,253,39,217
210 DATA 32,195,10,253,39,211
215 DATA 32,197,198,5,215,251
220 DATA 166,5,230,132,231,5
230 DATA 167,128,10,251,38,244
240 DATA 57,0,0,0,0,0,0,0,0,0,
0,0,0,0,0,0,0,0,0
250 DEFUSR0=&H7F63
260 DIMI(612),I$(612)
270 FOR I=1 TO 612
280 I(I)=I
290 READI$(I)
300 IF I$(I)="STOP"THEN X=I-1:GO
TO 320
310 NEXT I
320 PRINT X:I=VARPTR(I$(1))
330 POKE&H7FF1,INT(I/256)
340 POKE&H7FF2,I-INT(I/256)*256
350 I=VARPTR(I(1))
360 POKE&H7FF3,INT(I/256)
370 PRINT PEEK(&H7FF3),PEEK(&H7F
F4)
380 POKE&H7FF4,I-INT(I/256)*256
390 I=X-1
400 PRINT I
410 POKE &H7FEF,INT(I/256)
420 POKE &H7FF0,I-INT(I/256)*256
430 PRINT PEEK(&H7FEF),PEEK(&H7F
F0)
440 TIMER =0
450 I=USR0(0)
460 T=TIMER/60
470 'CLS
480 PRINT"SORT TIME",T;"SEC"
490 PRINT"SORTED NAME FOLLOWED B
Y DATA LOCATION"
500 PRINT#-2,"SORTED NAME FOLLO
ED BY DATA LOCATION"
510 FOR I=1 TO X
520 FOR J=1 TO X
530 IF I(J)=I THEN GO TO 550
540 NEXT J
550 PRINT#-2,I$(I);" @";I(I)
560 PRINTI$(I);" @";I(I)
570 NEXT I
580 REM DATA GOES HERE
5000 DATA STOP

```

Turn to page 106

GUARDIAN



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(I+50). Pages are separated by four line feeds on the top and bottom of each page (Figure 1 is a sample of the print-out).

The listing produced by this program is more compact, and immediately provides all the data necessary to delete a particular item. The Deletion Routine prompts for the item number — you simply enter it. Zap! The item will be gone in the next file. A -1 entry gets you out of the Delete Routine.

The performance of this program has been great. The first sort (of 500 items) took about 70 seconds. Adding a few items and resorting took only a fraction of a second. I guess the Sorting Routine had little work to do since the input array was already sorted once. Printing time has been reduced by 30 percent.

Program Tips

The proof's description should first be the manufacturer's name, followed by a description of the item. You don't have to be too careful; misspellings and differing descriptions are OK since one can quickly scan the sorted listings and recognize the item — the sample Listing shows descriptions which have proved adequate. For the disk program, only enter forty characters and spaces; it truncates the string at a length of 40.

Getting the first file started is time consuming. First, store anything in a disk file with the command SAVE "BUN.BAK",A. Save the same data again, this time with SAVE "BUND.DAT",A; then replace Line 30 with R=O. Enter data you want into lines beginning with 701. Run the program; it will create the new BUN/DAT file with your input data. The back-up file is still whatever you first saved there. Restore the program to the original, delete your input data, and run the program again. Now you will have the original file and its back-up created.

If you have to rescue the back-up file, use the following steps: run Lines 540 - 680 only after interchanging the BUND/DAT and BUN/BAK file names. Delete Line 620 and replace the return in Line 690 with an END. You will have both the back-up and BUND/DAT files.

Ideas

You could use this program to enter coupons and proofs of purchase at the same time; the manufacturer's coupons would appear next to the proofs in the Listing. You could also add subroutines to create first-time files of specific names and to recover the back-up files in a more

elegant way.

Several magazines exist to help serious refunders. Examples are *The Money Maker Bulletin*, P.O. Box 439, Ballwin, MI 63011, and *Refundle Bundle*, P.O. Box 141, Centuck Station, Yonkers, N.Y. 10710. These publications detail offers and what to save from each package. It pays to save nearly every package you bring home; sooner or later an offer will come up which uses part of it. Then, just dig into your "bank" and pull out the

needed proofs. It takes about six months to build up a reasonable "bank account." Clubs exist which trade coupons and proofs; swapping with your neighbors works well too.

You will find computerizing the proofs makes the job easy and gives you some additional refunds you would have missed otherwise.

I wonder if Radio Shack will issue coupons? I could use a few more disks — for about 25 cents each after refund.

Sample Listing

```

3 ALPO
4 ANACIN
5 ARMOUR BACON
6 B&M BEANS
7 B&M BEANS
8 B&M BEANS
9 B&M BEANS
10 B&M BEANS
11 B&M BEANS(2)
12 BAGGIES
13 BAGGIES SANDBAGS
14 BAKERS CHOC
15 BAKERS CHOC(2)
16 BAKERS CHOICE CUPS

```

Program Listing. Disk Refunding

```

10 CLEAR 10000,&H7EFF
20 DIM A$(1000)
30 GOSUB 540
40 A=0:N=0:I=0:J=0
50 DATA 190,127,254,52,16,238,22
8,174,94,48,31,79,52,18,166,196,
39,42,166,196,230,69,160,69,36,2
,230,196,52,1,174,66,16,174,71
60 DATA 109,69,38,4,50,97,32,41,
166,128,160,160,39,4,50,97,32,5,
90,38,243,53,1,35,24,174,66,16,1
74,71,175,71,16,175,66,166
70 DATA 196,230,69,231,196,167,6
9,234,69,234,228,231,228,51,69,1
74,97,48,31,175,97,38,176,166,22
8,50,99,38,161,50,98,57
80 B=0
90 FOR I=&H7F00 TO &H7F66
100 READA:POKE I,A
110 NEXT I
120 PRINT"#ITEMS FROM FILE=";R
130 FOR I=R+1 TO 1000
140 READ A$(I)
150 IF A$(I)="STOP" THEN 170
160 NEXT
170 NN=I:PRINT"NUMBER OF ITEMS="

```

```

;NN
180 INPUT"DELETIONS?(Y/N)";Y$
190 IF Y$="Y" THEN GOSUB 490
200 A$(NN)=" "
210 DEFUSR0=&H7F00
220 T=TIMER/60
230 N=VARPTR(A$(0))
240 POKE &H7FFE,INT(N/256)
250 POKE&H7FFF,N-INT(N/256)*256
260 A=USR0(0)
270 PRINT"SORT END";TIMER/60-T
280 GOSUB 400
290 CT=1
300 FOR I=1 TO 4:PRINT#-2:NEXT
310 FOR I=CT TO CT+49
320 IF I>NN-1 THEN END
330 IF A$(I)=" "THEN END
340 PRINT#-2, I "A$(I)TAB(42)I+
50" "A$(I+50)
350 NEXT I
360 CT=CT+100
370 FOR I=1 TO 4:PRINT#-2:NEXT
380 GO TO 300
390 REM STORE FINAL FILE
400 KILL"BUND/DAT"
410 OPEN"D",#1,"BUND/DAT",40
420 FOR I=1 TO NN-1
430 IF A$(I)=" "THEN GO TO 460
440 WRITE#1,A$(I)
450 PUT #1,I
460 NEXT I
470 CLOSE#1
480 RETURN
490 REM DELETIONS
500 INPUT"ITEM#(-#=STOP)";N
510 IF N<0 THEN RETURN
520 A$(N)=" "
530 GO TO 500
540 REM FILE INPUT &BACKUP
550 OPEN"D",#2,"BUND/DAT",40
560 R =R+1
570 GET#2,R
580 INPUT#2,A$(R)
590 PRINT A$(R),TAB(28)R
600 IF LOF(2)<>R THEN 560
610 CLOSE #2
620 KILL"BUN.BAK"
630 OPEN"D",#1,"BUN.BAK",40
640 FOR I=1 TO R
650 WRITE #1,A$(I)
660 PUT #1,I
670 NEXT I
680 CLOSE#1
690 RETURN
700 REM DATA GOES HERE
5000 DATA STOP

```




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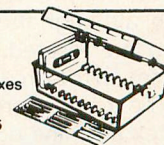


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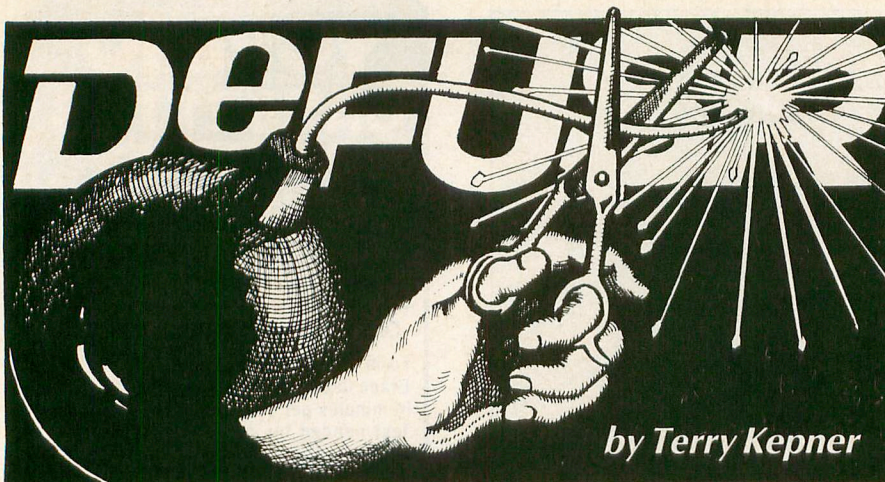


Illustration by Rod McCormick

*Filled your quota in frustration? Have a question and you just don't know where to get an answer? Don't despair—send your questions and confusions to DEFUSERS, care of **The Color Computer Magazine**, Highland Mill, Camden, ME 04843. Questions answered only in this column.*

Is it possible to convert a TRS-80 Videotex Terminal into a Color Computer?

— B.P., Salem, SD

No. They're completely different inside, although the RAMs and the 6809E chip are located in roughly the same places on the circuit board.

The main differences are that the Videotex machine doesn't have joystick or cassette ports (and is missing all the associated circuitry), but does have a built-in modem.

I have a 32K Color Computer with one disk drive. I want to get a printer and envelope/stationery feeder that's compatible with my computer. I'll be using them in business, so I need a daisy wheel printer. What kind should I get?

— T.M., Germantown, TN

You have two choices: you can get a parallel printer, with appropriate hardware, and use a serial-to-parallel converter to drive it with your Color Computer; or you can get a serial printer with the appropriate hardware.

Using a serial-to-parallel converter would let you use the Radio Shack Daisy Wheel II printer with their cut sheet feeder mechanism. Thus, you would have the Radio Shack warranty (the serial-to-parallel device won't void your warranty) and service available. This equipment is very reliable and sturdy.

Two companies make these converters, at this time. Both are sturdy units: Botek Instruments (4949 Hampshire, Utica, MI 48087, (313) 739-2910, CCP-1 — \$69), and The MicroWorks (P.O. Box 1110, Del Mar, CA 92014, (619) 942-2400, P180C — \$69.95).

If you think Radio Shack's prices are too high, you can shop around among the other parallel printers, such as the Qume, Diablo, and so forth, which also have cut sheet feeders.

Your other choice is to buy your printer (either serial or parallel) with a tractor feed mechanism, and buy your stationery and envelopes on tractor feed paper and carriers. This is more expensive stationery, but it can be used on almost any printer with a tractor feed. NEBS, New England Business Systems, supplies this type of stationery, as do many other companies.

You might find that this is the best way to go, since you can buy a Smith Corona TPII for under \$900, with tractor feed costing only a little bit more. The SC TPII is easy to interface to your computer, requiring only a few minutes. Thus, for under a thousand dollars you can have a rugged printer capable of producing your letter-quality correspondence on your own tractor-feed stationery. (The holes tear off and leave little trace that they were there in the first place, so your correspondents will never know you used tractor-feed paper.) The envelopes are attached to tractor-feed paper; once they've gone through the printer you just pull them off the carrier, put the letters in them, and mail them.

I have seen typing teacher programs for the other computers, do you know of any for a 32K Color Computer with one disk drive?

— F.E., Buffalo, NY

I know of only two typing teacher programs. One is available from Instant Software (Peterborough, NH, 03458, *Typing Teacher* — #464RC — \$17.95), the other from RAMPARTS (Box S-8 Gulf Rd., Greenfield, NH 03047, *Typing Tutor* — \$19.95). Both these programs require Extended Basic and will run in as little as 16K of memory, so your 32K system is more than big enough for these two. Both programs are also modular, that is, the lessons are divided into more than two programs. The Instant Software program is seven small modules, while the RAMPARTS program has three large ones.

I have a real problem with my Color Computer. After using it for a few hours it quits working, garbage appears, and my program is gone.

— T.B. Tucson, AZ

You have one of two possible problems: your power supply is malfunctioning, or your SAM chip is overheating.

Some power supplies are poorly soldered, and as the computer gets warm the parts sometimes break contact, killing the power to the computer for a millisecond or so, just long enough to pull in the protection circuitry that turns off the computer to prevent damage. The solution is to take a soldering iron and gently reflow the solder of the parts of the power flow, especially the resistors.

If you want to do it yourself, schematics of the Color Computer are available from Radio Shack in the *Color Computer Technical Manual* (#26-3193, \$14.95). **WARNING:** opening the case of the Color Computer will void your Radio Shack warranty. Also, unplug the machine from the wall circuit before opening the case. The on/off switch controls the power delivered to the computer circuits, and does not disconnect the power supply from the wall (that's right, as long as your computer is plugged in the power supply is on, regardless of the position of the on/off switch).

The other possibility is easier to fix. The SAM (Synchronous Address Multiplexer) chip can get very hot while you're using the computer. When this chip overheats, it stops working properly. Since the SAM chip is in charge of memory addressing, all kinds of strange things happen. It's easy to check and see if that's the problem: turn on the machine, with the case and RFI shield removed, and lightly touch

the SAM chip (U10 on the circuit board). If it's too hot to touch, you need to help it stay cool. You have three possible courses of action: remove the RFI shield, which might help; add a heatsink to the SAM, which should also help; or install a fan, which will definitely help. The first two options will void your warranty.

The RFI (Radio Frequency Interference) shield over the brain of the computer has holes punched into it for ventilation, but sometimes that isn't enough. Removing the shield will provide better ventilation, but you risk incurring the wrath of the FCC and your family and neighbors over the RFI your computer will be putting out. (Boy, can it ever mess up TV and radio reception!)

The next choice is a heatsink (a small piece of metal glued to the top of the chip), to help it quickly dissipate the heat generated. While you're at it, check the 6809E CPU chip (just above the SAM chip). If you decide to add a heatsink, add one to the CPU too, it won't hurt. Heatsinks, and heatsink grease (the glue), are available from Radio Shack.

The last solution to the overheating problem is to buy a fan and have it blow air through the vents of the computer. Radio Shack sells a muffin fan (#273-241, \$15.95) that will do the job if you don't mind building your own case for it. Or, you can buy the CoCo Cooler, a fan specially designed to attach to the side of your computer (REM Industries, 9420 B Lurline Ave., Chatsworth, CA 91311, \$39.95). This solution will not void your warranty.

I've heard that you can speed up the Color Computer by POKEing a number into an address in memory. Is this true, and what's the address and number?

—R.E. Vancouver, WA

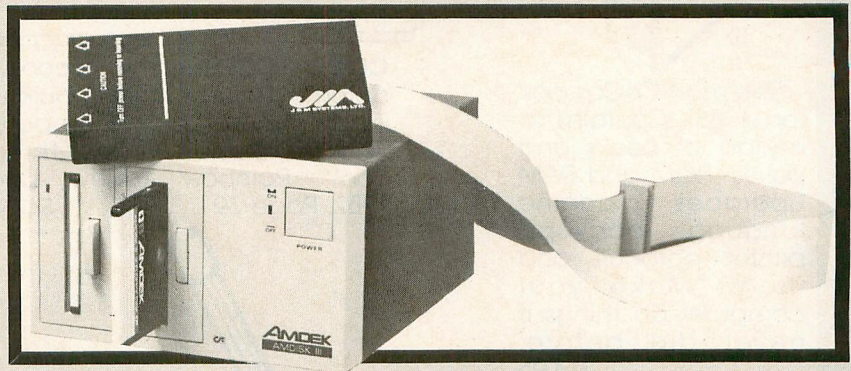
One of the chores of the SAM chip is to select the clock frequency used by the 6809E CPU (the variable clock rate is unique to the 6809E, the other 6809 CPUs can't change their clock rate). The SAM chip has 16 programmable bits in its operations register. Four of these bits are memory mapped to memory locations 65494 to 65497. The first two, 65494 and 65495, control the clock rate to certain memory locations only. Executing a POKE 65495,0 results in doubling the speed of arithmetic and data processing, from .89 MHz to 1.7 MHz, while leaving the RAM refresh and video

display refresh signals at .89 MHz. This POKE also tries to double the RS-232, cassette (CSAVE and CLOAD), SOUND, and PLAY routines. The RS-232 and cassette routines use additional circuitry to generate timing signals to communicate to the outside world. This additional circuitry won't work with the higher clock rate and CSAVE, CLOAD, and RS-232 operations become unreliable. The SOUND and PLAY routines are also out of synchronization and will be much higher in pitch than normal.

Unfortunately, the Color Computer uses components that aren't rated to

work at higher frequency. Try this POKE and see if your cursor blinks at twice its normal rate. If it does, your computer works with the high speed POKE.

There are dangers to using this POKE: operating at higher speeds makes the SAM and CPU chips hotter than normal, which could lead to overheating problems (see previous letter). Even if your computer doesn't overheat while you're using it, long term, high-speed operations can shorten the life of the chips, causing them to wear out in a year or so. Carefully consider the consequences before you use the high speed POKE.



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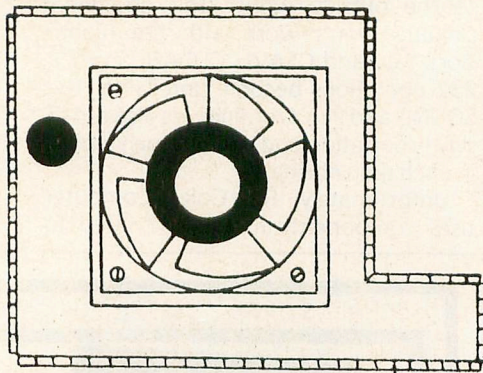
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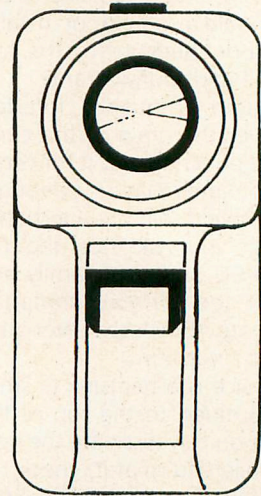
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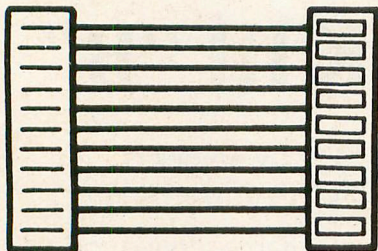
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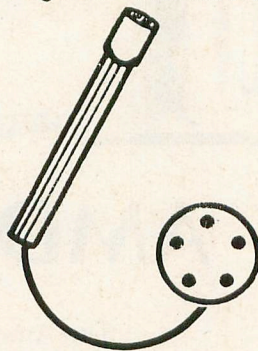
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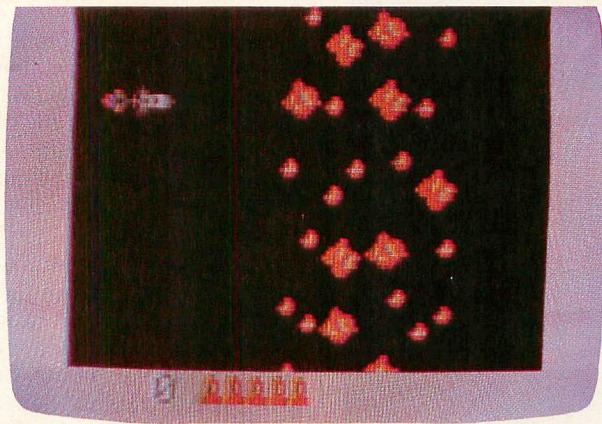
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Moon Shuttle

Data Soft
9421 Winnetka Ave.
Chatsworth, CA 91311
(213) 701-5161
\$29.95



SHOOTING ASTEROIDS, bomb launchers, expandos, and man-o-wars are all part of the challenge that faces you with Moon Shuttle. Moon Shuttle features quality graphics, arcade sounds, and a real challenge for Color Computer gamers.

The game begins easily with the objective of flying your shuttle through an asteroid belt. While this initial challenge isn't terribly difficult, each future encounter with asteroid belts will find you dodging asteroids that move faster. There is also a mystery ship disguised as an asteroid; you can get 30 extra points plus one extra shuttle by destroying it, so keep your eyes open.

Once you have passed through the first asteroid belt you receive 500 bonus points. Your reward for success is to be greeted by two bomb launchers. Bomb launchers have the unenviable feature of summoning reinforcements when you eliminate one of them. Don't despair however; you know they will begin firing

when they stop moving.

The next step is battling the expandos. When the expando begins to expand, watch out! Your joystick is in for a real workout trying to avoid enemy fire.

The last event of the first cycle features one of the most unique enemies you will ever encounter in space, the man-o-wars. Winning this battle won't be easy; man-o-wars don't give any warning when they are about to fire, and it seems like they never stop coming.

If you survive the asteroids, bomb launchers, expandos, and man-o-wars in the first cycle you get to move on by repeating each of the events again, but it gets more difficult. An additional challenge is also added: dodging diagonal

fire from the alien enemies. Additional bonus points are awarded for each trip through the asteroid belt. The second cycle award is 1000 points, the third 1500 points. After the third trip each successful trip will result in a 2000 point bonus. Extra shuttles are awarded for each 10,000 points you accumulate.

Moon Shuttle is available on disk or cassette. It can be played on a 16K TRS-80 Color Computer or a TDP-100. While joysticks are optional, I can't imagine being too successful without them. Moon Shuttle is a fast-paced action game that will keep you occupied for hours. It features hi-res graphics with some neat arcade sounds.

— by Paul Kimmelman

DISK DATE-O-BASE CALENDAR

Custom Software Engineering
807 Minutemen Causeway
Cocoa Beach, FL 32931
(305) 783-1083
\$19.95

DISK DATE-O-BASE CALENDAR is designed to create a database of date-related memoranda that can be accessed and manipulated in a variety of ways. Skeptical at first, I found that, in fact, it is a powerful piece of software for a relatively low price. But let me start at the beginning.

When I ordered the software, I fully expected a three-to-four week time lapse before I would receive it. To my surprise, my order came within 10 days after I sent it (personal check and all). My only fear was that I hadn't received the proper software. When ordering, I had to specify the computer and version of Extended Color Basic I have, and Murphy's Law dictated that I would probably receive the wrong package. My fears were quickly allayed when I opened the package and found

some marginal (handwritten) notes on my documentation, giving me some specific instructions for my particular machine.

Reassured that I was dealing with the right version, I hastily read the documentation and tried to make Date-O-Base work. The key here is "hastily," because in my superficial reading of the docu-

mentation, I missed some key points that later came back to haunt me. The documentation consists of two pages of fine print. It is sketchy in places, but generally contains the information you need to run the software. It contains a warning against using the Break key during the execution of the program, and says that

Please turn the page

1983							AUG						
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	1 a	2 a	3 a	4	5	6 a							
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Figure 1. The Date-O-Base Calendar. The marks on certain dates represent memos.

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112/September 1983

Continued from page 111

the results will be unpredictable if you do. I can verify that this statement is true; if you use the Break key (as I did, having missed the warning in my quick scan of the documentation), you will get a BR ERROR IN 147. Once I figured out the root of the problem (about 45 minutes), things worked just fine.

Date-O-Base Calendar is easy to use. It provides a menu of five functions. The first lets you print the calendar of any given month; this option lets you see a calendar for any month between the years 1700 and 2099. The second option is the Display/Change Memos option, that lets you input, change or delete selected memos from your database. Incidentally, this option can also be accessed from the calendar display simply by entering the date and pressing the Enter key.

Option 3 lets you select memos by keys. You can select any key or combination of key fields and search between any two dates. This feature is handy if you set up your memos to contain key phrases, as you can instantly look at all memos on any given topic. Option 4 lets you block-delete memos, a month at a time.

Option 5 is a date calculation feature. It will compute the elapsed time between any two dates, giving you the result in four forms: days; weeks and days; months and days; years, months and days.

The graphic calendar presented in option 1 is well done and contains a block visual calendar with a small mark for each memo during every day of the month. If using a screen print program, the calendar looks very nice when printed (see Figure 1).

Generally, the program is easy to use and is straightforward. It didn't take long to become very familiar with it and become quite adept at its use. The problems I encountered were relatively minor and fairly quickly resolved.

According to the documentation (which is adequate, but sketchy in places), starting out with CLEAR 11000 will allow for 300 memos per month. I have a 32K machine and that doesn't leave any room for program execution if a screen print program is loaded. In attempting to run the program, I kept getting OM Errors after adding the screen print program. I fixed it by allowing for 280 memos instead of 300.

A word of caution: this disk comes with source code. You should modify the source code only as needed, and if you make any modification, do not save it after a test. Line 3 in the code is set to de-

lete itself. If you test, then Run, don't save or you'll lose Line 3. After your modifications are complete, and before testing, save the file.

—by Norman Garrett

SCREEN PRINT

Custom Software Engineering
807 Minutemen Causeway
Cocoa Beach, FL 32931
(305) 783-1083
\$7.95

SCREEN PRINT is an excellent program with several important features. By using the proper parameter with the routine, you can vary the size of the print and move it around on the printed page. It is easily merged with Date-O-Base (or any other graphics program), and generally does a quality job of duplicating the screen. I modified my Date-O-Base code to allow the selection of calendar print size prior to printing any given calendar. That way I can print a small calendar for use in combination with printed memos, or a large calendar to hang on a wall. Many similar variations are possible.

If you have a printer, Date-O-Base will print your memos, but not your graphics calendar. With the addition of the Screen Print program, the calendars can be printed just as they appear on the screen. You will, of course, need an LP VII, DMP-100 or other printer with dot-addressable graphics.

Overall, I found the program to be well worth the money, and would recommend it for general Color Computer use.

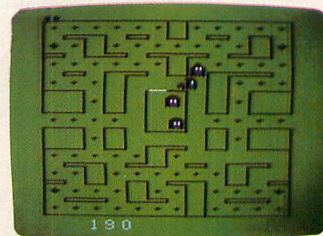
—Norman Garrett

Ghost Gobbler

Spectral Associates
141 Harvard Avenue
Tacoma, WA 98466

\$19.95 Cassette

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MAZE/CHASE GAMES all have one thing in common: clear the board without being caught.

Ghost Gobbler remains close to the

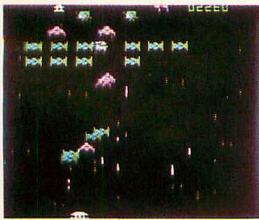
more famous game. Maneuver through the maze eating all the food dots plus four "energizer" dots while four ghosts try to eat you. Sound familiar? The twist is teleportation. At the bottom of the screen is the teleportation spot; enter and you are transported to the top center of the maze. Ghosts can't follow and it works only one way. Think of it as hyperspace.

Eat an energy dot and the ghosts are yours for dinner, worth 200, 400, 800 and 1600 points. The ghosts will blink before gaining back their courage and desire to have you for supper. Gobblers have dinner, ghosts have supper—thereby keeping the class society intact. Eight different bonus shapes will appear, worth from 100 to 5000 points depending on which board you are currently playing. There are different shapes for each maze and they will appear twice each board. Every 10,000 points the skill level automatically increases by two and a bonus gobbler is awarded. No more than five gobblers may be accumulated. As the skill level increases the gobbler goes slower and the ghosts have a better idea of what's going on (they don't seem to be in a maze.) If you must have a maze chaser game, consider Ghost Gobbler. Ghost Gobbler requires 16K Color Basic.

— by Sandy Ellsworth

Galax Attax

Spectral Associates
141 Harvard Avenue
Tacoma, WA 98468
**\$21.95 Cassette, \$25.95 Disk,
\$32.95 ROMpak**



GALAX ATTAX is a fast-action arcade game with high resolution graphics and enough challenge to keep you busy.

The set-up is designed for one player at a time with a record of the five highest scores. Before starting, enter your three initials. Wait for the screen to change, press Enter and the game begins immediately, so be prepared! Shoot first, fast, and often. You cannot fire again until the missile passes the top of the screen or an alien fighter has been hit.

Your missiles will not destroy theirs, which is something to keep in mind.

Your ship is pitted against a formation of three types of alien fighters, each with their own characteristics. The large fighters are worth 50 points, the medium-size fighters score 100 and the small nasty ones are 200. Point values double when the fighters are attacking, and believe me, they do. Wave after wave, after wave... The more formations you destroy the faster the aliens attack. The bombs will also drop quicker. For each formation completed you score a bonus of 500 points and you get a bonus ship for every six formations. Each flag at the top of the screen represents past and present formations completed. After 10 flags it resets to one. GALAX ATTAX requires 16K Color Basic and is available from Spectral Associates. It is a necessary addition to every game library.

— by Sandy Ellsworth

Keys of the Wizard

Spectral Associates
141 Harvard Avenue
Tacoma, WA 98466
\$19.95 cassette \$23.95 disk
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IFOUND MYSELF inside a small cottage, near a fireplace. There were passages leading south and west. I looked down: on the floor, not two feet from my left foot, was a bag of pearls. What a find this cottage turned out to be! I picked up the pearls and examined the other rooms hoping to find more treasures. The cottage was loaded with delights. So many, in fact, I couldn't carry all of them at the same time.

My pleasure was short-lived because of the apparent displeasure exhibited by the one of the cottage's inhabitants—a huge cyclops. He was not pleased and started throwing rocks at me. I got weaker and weaker. Treasures dropped from my grasp as I no longer had the strength to carry them.

I needed time to think; more time than I could reasonably expect the cyclops to allow me. He really did seem to be a bit angry. If he cares so much about the pearls and other treasures, he shouldn't leave them lying about! I retaliated by activating the all-powerful Cassette Save feature which enabled me to freeze the

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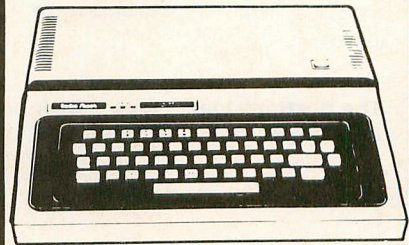


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Continued from page 113

action in my latest bout with the demons in Spectral Associates' new adventure game "The Keys of the Wizard."

Keys of the Wizard is not an animated adventure, but it is a good adventure game and will prove challenging to the new and the seasoned adventurer. The documentation explains the scenario and vocabulary very well. I decided to opt for level 1 (there are three levels) for my first encounter in the Wizard's domain.

The game player's current strength creature strengths, score, and a real-time clock are constantly displayed on the screen. The real-time clock is especially important; the creatures you will encounter also live by this clock. The cyclops I encountered in the cottage entered the room on its own—it wasn't there when I first entered. It must have heard me rummaging about looking for treasures, and come to investigate.

Having lived through that experience, I was no longer nonchalant about my wanderings. Knowing an evil being might tap me on the shoulder as I tried to pick the lock on a steamer trunk added a real-time urgency to my wanderings and investigations.

Two versions of Keys of the Wizard are available; 16K and 32K tape, and a 32K disk configuration. The disk game even speaks at opportune moments.

The well-plotted story line and special features—ability to save games, real-time clock, smart creatures, multiple skill levels, two viewing screens, constant information display, and a randomizing feature to ensure that no two games are the same—make this game a good buy for adventure enthusiasts.

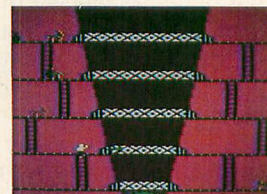
—by Chuck Shackelford

Canyon Climber

by James Garon
Radio Shack
One Tandy Center
Fort Worth, TX 76102
ROMpak \$34.95

CANYON CLIMBER IS YET another of what is turning out to be a fine series of fun-for-the-family ROMpak games by Radio Shack in association with DataSoft. This is a Donkey Kong-type game where, in the guise of a mountain climber, the user scales a crevice, Indian-defended hill, and hills patrolled by rock-dropping eagles.

The first of three screens pits you against mountain goats as you cross



bridges spanning the crevice, climb ladders, and set off dynamite charges. You have to successfully climb five levels of the crevice as you set two dynamite charges at both ends of each level's bridge. Ornerly mountain goats stand between you and the top level. If one of the goats butts you, you fall off the crevice ledge into the great void below. Your only defense against the goats is pressing the fire button of your joystick, or space bar on your keyboard, which jumps you over the oncoming goats. They are persistent and tend to reverse direction a lot. You'll have to be on (and off) your toes quite a bit. When you successfully climb to the final level, detonate the charges and advance to Indian Hills.

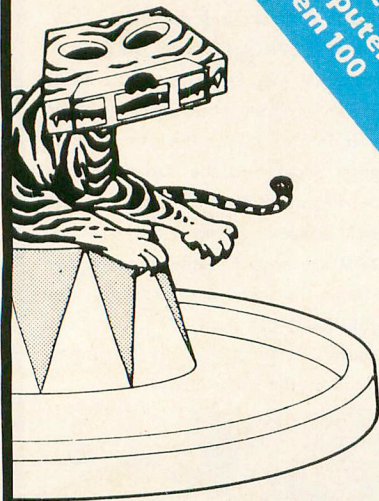
The Indians defending the hills ascribe to the shoot-first-ask-questions-later philosophy. Once again you are faced with five levels of ascent, with each guarded by an arrow-shooting Indian. You have two ways to avoid the Indian's arrows; by jumping over them or by grabbing a magic shield located on three of the five levels. The shields work well, but inhibit you from climbing ladders and jumping.

The Indians are merely defending their land, so it wouldn't be right to blow them up with dynamite. If you make it through the final level, a magic force pulls you upward onto Eagle Cliffs. Here you are faced with a series of plateaus. The only way to get from one plateau to another is...well...remember the old running broad jump? That's how you get from one cliff to the next. With your joystick in the left position, quickly advance it to the right and when you get to the edge, hit the fire button and jump to the next cliff's plateau.

The cliffs are not the only hazard you'll encounter in this screen. The eagles flying overhead are apparently members of the Eagles Bombardier Cadet Squad. They fly across the top of your screen dropping rocks. It's not enough to jump from cliff to cliff; many times the rocks will get you just after making a successful leap.

At the end of each range of cliffs is a ladder to climb in order to advance to the final level. There's no flag-raising ceremony for you at the top of Eagle Cliffs.

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Chromasette

PO. Box 1087 Santa Barbara, CA 93102
(805) 963-1066

As a matter of fact, the treatment up there is downright shoddy. Remember the mountain goats from level one? Apparently one of them escaped the blast and has managed to find its way to the top of Eagle Cliffs. His mission is revenge. There's no avoiding this one; once he butts you, you are returned to the first screen and are awarded an extra man. The game gets more difficult each time you make it through the three levels.

Canyon Climber is good fun.

— K.L., Color Staff

MOPTOWN

by The Learning Company
Follett Library Book Company
4506 Northwest Highway
Crystal Lake, IL 60014
16K Extended Color Basic

Moptown Parade \$45 Disk, \$40 Tape
Moptown Hotel \$35 Disk, \$30 Tape

AS AN EDUCATOR concerned with the implementation of the Color Computer in schools, I continuously search for software that can provide students with creative thinking opportunities. "Moptown," developed by the Learning Company, meets these needs. The Moptown program is a series of eleven learning activities, each designed to be progressively more difficult. Students from ages six to thirteen will have a challenging experience working through the Moptown activities.

Sixteen moppets reside in the village of Moptown, and each is different. Some moppets are tall, others short, some may be fat, some thin. There are bibbits (characters with large noses and big feet), and gribbits (characters with tails). In addition, some moppets are red while others are blue.

The following briefly describes the Moptown programs.

"Make My Twin" establishes the basic design format for the remaining programs. A moppet is displayed, and the user must create its twin by determining if the moppet displayed is: tall or short; fat or thin; red or blue; bibbit or gribbit.

The pattern for the four pairs of traits is consistent through the complete set of learning activities. Answers are accessed by pressing the first letter of each trait. For example, a moppet could be: S-F-B-G — short, fat, blue, gribbit.

"Who's Different?" In the second activity four moppets are displayed. The user must determine which moppet is different and press the correct number,

i.e., 1,2,3,4. In addition, this activity provides a choice of rules. Rule 1: three moppets the same, or Rule 2: no moppets the same. Once the correct choice is made the user must determine why that moppet is different. For example, the four moppets displayed might be: Number 1 tall-thin-red-gribbit; Number 2 tall-thin-blue-bibbit; Number 3 tall-fat-red-gribbit; Number 4 short-fat-blue-bibbit. The user must determine why moppet Number 4 is different (Rule Number 2). The screen displays:

- A — tall/short
- B — fat/thin
- C — red/blue
- D — Bibbit/Gribbit

The user selects A because the trait that makes moppet Number 4 most different is that it is short.

"What's the Same?" When using this program, students must determine what trait is the same for the four moppets displayed. All eight of the attributes are listed and the user must select the correct attribute (1 — 8).

"Who Comes Next?" During this activity the player must determine which moppet comes next, sequentially, from studying the four moppets that are displayed. A choice of three patterns is possible: ABABAB; ABBABB; AABAAB. The user must choose the moppet that continues the pattern.

"Moptown Parade." This program provides the student with the flexibility of having up to four differences between moppets. The purpose of the program is to create four moppets for the parade.

"Who's Next Door?" Three moppets are displayed in "Who's Next Door?" The student must determine which moppet trait is changed in the upstairs room. The user can then determine the correct traits for the moppet in the downstairs room.

"Change Me." This activity requires the moppet be changed by changing one trait at a time (Rule 1) or two traits at a time (Rule 2). Moppets Number 1 and Number 4 are displayed, and the user must create Moppets Number 2 and Number 3.

"Club House." The user must determine the moppets who are members of the club before they can be placed in the clubhouse. The program calls for a single or double rule game. When the user is prepared to guess which rule allows entry into the club, the R key is pushed and then a selection can be made.

"Secret Pal." The user must determine

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Continued from page 115

which traits create the secret pal. The only hint from the computer is that for each correct trait selected, a yellow dot is placed under the moppet that is displayed.

"Moptown Map." Moppets must be placed according to the house in which they belong. Sixteen homes are drawn and five moppets are displayed to assist you. Each row and column has two rules. (Example: only tall, blue moppets in this row.) The challenge is to place the remaining eleven moppets in their respective homes.

"Moptown Hotel." This is a two-player activity that requires the student to place moppets in hotel rooms after receiving specific rules. Each player has a choice of up to three different rules for each row and column.

Educational Value

Moptown is designed to assist students with the development of logical thinking skills. Beginning with "Make My Twin," the students must begin to recognize similarities between moppets. As the activities progress, the students must

learn to identify differences and patterns, and develop strategies to solve more complex problems.

The Moptown program is easy to use. The user must enter information in a simple, logical sequence. The directions are provided at the beginning of each program. Young children may require the assistance of a teacher or parent to read the directions.

The documentation provided with the program is excellent. Instructions are clear and understandable. Special function keys are written in bold red type, and colorful moppet characters are well placed throughout. In addition, there are suggestions for supplemental learning activities in the back of the manual. The positive characteristics make Moptown an excellent program for educational use. There are only two minor concerns: when a user is asked if he or she wants to leave and responds YES, the program is erased from memory and must be reloaded; and the back arrow key is non-functional.

Finally, the packaging of the program is most convenient for easy access and storage.

— by David M. Macali,
Educational Consultant

CoCo Cooler

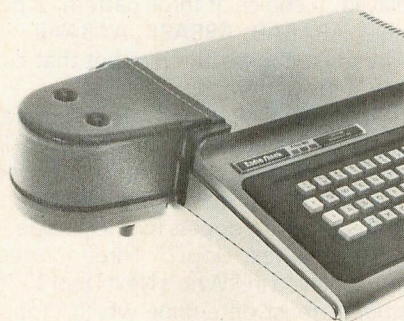
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DOES YOUR COMPUTER suddenly go crazy after you've been using it for several hours? For no apparent reason, do you lose hours of data entry or programming time because your computer glitches out and garbage appears on the screen?

If these problems happen to you, perhaps your problem is an overheating SAM (Synchronous Address Multiplexer) or 6809E CPU (Central Processing Unit) chip. Both of these devices are vital to the operation of your computer. If either of them malfunction, you might lose hours of work. If it happens frequently you'll destroy the overheating chip, which in turn could damage other circuitry in your computer.

The cause of the overheating is simple: insufficient ventilation. The reason for the inadequate ventilation lies with the FCC (Federal Communications Commission). The FCC has ruled that before any

home or personal microcomputer can be sold, it must pass an RFI (Radio Frequency Interference) test. Too much RFI wipes out TV and radio reception in rooms within 50 feet of your computer. To control this RFI, Tandy installed a metal shield around the CPU, SAM, and memory chips. This shield, while keeping the RFI down to FCC acceptable limits, severely cuts down on air circulation to these important chips. In most computers and locations, there is just enough ventilation to keep your computer operational. But some chips run hotter than others, and some locations in the US are hotter than others (when the surrounding air temperature is at 100 degrees, the chips tend to overheat quickly).



One solution is to remove the RFI shield, giving better ventilation. Unfortunately, the RFI problem will probably get you many complaints from those members of your family who want to watch TV or listen to the radio. If you live in an apartment house, the complaints will come from your neighbors.

The other solution to the problem is the CoCo Cooler. The CoCo Cooler is a fan designed to attach to the side of your computer and draw air through it. The fan includes its own on/off switch and power cord, and is extremely simple to install. Just remove the protective covering on the adhesive tape attached to the contoured edge of the unit and place the fan against the computer. Bonding is instantaneous. To prevent problems when servicing, the fan attaches only to the top section of the Color Computer.

The disadvantage to this method is that your Color Computer will no longer fit inside its shipping carton and carrying case. I discovered that the fan works just as well when you just place it against the side of your computer, without using the adhesive tape. This leaves you the option of maintaining portability.

According to a chart in the documentation of the CoCo Cooler, in a room maintained at 80 degrees, the fan kept the casetop above a 64K Color Computer power supply below 90 degrees Fahrenheit, instead of letting it reach its 109+ degree normal operating temperature.

Even if your computer isn't a victim of overheating, you should consider getting this fan unit. Every degree closer to room temperature at which you can get your chips to operate, the longer they'll survive.

— by Terry Kepner

HUMBUG

Star Kits
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Mount Kisco, NY 10549
\$39.95 Disk or Tape; \$69.95 ROMpak

STAR KITS CALLS HUMBUG "the super monitor," and I think they're right! When doing any machine language work, I always load it first, and since it is relocatable I can put it in any area of memory that will not otherwise be used.

A monitor is used to put machine code and other data into the computer's memory. It also lets you examine and change data in memory, and even control the execution of programs. I use it to

Turn to page 118

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Color Computer News



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REVIEWS

Continued from page 116

enter the hex code of my program, then I single-step through each instruction and look at the registers to make sure it is doing what I wanted. You can also set breakpoints (locations for the program to stop) and display the registers during the running of the program.

Another good use is to modify programs you did not write. If you know what you're looking for, for instance, the D/A converter for sound output, you can search for all FF20's (hex address of D/A). HUMBUG will show every address that has FF20, then you can make the changes needed.

I have a bad habit of leaving unmarked tapes on my desk; this is where HUMBUG is great! I put the tapes in the recorder and type "AT;" then HUMBUG tells me the name of each program and the starting and ending address. Then I can either re-use the tape or save it. A monitor will not take the place of an editor-assembler, but it will let you write short machine language programs and get away from using Basic and data statements to enter hex code.

HUMBUG was used on 6800-based computers long before the birth of the Color Computer, so it is not a newcomer,

nor do you have to worry that it will have a lot of bugs in it.

HUMBUG is in machine language and comes on disk, ROMpak or tape. It needs 4K of memory, and will run on any 16K to 64K machine with or without Extended Basic or Disk Basic. If you buy the disk, it can be copied to tape.

There are 37 two-letter commands. Of

these, three or four may have limited use to Color Computer users.

The 21 page manual is well written and contains the source code. There are a few things that could be improved — I had trouble understanding the PR command, and the disassembler could be a real one. But it still is one of my most valuable tools! — by Frank DuPont

Summary of commands:

- AD:** Formatted ASCII dump; 16 bytes per line of ASCII data from any place in memory.
- AI:** ASCII input; inputs ASCII data from keyboard to any memory location.
- AO:** ASCII output; opposite of AI.
- AT:** Analyze tape; very useful! Top of screen shows what's on the tape and the start, end and number of bytes it contains is on the bottom.
- BA:** Baud rate; sets speed of RS-232 port to 110, 300, 600, 1200 or 2400 baud.
- BR:** Breakpoints; set or reset up to four breakpoints.
- BP:** Display locations of breakpoints you have set.
- CO:** Continue; after breakpoint is encountered you can continue to the next or to the end of the program.
- CS:** Checksum; Prints 16-bit checksum of area of memory you select.
- DE:** Desemble; not a true disassembler, but it does group the machine code with its address.
- EN:** End of tape; not of much use, it puts end of tape code for "MIKBUG" format.
- EX:** Exit to Basic.
- FL:** Find; very useful for searching memory for any one-to-three byte number.
- FM:** Fill memory with bytes of code.

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HD: Hex dump; dumps eight bytes per line to the screen or printer.

HE: Help; displays all HUMBUG commands.

JU: Jump to subroutine.

LO: Load tape; not of much use — it is used to load tapes in "MIKBUG" format.

MC: Memory compare; very good for finding where two programs or ROMs are different.

ME: Memory examine and change.

MH: Move HUMBUG; useful when HUMBUG is in the same memory area that you want to put another program.

MM: Move memory; this will move a program even when two programs overlap.

MT: Memory test; non-destructive (rotating bit) test.

MV: Memory view; displays 512-byte block.

PR: Printer; send data to printer.

PU: Punch tape; not useful on Color Computer; outputs data to serial port in "MIKBUG" format.

RC: Register change; change data in 6809 registers.

RE: Register examine; prints contents of registers.

RT: Remote terminal; allows you to hook a terminal to your computer to run Basic programs. It will not work with Extended Basic and may not work with some Disk programs.

SA: Save to cassette; same as CSAVEM in Basic.

SI: Serial input; you can connect either a terminal or another computer to the serial port and control HUMBUG, but not Basic.

SS: Single step; very good for debugging programs, but there are a few instructions it will not do.

ST: Start single step; special command to single step if a breakpoint has not been used.

TF: Terminal full duplex.

TR: Terminal half duplex.

WH: Where is HUMBUG? This is a good one, I often forget where it is!

!!: Reset command; resets to power-up condition. Shift command followed by the letter O turns the serial port on or off. This is nice for controlling a print-out. A shift command followed by the letter P turns a pause control on and off, which will print 15 lines on the screen and won't stop until a key is pressed.

THE PI80C

The MicroWorks
P.O. Box 1110
Del Mar, CA 92014
(714)942-2400
\$69.95

THE CCP-1

Botek Instruments
4949 Hampshire
Utica, MI 48087
(313)739-2910
\$69.

IT'S HARD TO FIND a good, inexpensive printer for the Color Computer. Most really good printers available are parallel printers. Radio Shack is the only company that makes printers that include parallel and serial ports as a standard configuration. The other manufacturers sell their printers either as a parallel or a serial printer, and the serial version is usually more expensive. In addition, to use these serial printers you have to buy (or build) a special cable to connect the Color Computer 4-pin serial port to a standard 25-pin RS-232 connector. Most printer manufacturers don't sell cables

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Continued from page 119

for the Color Computer, and Radio Shack doesn't have a 4-pin to RS-232 standard printer cable (the RS-232 cable they sell is for attaching to a modem, and uses slightly different pin connections than a printer requires). Hence, the only sources for these special cables are freelance technicians who can wire the cable for you, or it's a do-it-yourself project.

To alleviate this problem, two companies, Botek Instruments and The MicroWorks, are producing devices that plug into the Color Computer serial input/output port and convert its output into data that can be read by a standard Centronics parallel printer. While they both use the same general principles, the devices are different.

Botek Instrument's CCP-1

The CCP-1 is a complete unit. It has a 4-foot cable with 4-pin DIN connector for the Color Computer, a 2½-foot ribbon cable with a 36-pin plug for connecting to the printer, and an ac adapter to supply power for the conversion box situated in-line between the two cables.

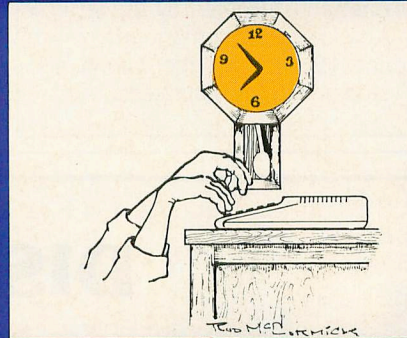
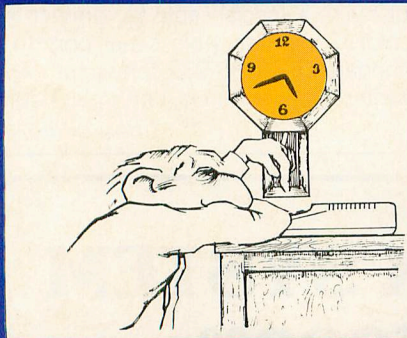
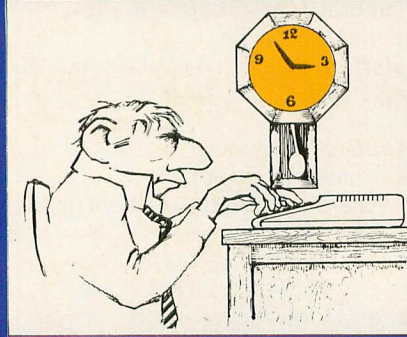
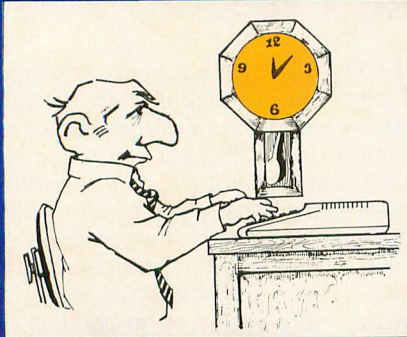
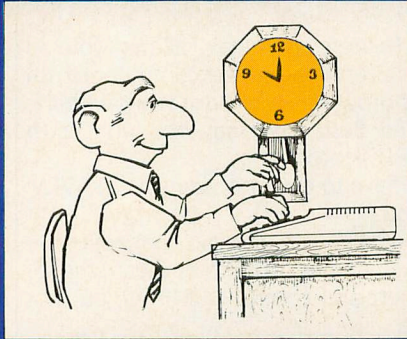
The CCP-1 includes switch-selectable data rates (300, 600, 1200, 2400, 4800, and 9600). These let you operate your computer and printer at maximum efficiency, cutting down on the time wasted waiting for your computer to finish sending data before you can use it again.

For the technically minded, Botek has included a brief schematic (with the parts clearly labeled) of their "black box" (actually a 2 1/2 inch by 4 1/2 inch by 1 inch blue box) device. This is especially helpful since it means you can take the unit to any competent technician for repair in the event of problems.

The instructions are simple, with all pertinent information included on one page, excluding the schematic. To help you use the unit and your computer at higher data rates, a short list of POKE commands are given that set the Color Computer to operate at the data rates available with the CCP-1. I've used mine successfully at 2400 baud, roughly four times faster than normal. I've had difficulty at the higher data rates, but I'm sure that's more my fault than the unit's.

The only fault I find with the CCP-1 is that there isn't an easy way to switch between 7- and 8-bit operation. The instructions tell you how to open the unit's box and move a jumper wire that sets either 7- or 8-bit operation, which is fine if you have a newer Color Computer that sends eight bits of data from Basic. But if you have the older unit, which sends

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seven bits, then you're going to have to open the unit every time you want to use Scripsit or any other software that operates with the 8-bit word length. Fortunately, this problem is easy to correct. I bought a miniature double-throw, single pole switch, drilled a mounting hole, soldered three wires to the switch, and placed the other ends of the wires in the three jumper slots. Now I can simply switch between the 7- and 8-bit operation whenever I need to.

The MicroWorks' PI80C

The PI80C is a small black box about the size of a ROMpak cartridge, with a 4-pin DIN plug on a 9-inch cable, and an ac adapter power supply. The black box is so similar to a ROMpak cartridge that the instructions and cartridge contain warnings against trying to plug the unit into the Color Computer ROMpak port.

Unlike the Botek unit, the PI80C doesn't include a cable to connect it to a printer. Instead, you have to buy the Model I to standard printer Radio Shack cable (\$39), or its equivalent. Also, it doesn't have selectable data rates. The only rate it supports is 600 baud, the standard rate used by the Color Computer.

Like the CCP-1, the PI80C includes a schematic of its circuit board with all the parts identified. In addition, the documentation (four pages) has a diagram of how to plug the printer cable to the "black box," and a pin-out description of the signals on the box's card edge-connector and where they appear on a standard 36-pin Centronics cable connector. Another plus for the PI80C is the toggle switch on the top of the cartridge that lets you change operation from 7-bit word length to eight.

The documentation even includes a seven line Basic program that lets you dump hi-res graphics from the Color Computer to an Epson MX80GT printer. If you don't have an Epson printer, this program can still serve as a model for writing a routine for your own printer's hi-res graphics capability.

The documentation also includes a brief note that not all Scripsit packages send data to the printer at an even 600 baud; there's a little variance in the timing. To compensate for these inconsistencies, The MicroWorks has included an adjustment screw inside the case. Using a small screwdriver, you can turn a potentiometer to exactly match the rate required by your specific copy of Scripsit, or any other software that uses its own RS-232 driver routines. The potentiometer is accessible through a small hole in

the PI80C case, marked, simply enough: Baud Rate Adjust.

Another note in the documentation states that the PI80C was designed to be compatible with all Radio Shack parallel printers. Centronics-compatible printers will also work as long as they can do a line-feed automatically when they receive a carriage return (the Color Computer doesn't send a line-feed when it sends a carriage return, it assumes the printer will do that chore for it). This is also true of the CCP-1. If your parallel printer doesn't line-feed when it receives a carriage return, neither of these serial-to-parallel devices will drive the printer properly.

Summary

Both devices let you use a Centronics-compatible parallel printer with your Color Computer. Both have their own power supplies so you don't strain the computer's power supply. This means you have to have another wall socket available, a minor inconvenience. They both work. Which one you choose should be determined by what you want and how much money you can spend.

No matter which you buy, you'll find that your choices of which printer to get for your system will be greatly enlarged. And once you have one of these serial-to-parallel boxes, you'll find it easier to find another useable printer to borrow if you should have to take yours to the repair center. — by Terry Kepner

DISK DRIVE CLEANING KIT

Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$29.95

DISK DRIVES ARE certainly great little devices, as those of you who are already using them well know. After a modem and a printer, the disk drive is the most wanted Color Computer accessory. Sometime after you take the disk drive plunge, but before those dreaded I/O errors start appearing, you should think about buying a cleaning kit, such as the one sold by Radio Shack (part number 26-0407).

When a disk drive is operating, as in Read/Write operations, the disk is spinning past the stationary drive head at 300 revolutions per minute. The head that reads and writes the information on

Turn to page 123

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Continued from page 121

Program Listing. Disk Cleaning Program

```

10 CLS : PRINT : DEF USR0= PEEK
(&HC004) * 256 + PEEK (&HC005)
20 INPUT " DRIVE (0-3)"; DR
30 IF DR<0 OR DR>3 THEN 20
40 INPUT " TRACK (0-34)"; TR
50 IF TR<0 OR TR>34 THEN 40
60 PRINT" PLEASE PUT FORMATTED D
ISK IN DRIVE "DR", AND PRESS
<ENTER>"
70 IF INKEY$<>CHR$(13) THEN 70
80 POKE 234,0 : POKE 235,DR : PO
KE 236,TR : X= USR (0)
90 POKE 234,2 : X= USR (0)
100 PRINT : PRINT " PLACE CLEANI
NG KIT DISK IN DRIVE"DR"
, AND PRESS <ENTER>"
110 IF INKEY$<>CHR$(13) THEN110
115 TIMER= 0
120 POKE 234,1 : X= USR (0)
130 PRINT @ 424, INT (TIMER/60)
140 IF TIMER<1830 THEN 120
150 POKE 65344,0

```

CGP-115 Color Graphic Printer

Radio Shack
One Tandy Center
Fort Worth, TX 76102
\$250

IN THE PAST several months, many printers have been introduced on the microcomputer market. One of these, the Radio Shack CGP-115, is different and quite unique. The CGP-115 is a text and graphics printer. This is not so different from the other new printers on the market, but the CGP-115 prints in four colors. It also draws, prints charts and graphs, even "doodles" if you like, all in color and with simple commands.

If that interests you, wait until you hear the rest. The CGP-115 has built-in serial and parallel interfaces, so it will work with all Radio Shack computers and probably any other computer on the market at no extra cost. It is small and compact, ideal for applications that require portability. Best of all, the price is less than \$250.

With all these features, the CGP-115 also has its weaknesses. The paper is only 4½ inches wide, ruling out word processing. Even so, the CGP-115 can print 40 and 80 characters per line. The print style is easy to read, although very small at 80 characters per line. The four color pens have a limited life span if left in the printer, but they are easy to remove and replace if the printer is not used for any length of time. These flaws are minor compared to the major one. The CGP-115 is *slow*. At 12 characters per second, it won't win any speed contest; however, most plotters or graphic printers are relatively slow, and the cost for any other four color unit is greater than the CGP-115.

I have found the CGP-115 very useful. It can draw or plot almost anything, and is easy to control, using the two page Command Summary. I use it to print Disk Directories. The printout is exactly the right size to glue onto disk sleeves for a permanent reference.

The CGP-115 will certainly not serve as the primary printer for a system, nor was it designed for such. It is very useful for producing small charts and graphs in color, and for limited printouts. It may not be fast, but it is colorful.

— Ted Evans, Jr.

the magnetic disk is lightly touching the disk during these periods of operation. The same thing that happens to the heads on a tape recorder will eventually occur to the heads of your disk drives: minute amounts of a brownish material will migrate from the surface of the disk to the face of the Read/Write head. That's when the problems and I/O errors start. And, once they start, they do not go away by themselves. Unfortunately, disk drive heads are not as readily accessible as tape drive heads. Fortunately, a way exists to cure the "dirty head blues," and that's where the cleaning kit comes in.

Open the kit and you will find four items. There is a plastic bottle containing four ounces of head cleaning solution. The label on the bottle reports that the solution is made of fluorocarbon and isopropyl alcohol. A pour-spout is supplied for the fluid. There are two "cleaning disks" in the box. The instructions for use of the kit are generally quite clear; the instructions are found on the outside of the kit box, and on the disk, as well. The disks can be used with single-sided or dual-sided drives.

The kit instructions suggest that you execute a DIR command in order to bring the drive head(s) into contact with the disk cleaning material. In fact, you would have to execute several DIR commands to obtain a total of 30 seconds of cleaning time. A major fault of this procedure is that the cleaning surface will always be in the area of track 17 on the cleaning disk. Program Listing 1 solves both these problems. The program will run your

drive for 30 seconds, the recommended cleaning period. The program also lets you select any track from track 0 to track 34 for cleaning. By being able to use the entire surface of the cleaning disk, you should be able to obtain as many cleaning cycles as there is available cleaning fluid.

As I prepared to use the kit for the first time, I discovered that I was not quite sure just which side of my Radio Shack disk drive the head was located on. The instructions are a little hazy in this area, as they seem to be aimed at Model III owners. I did a little investigation and found that the read head is on the same side of the drive as the red "in operation" light. So, insert the cleaning disk with the label side *away* from the red light (as usual), and the cleaning material on the red light side. There is no protect notch on the cleaning disk so don't look for one by which to orient your disk.

A few final comments are in order. The cleaning solution bottle is supposed to have a protective foil seal — mine didn't. When using the solution be careful, it really pours out a lot at a time, a *whole* lot! The instructions tell you to use "some" of the solution, about 2 milliliters. If you want that in ounces, it is approximately 1/15 of an ounce. There should be enough of the fluid (4 oz.) to give you 60 cleanings, if you don't waste any. With a 50 percent error factor, that's 30 cleanings. The instructions call for 13 cleanings per cleaning disk, a total of 26 operations. Program 1 should give the disks a longer life span than 13 cleaning operations per unit.

— by Tom Garcia

NEW:PRODUCTS

ColorSpeak

Bumblebee Software
P.O. Box 25427
Chicago, IL 60625

ColorSpeak is a self-contained cartridge voice synthesizer for the TRS-80 Color Computer, using state-of-the-art electronic components.

ColorSpeak is located in ROM so it is always available, and has its own 2K RAM, so it requires no memory.

ColorSpeak is priced at \$169; the user manual costs \$4.

Circle No. 89 on Reader Service Card

CC Forms

MJM Design
P.O. Box 54188
Los Angeles, CA 90054

MJM introduces a matched set of coding forms specially designed for the TRS-80 Color Computer. The Testscreen coding form is designed to fit the formats of the most popular Color Computer word processors with 51 by 24 and 64 by 24 markers, as well as the Tandy 32 by 16 text format. Key information on the low resolution graphics format is also included on each sheet. The graphic screen plotting form is the same size as a 13-inch TV screen image so that a graphic image may be drawn

on the plotting form and the X,Y points transferred directly to Basic programs. The form shows relative PMODE screens for correct image locating and shifting between pages.

Each form is sold in 40-sheet pads for \$2.50 plus 60 cents shipping.

Circle No. 90 on Reader Service Card

Chromasette Magazine

Chromasette Magazine
P.O. Box 1087
Santa Barbara, CA 931102

Issues of Chromasette magazine from July, 1981 on will soon be available on tape and disk. The programs will be the same on either medium, but those on disk may be modified especially for 32K disk systems.

Each disk will contain a menu program to take care of the initial memory allocation for each program, making it easy to run programs without worrying about CLEAR and PCLEAR values.

Subscriptions for one year (12 issues) are \$95 on disk, and \$50 on tape. Six month subscriptions are \$55 and \$30 respectively, with single copy back issues \$11 and \$6.

Circle No. 91 on Reader Service Card

Spell-Rite

Eigen Systems
P.O. Box 180006
Austin, TX 78718

Spell-Rite is a cassette spelling verifier designed specifically for cassette operation. It can reduce misspelled words using its 10,000 word dictionary, and has the ability to use multiple special-purpose dictionaries. Spell-Rite can verify a 1,000 word document in under nine minutes, including cassette I/O time. On an average, any word can be verified in approximately a half second. The program operates in manual mode, giving you full control of the verification session, or automatic mode handling all program operations without user intervention. Any number of dictionaries can be built, tailoring each to handle special-purpose vocabularies (i.e., engineering or medical terminology). A new 10,000 word dictionary can be built in about one hour. Spell-Rite comes on cassette and requires 32K with Extended Color Basic. Available for \$59.95 plus \$1.50 shipping and handling.

Circle No. 92 on Reader Service Card

Computer Console

The Project Works
P.O. Box 8086
Des Moines, IA 50301

The Project Works has introduced a line of computer furniture. The computer console is built to last; it can accommodate almost any personal or small business computer currently on the market. Also offered is a laminate covered storage/file unit that fastens to the underside of the console. This item allows dust-free storage of sensitive equipment. A matching peripheral/printer console is also available. The Project Works offers shop-proven blueprints for the computer console and the peripheral/printer unit at \$14.95 each. The console is priced at \$349, the other units are priced accordingly and sold separately.

Circle No. 93 on Reader Service Card

Radio Shack Helps Students

Radio Shack
1800 One Tandy Center
Fort Worth, TX 76102

Careers in Computing, a multimedia instructional kit from Radio Shack, provides secondary school students with the information they need to begin considering a computer-related career.

The complete *Careers in Computing* (26-2758) package contains a film strip, Teacher's Guide, 30 Student Handbooks, a wall chart and spirit masters for student activities. The kit is available through participating Radio Shack stores and dealers for \$130. Extra Student Handbooks (26-2759) are available separately at \$1 each.

The Teacher's Guide and Student Handbooks look at the major areas of computer careers and specific jobs within each area. Individual jobs are described by general responsibilities, the education and experience required to perform the job, future outlook and personal characteristics of people who have been successful at the job.

Eight spirit masters for student activities directly involve students with such exercises as a true/false quiz of their knowledge of computers, a resume-writing practice and a script for a role-play interview. A graphic wall chart for the classroom reinforces the training, experience and future demand associated with the computer careers discussed in the handbook.

The materials point out that programming skills are not required for many computer related jobs, such as computer center librarian, technical writer, data entry operator or sales representative.

Careers in Computing can be used as a unit on career awareness in middle or junior high school, a unit on career opportunities within a secondary school computer science program, or as part of a business class or vocational education class. It can also be used as part of a vocational



The Computer Console

NEW:PRODUCTS

counseling program for high school or college students, or as part of an adult education or continuing education program.

Circle No. 94 on Reader Service Card

Business Software

Fingraph Corp.
960 Clock Tower Drive
Springfield, IL 62704

Fingraph, a new software product that aids management in analyzing and interpreting business data through visual display formats, will link to any database. It converts tabular financial statements, schedules and inventory, sales and marketing information into graphs that show trends and relationships. The program includes Time Series, Ratio Charts, Item Charts, and Variance Charts. The system produces print-outs and can provide automatic scaling and labeling of charts, as well as many other functions. The program was created by Irwin M. Jarret, Ph.D., C.P.A.,

author of *Computer Graphics and Reporting Financial Data*.
Circle No. 95 on Reader Service Card

CoCoMail

Eighty Computer Services
4811 Wickford Green Suite 11
Sylvania, OH 43560

Eighty Computer Services has a new mail list program for one disk operator. This program stores all pertinent client information on up to 200 accounts per disk. CoCo Mail saves name, address, city, state, special code, and customer information in records of up to 256 characters total. The system prints standard 15/16 inch two across or single mailing labels sorted by city, state, zip, or special code. Files of certain clients can be built by moving specified files from one disk to another. CoCo Mail comes on disk with manual and binder for minimum 16K Color Computers with one disk drive for \$59.95.

Circle No. 96 on Reader Service Card

Rainbow-Writer

Rainbow Connection Software
33514 6th Place NW.
Rochester, MN 55901

Rainbow Connection Software announces the addition of Rainbow-Writer to its line of quality software for the Color Computer.

Rainbow-Writer is not a word processor, but rather a general-purpose screen formatter, priced at \$29.95 cassette, \$32.95 disk. With Rainbow-Writer in memory (in upper RAM of any configuration), dazzling screen displays can be created effortlessly. The 32 by 16 character set is replaced

with a new set including lowercase descenders and graphics figures. Twelve character sizes are available from 64 by 24 to 16 by 8, with most sizes available in a multitude of colors. Rainbow-Writer also has many new and useful screen features including underline, subscript, superscript, scroll protect and more. Even four-color artifacts in PMODE 4 are easily attainable. Rainbow-Writer can even be incorporated into your own Basic or machine language program. The program requires 32K Extended Color Basic.

Circle No. 97 on Reader Service Card

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 reader service card, or writing or calling the address provided.

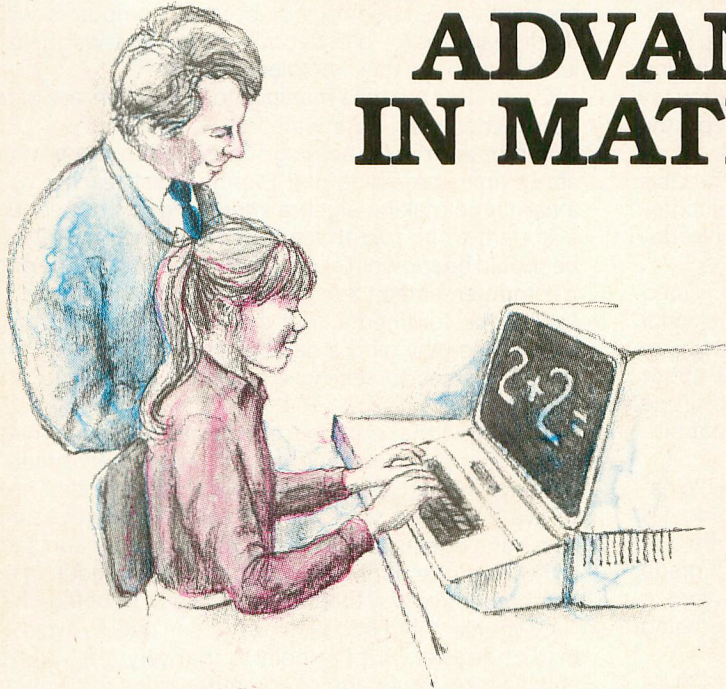
Manufacturers wishing to publish an announcement are invited to send any appropriate information to the Color Computer Magazine, New Products Editor. Announcements will be edited.

— Eds.

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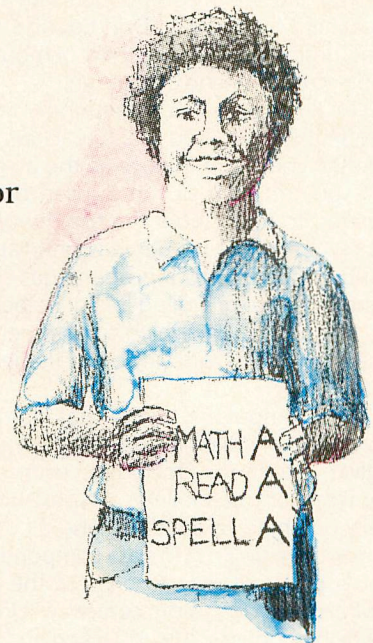
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END OF FILE



his month means a beginning of school and a continuation of education, a subject very close to us at **The Color Computer Magazine**. Since this month's issue focuses on education, let's try a short quiz. Does computer literate mean:

- a) able to speak (program) Basic.
- b) able to converse with a computer.
- c) able to read a computer print-out.
- d) none of the above.
- e) all of the above.

I probably should have warned you, it's an all or nothing quiz. Just one question; get it wrong and you have to stay after school and write, "Am I computer literate?" on the blackboard 1,000 times.

The answer is *d* or *e*, whichever you feel most comfortable with. That isn't really fair, is it? Well, neither is the computer literate mandate hanging with increasing force over educators and teachers.

The computer is a tool to be used, not dissected. When Bunsen burners were first introduced into high school chemistry labs, were there articles debating the burner's intrinsic values and social implications? Not likely. How about spiral notebooks? Did change-resistant teachers argue against them in favor of the more traditional looseleaf binder? Also not likely.

What is all the commotion over computer literacy? What does the phrase mean? If English literate means a student is literate in English, then computer literate must mean a student is literate in computers. I can still hear my fourth grade teacher Mrs. Smith: "Don't define a word using the word in the definition." Okay, then computer literate means being able to understand computers.

Now we're on to something. I've read too many articles and talked with too many teachers and administrators who define computer literate as the ability to program or etch a PC board. Back to the Bunsen burner: were students required to know how the thing worked, or just how to use it? Probably the burner was simply brought into a classroom and hooked up to a propane gas source; ten minutes later chemicals were boiling in a glass beaker. The Bunsen burner is a tool through which to channel gas for the purposes of heating things with an open flame. The computer is also a tool.

The computer is a tool that channels information for the purpose of gaining a more thorough understanding of a given situation. Obviously, even a definition that broad leaves many possibilities unspoken. Computers can do virtually anything to anything else as long as the anythings can be broken down into data components. This is not an acceptable pedantic way to express the idea, but maybe that is where the confusion comes in. Unlike the Bunsen burner, which upon arrival is unpacked and stored by the science department and used in science classrooms, the computer can be used in all classrooms—even physical education.

Much of the in-school emphasis on computers is programming. Does everyone really need to know how to program in Basic, or Logo, or assembly language? No; but they should understand programming logic. After all, computers are logical machines—another gray area.

Each point of view has its counterpoint. There are good reasons for teaching programming languages in school. There are good reasons against it. Scholastic debate shifts continually over how a school should buy computers, how to use them, how not to use them, why it shouldn't use them, how it shouldn't use them.

The situation has become absurd. Absurd to the point where Apple is trying to push a bill through Congress that would favor implementation of Apple computers in schools. Maybe the next step is for Zilog to sponsor a bill that promotes Z-80-based computers.

School boards, administrators, and teachers debate. Computer manufacturers, politicians, and software producers argue. But what about the students? They need the computers in their classrooms, not because computers will help them learn more, but because computers will help them learn how to use their knowledge better.

Computers are data manipulators. Teachers are data vendors. Schools are data warehouses. Students are just kids. A computer makes learning fun, so much the better. "It's about time something did! Even the best teacher will have a hard time making algebra interesting. It's not enough for a student to be told that algebra is a study in abstractions, he should be shown. Take his theorem and plug the data into a computer, and let him see why his hypothesis won't work. Explain the continental drift theory with a graphic program, let him see why oil is a depletable source, and let him play what-if games to see how quickly a glut can turn into a drought.

The saying that experience is the best teacher is magnified by the computer. Computers will let teachers simulate experience in the classroom, so that students might not have to live through a stock market collapse to understand the cause and effects of real money versus false wealth. Students today have the opportunity to gather knowledge in a more comprehensive way than students two years before them.

Of course, there is more to learn than how to avoid a stock market disaster. But the point is that very few will truly be able to take advantage of computer-aided instruction until semantic debates resume their rightful place on the back burner.

Maybe the term computer literate should be changed to computer familiar. Once students know how to insert and format a disk, or CLOAD a tape, and realize that no damage is done by pushing a wrong button, they can graduate to computer user status and get on with the important task of gathering knowledge.

—K.L., Editor

FOR...NEXT (10,83)

OCTOBER HAS ALWAYS been a favorite time of year in New England. The trees are in full color, the days are growing shorter and shorter, and all the summer garden time can now be devoted to computing.

To help take up some of *your* extra time, Dennis Kitz will present a 64K upgrade, a hardware project that will give you a memory boost. For beginning hardware enthusiasts, Brian Alsop takes a look at tools you'll need for basic computer hardware projects.

Jean Plesser will present a typing lesson for the kids, and two Hallowe'en programs for their enjoyment. Another Hallowe'en program—this one a game—was spelled out by the Aftamonows.

You won't want to miss our FLEX/OS/9 review, or Commander's continued disassembly, either.

Finally, a special treat: ORBIT! a space-simulation game that's kept everyone in the office docking and undocking for days.

These are just a sampling of what's in store for our October grab-bag. See you next month!

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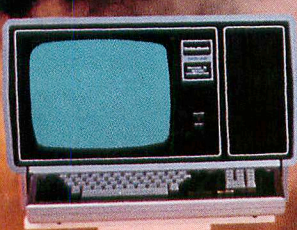
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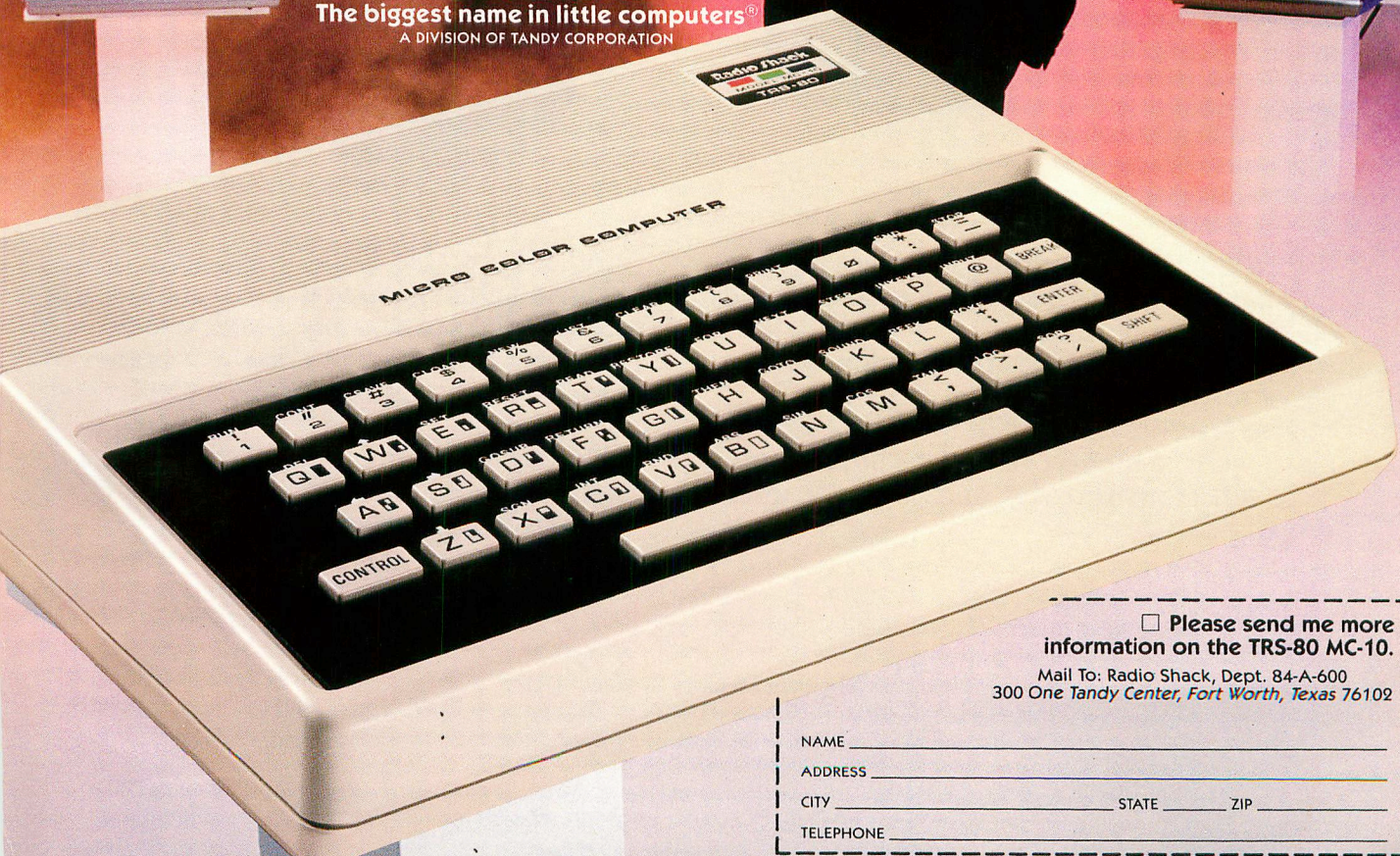
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