THE Color Computer MAGAZINE

November
1983
$2.95

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

GRAPHICS

- Barden
- Bjork
- Commander

...and others

Sorcerer's Puzzles

M... Kitsz

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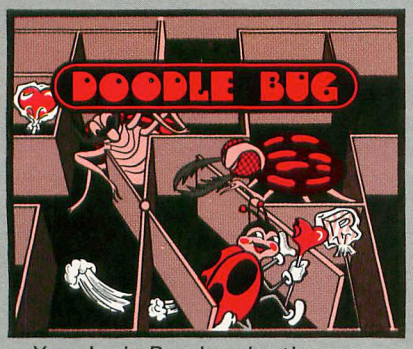

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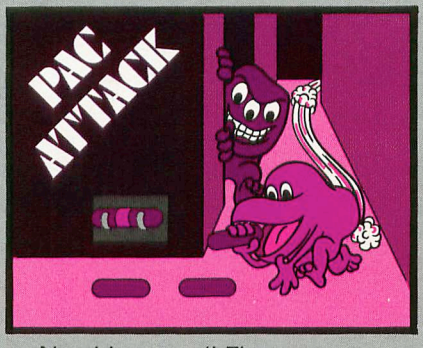

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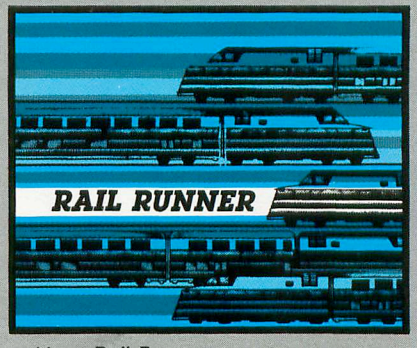

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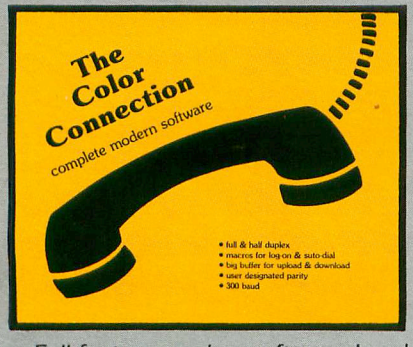

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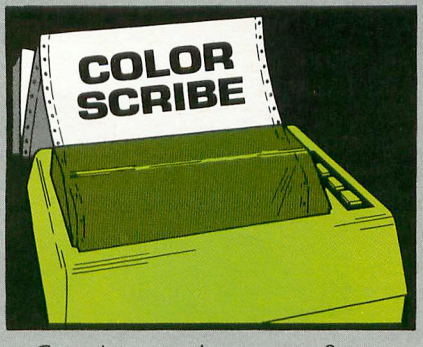

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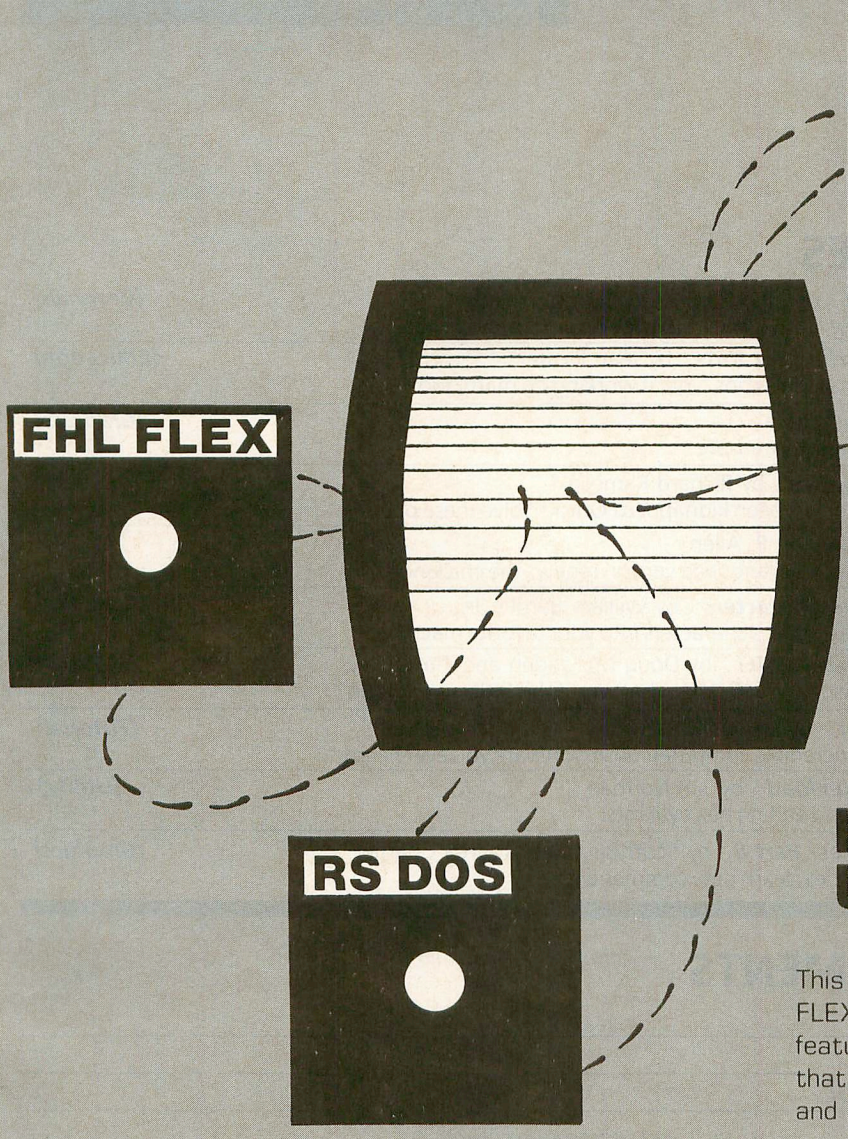

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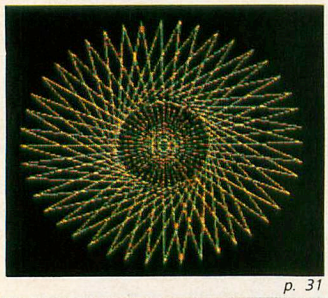
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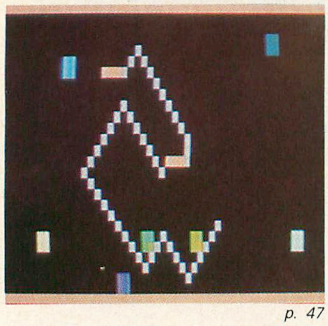
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FEATURES

15/Super Spiro! by Jake Commander *(Graphics)*
Go "beyond reality" into super- and hyper-spirographics.

20/Color Computing for Kids by Jean Plesser *(Education)*
Send your computer into loops... get it working on math, too.

31/Star by David Lauta *(Graphics)*
A short, sweet, graphics treasure.

34/Sorcerer's Puzzles by Richard Ramella *(Game)*
Oh no! The sorcerer has been kidnapped! Quick! Solve these puzzles!

46/Slither by Stephen P. Allen *(Game)*
An eight-speed machine language version renews the challenge.

65/Unforgettable Characters by William Barden Jr. *(Graphics)*
Put user-definable graphics characters into your favorite machine.

83/My MC-10 Speaks ML! by Doug McFadden and Tim Kelley *(General)*
Machine language on the MC-10? What won't this little machine do?

90/Custom Color by Dennis Kitsz *(Tutorial)*
Part I of the most incredible computer music software you ever heard.

96/One-finger Hexload by Jim Norman *(Utility)*
Save time storing and editing hex byte lists.

104/Graphics? Yes! Part II by Scott Bain and Andrea Chartier *(Graphics)*
Draw lines and circles; learn new commands.

DEPARTMENTS

4/PEEK (12,83)

6/INKEY$

74/GOTO SCHOOL

100/DEFUSR

111/REVIEW$
Micron eye, Astro Blast, Colorkit, Cosmic Clones, and more.

120/NEW:PRODUCT$

126/FOR...NEXT (12,83)

128/END OF FILE

Cover
Graphics by William A. Giese

ABC membership applied for.

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·ARCADE·
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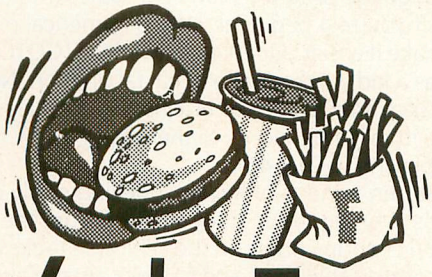

WackyFood!

Hamburgers, fries, drinks and other fastfoods are chased by chattering teeth. Can you stop them before you go...WACKO? *Three levels of play from beginner to expert.* This is number one for fun.
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ICEMASTER

Push blocks of ice to crush giant mosquitos and avoid getting stung long enough to get them all. *Three levels with graphics so real you'll want your fly swatter.* Don't miss this arcade classic.
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Armed with laser cannons guide your desert vehicle past obstacles while avoiding enemy fire. Watch out not to run out of fuel. *Five levels of play.*
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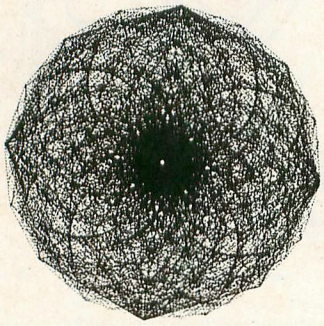
PEEK (11,83)

If any of you have ever been to a computer graphics show, for instance the annual SiGraph, you probably came away like me: stars in eyes, jaw dropped open in amazement, and totally discontented with your own micro's graphics capabilities. If you've never been to a graphics show, imagine hour after hour of graphics that surpass some of the neat things you've seen on TV — Levi's ads, car ads, etc. In fact, many programmers with entries in graphics shows also wrote the graphics pieces you've seen in ads and movies.

We can't expect our micros with their 64K memories to produce some of the wonders the big boys produce (can we?). But, oh, to be able to do something just a little spectacular, a little out-of-the-ordinary... Shoot, if talented early photographers could do as well or better with their pin-hole box cameras as modern-day photographers with their expensive, highly technical equipment, couldn't a talented micro user produce something *really* amazing if he just worked at it hard enough?

I guess a fairly large number of Color Computer programmers have thought the same way. And there are some pretty interesting graphics out there — lots are just mediocre, but some are truly superlative. One programmer who has been steadily urged on by his memories of SiGraph is our own Jake Commander. It inspired him to create Spiromania two years ago for the TRS-80 Model III; today he has created Super Spiros for the Color Computer (GOTO 15). If this doesn't inspire you, you'll have to face up to it — you simply are *no* artist.



Beginners who need more help developing their graphics procedures should GOTO 104. Scott Bain and Andrea Chartier continue a wonderful job explaining basic graphics techniques in Part II of "Graphics? Yes!"

Feeling frivolous? A little bit arty? Want to amaze your friends and snazz up your programs? GOTO 31; David Lauta shows you how to produce a star of remarkable beauty.

Straight and steady; calm and commanding; practical and pragmatic; GOTO 65 for Part I of Bill Barden's graphics challenge.

Before we leave the subject of graphics, I'd like to mention that next month we'll have a graphics article by Steve Bjork with Mark Randall on game graphics — it didn't quite make our November deadline, but you surely won't want to miss it!

Oh, no! Sorcerer Goldberg has been kidnapped and Poke and Sunflower have to find him and free him. Bob, the Sorcerer's twisted major domo, is too busy trying to deplete the raspberry seltzer supply to help. Can you solve the puzzles? GOTO 34!

Kids, GOTO 20 for a new lesson on your Color Computer and some Thanksgiving fun. Educators, GOTO 74 for a look into what's happening in the educational software market.

My MC-10 speaks machine language — does yours? GOTO 78 to find out how to teach it a new language.

Questions? Questions? We have answers. GOTO 100 — your question may be answered this month in DEFUSR.

Machine language programs can be troublesome to enter — especially if you're a beginner. Here's numerical memory entering to make it easier: One-Finger Hex load (GOTO 96).

When I was a kid, snakes were a real fascination. Now I'm not a kid, snakes aren't quite so fascinating — at least, they weren't 'til Slither came along. Slither away a few days of good game-playing (GOTO 46).

A brisk autumn wind is blowing, shrieking softly outside your door. It's evening; your study is warm from the hearth fire, a candle flickers invitingly on the chair side table. A good book and a comfortable chair and hassock await. Pour some brandy into a snifter and settle down for a good read. Oh — something's missing: a little soft music, perhaps? Turn on your Color Computer and be transported by *good*, four-voice compositions. GOTO 90 for Part I of Dennis Kitsz' music on the Color Computer.

One final thing I'd like you to look forward to — next month we'll have a preview article on robotics and the Color Computer. Let me quote the author of the article: "...we take a look at the recent marriage of our machine and Topo, a 33-pound robot made by Androbot in Sunnyvale, CA. Until recently Topo has interfaced mainly with Apple IIs. This summer a couple of midwestern computerists took it upon themselves to design an interface for the Color Computer, a development that opens a whole new arena for all of us." You won't want to miss it!

— D.M., Managing Editor

illustration by Rod McCormick

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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, Terminet, 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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INKEY$
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Piracy: Some Solutions

I would like to voice some comments and suggestions re: "End of File," August, 1983. Your topic of software piracy and user groups really hit home, since I am attempting to organize a user group in northern San Diego County. This job presents several problems, not the least of which is how a user group confronts software piracy. The choice seems black and white: either a group will abstain from piracy or everyone will come to a meeting, color tape copy in hand. The latter is understandably horrifying to any software author or distributor. Unfortunately, it is also hard, if not impossible, to abstain from piracy under current conditions. Any time I part from my hard earned (and at 16 it is especially hard earned) money I always wish there was a cheaper way to get what I want.

Piracy offers such an easy way out, no money, no hassle, just grab a friend and get a copy of the new game or that expensive "professional" business package. I wouldn't be so intrigued with breaking the law if I wasn't saving so much money. If games were only $10 instead of $24.95 I am certain I would save up and buy instead of copy. Unfortunately the "catch 22" syndrome stares out too badly to be ignored: a software company can easily lose its shirt if it offers a deal on a good game and everyone plays "pass the copy." However, people will continue to pass the copy as long as software is so costly. With this realization, an experiment would be worthwhile just to test the public reaction. I would do it if I only could produce such a program (software distributors, authors — hint).

So far I have only offered one solution to this problem, but I hope these other solutions are also valid. Protection is a touchy issue with consumers as well as software producers. The software industry must realize that protection is only a temporary and expensive solution; it will always be defeated. In addition, it stops the majority of honest software buyers from making legitimate copies of *their* software. All it promises to do is infuriate the potential return customer when their fabulous program greets them with a screenfull of I/O errors. However, in return the public must live up to the trust and responsibility each company has conceded when a software package is purchased. Remember that every legal copy you buy ensures the Color Computer's future. I know I don't want my biggest computer investment becoming worthless. Do you? My last solution is software support. This is where software houses should concentrate their resources, not in worthless protection schemes. Any software company could stop piracy by making the software itself worthless in comparison to the support the company gives it. "Over-support" is not a phrase in computerese, but it should be.

Everyone in the computer industry must realize that software piracy will be with us in some form or another as long as there are computers. It will never end but it can be controlled with the cooperation of the public and the software industry. I, for one, do not want the Color Computer software situation to become terminal. Software companies, software buyers, we must work together or our greatest asset will become our greatest loss. **The Color Computer Magazine** readers, take a stand against software piracy: it really is up to you.

Don Bradford
Solana Beach, CA

Praise for "Recover"

I would like to commend Kenneth Van Camp on his "Recover" program. I typed it in when I got the August issue and it has already saved my skin once or twice.

Paul Jensen
Forest, Ontario

Machine for Beginners

I have enjoyed every issue of your magazine so far and plan on doing so for some time. It is almost everything I ever wanted and more. Please keep up the good work.

One area I would like to see better covered is machine language. I hope someday you will run a series on machine language for the absolute beginner.

Roger Van Hoover
Bremerton, WA

You'll be happy to hear, Roger, that an introductory series to assembly language will begin early next year.
— Eds.

Beyond Games

I want to thank you for a great magazine. Yours is the first Color Computer magazine I have seen on the newsstands and it is really good to read about all the previously hidden information. It is also great to see all the new software being written for the Color Computer, taking it beyond the "game machine" image.

One such piece of software is "Filmastr," a data file program mentioned in your new products section. This is an excellent example of serious software with a professional touch at a reasonable price. In my opinion, the author has done a terrific job of combining the features of a powerful database program with the limitations of a tape based system and a 32 by 16 screen. The program is easy to use and the manual is very clear. If there were more programs of this quality available for the Color Computer, many more people would be attracted to this fine machine.

I also want to thank Bill Barden for opening the world of machine language programming for me. His clear and direct approach makes this very difficult subject as clear as can be. More *please*.

Arthur Toomey
Arlington, VA

Missing Routine

I enjoy your magazine, but I'm having trouble with Paul Detwiler's Basic DBM article (April, 1983). It seems that part of the program was edited out. The Line by Line shows Lines 9000 – 9999 as

to page 11

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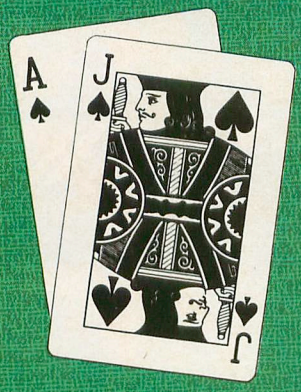

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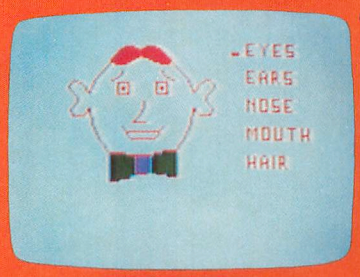

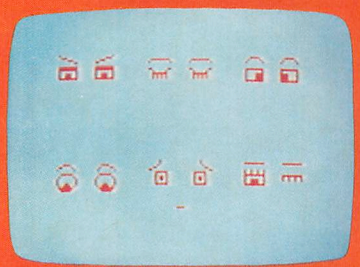

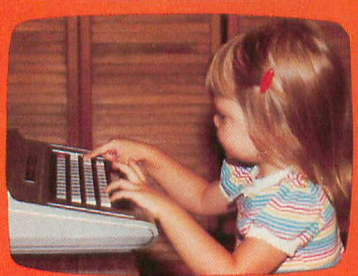

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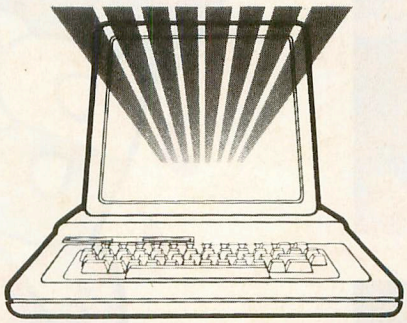
SUPER SCREEN

the Color Computer Supercharger



- **A big 51 character by 24 line screen.**
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- **Easily combine text with hi-res graphics.**
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- **Control codes for additional functions.**
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51 CHARACTER BY 24 LINE DISPLAY

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

PRINT @ IS FULLY IMPLEMENTED

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

ON ERROR GOTO

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

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

CONTROL CODES FOR ADDITIONAL FUNCTIONS

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

AND MORE GOOD NEWS...

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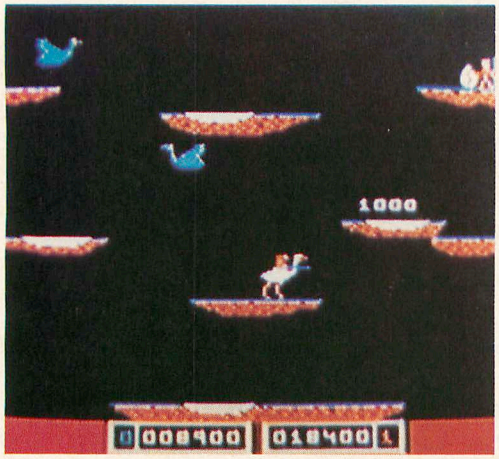

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from page 6

the loading routine. After Line 9120, a cartoon appears where the rest of the Listing should be. In the July issue, End of File lists an indexing bug, "Insert Q=Q−1 in Line 9220." Was this supposed to be part of Line 9120, so the line would read 9120 CLOSE#−1: Q=Q−1: GOTO 1000, or is some of the Listing missing?

The program jumps from Line 6940 to 8000, while all other line breaks occur at even thousands. Line 110 calls for subroutine 7000. Where is it?

Richard King
5810 Old Spanish Trail #9
Houston, TX 77023

Yes, Richard, the indexing bug we listed was for Line 9120, and no, the Listing is complete. The missing subroutine wasn't written into the program. Paul Detwiler merely provided space for the routine so it could be implemented later.

— Eds.

Color Expo

The members of the Los Angeles Color Computer Users Group would like to thank you and your excellent staff for organizing the Color Expo in Los Angeles this month. We appreciate your willingness to involve local users groups every step of the way, and we are looking forward to hosting you and Color Computer users from all over the world in sunny Southern California this month.

Mark Randall
President
L.A.C.C.U.G.

ColorForth Fix

I want to correct some errors in the ColorForth review. (July, 1983) Although the program is distributed on tape, typing CLOADM EXEC causes the program to construct a bootable disk. The addresses you mention are for use when there is no disk system. Both versions of ColorForth work with disk and tape. It is also possible to save programs in compiled form by defining a couple of simple words. The ROM can easily be used by plugging it into a game cartridge, and if you have an appropriate expansion box, then the disk can also be run. It is worth noting that the bootable disk constructed from the tape puts Forth kernal in track 0, leaving all screens from 17 up free to the user.

Hoyt Stearns Electronics
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ROMpak Woes

I have just purchased a Color Scripsit ROMpak. I would like to warn your other readers about a problem I discovered with this program, so they too will not have this happen: If for any reason the program should hang up (a maddening experience) do *not* press reset, or any text will be lost!

Hugh Craig
Sharon, MA

Piracy: Not So Bad

On page 15 of the August issue Jyym Pearson tells us the Color Computer "is not just going but hot." His whole article brightened my day. But then we get to page 96, End of File. Doom, death, destruction! We might as well sell our Color Computers because of pirates. But consider this: I read somewhere recently that there are about 400,000 Color Computers out there now, and about half a dozen magazines devoted entirely to the Color Computer. If piracy was as bad as you say, would it have come so far? I doubt it.

Strikes me that if it weren't a profitable business, people wouldn't stay in it. And from what I read by people like Jyym Pearson, there will be no shortage of business for the Color Computer any time soon.

Don Ward
Groton, CT

Software piracy alone will not spell the doom, death, and destruction of the Color Computer. Piracy drives prices up. Piracy provides justification to manufacturers of uncopiable software. Nothing is more frustrating than having a disk crash, or tape break or stretch, in a program for which you have no back-up. Piracy costs the honest user money and aggrevation.

— Eds.

Fix

Color Computing for Kids Fix

Kids! Don't panic! As careful as we were, a few errors got past our art department in the September column. On page 39 of the September issue, in the middle of the page, find the lines that read:

```
PRINT* 4−2
and
PRINT 2 + 2 + 2* − 4
```

The asterisks (*) shouldn't be there — the lines should look like this:

```
PRINT 4-2
and
PRINT 2+2+2-4
```

Take a pen and write this correction in that page, so you and the big people who read that article don't get confused in the future!

DYE-IT Corrections

Corrections for the disk version:

Line 10: change −429 at end of line to −432
Line 20: change X+428 to X+431
add line 250 DATA 0, 0, 0
or:
Load old DYE SETTER from disk. Change Line 20 to DEFUSR!=X:X=USR(0), save corrected DYE SETTER over old one.

Before typing any programs using DYE commands, be sure to run DYE SETTER first. Otherwise, the computer will not recognize DYE as a Basic word.

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SIMPLEX — New!! Linear programming by the "simplex" method now available for the Color Computer. This powerful decision making tool finds the optimum "mix" for a given set of constraints. Ideal for business students, teachers, and professionals. Dynamic model dimensioning, with maximum size approximately 45 constraints and 45 variables. Disk compatible. 16 page manual included. 16K Extended BASIC. **Cassette $29.95**

PAGE PLUS — Attention BASIC programmers! Here is the software you've been waiting for! Up to 56K available from your BASIC programs. This utility, written by Chris Hawks, does the memory management necessary to utilize the two 32K banks of memory. Easy enough for any "intermediate" level BASIC programmer to use. Includes documentation and demo programs to show you how to use PAGE PLUS to get the most out of your computer. Works with 64K tape or disk systems. **Cassette $27.95 Disk $29.95**

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. **Cassette $27.95 Disk $29.95**

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QUICKSORT — A machine language sort routine specifically designed to be used by BASIC programmers. Speeds up those programs where a BASIC sort is just too slow. Great for mailing lists and databases. Can be incorporated into many existing programs as well. Written in position independent code, works on tape or disk systems. 16K required. **Cassette $12.95**

64K BOOT/PAGER — The 64K Boot allows you to modify BASIC by moving it from ROM to RAM. The PAGER is a menu-driven utility allowing you to manually page between the 32K banks of memory, copying BASIC or data from one page to the other. The complete assembler source code for both programs is included. Both are written in position independent code and run on 64K tape or disk systems. **Cassette $19.95**

STRUCTURED MACROS — An assembly language programming tool for users of the Macro-80C assembler, by the Micro Works. Structured macros come close to transforming your assembler into a high-level language. Your programs become more understandable and debugging is simplified. Commands include IF, ELS, ENDIF, IFTST, IFCC, WHILE, ENDWH, REPEAT, and UNTIL. **Disk $19.95**

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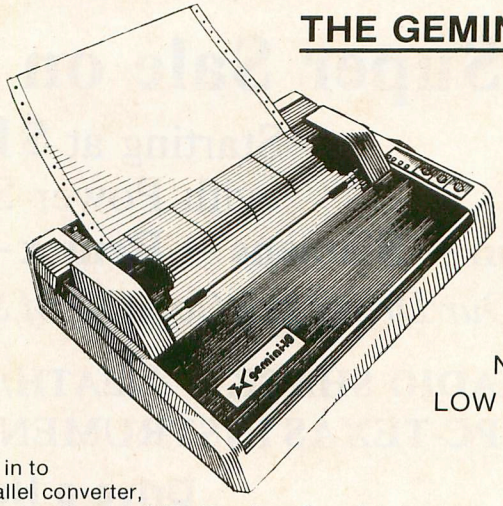

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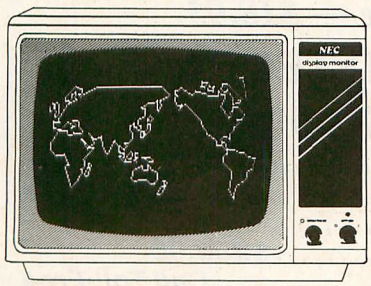

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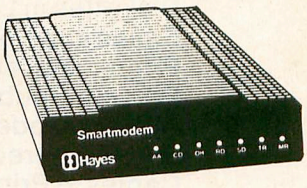

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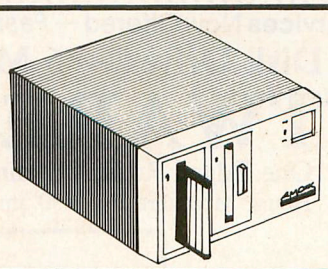

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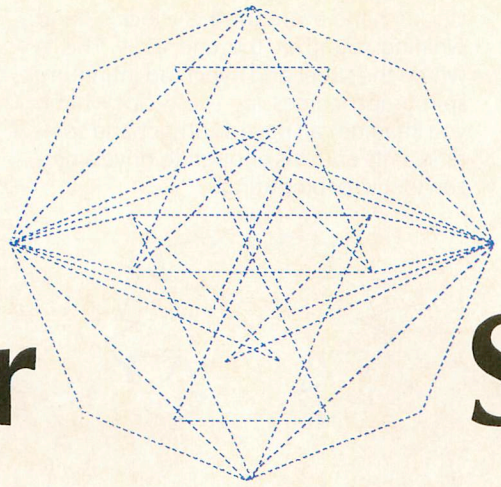

Super Spiro!

If you thought Spirographics was heaven, think again!

Figure 11.

by Jake Commander

I'VE BEEN TOLD BEFORE (and by more than one person) that I'm a maniac. To be a bit more precise, I should qualify that by noting that I'm really quite harmless. In fact, my condition is supposedly curable — although I can't imagine why anyone on earth would want to be cured of spiro mania. Get the picture? If you haven't heard of such a conditon, stick with this article — you soon will. Not only that, but with any luck you'll catch the bug too.

I should first explain that the examples here were developed on the Tandy CGP-115 color graphics printer. If you haven't got one of these yet, get one now! You don't know what you're missing. It's unbelievable that for $199.95 you get a four-color printer/plotter capable of text as well as graphics. All the graphics displayed in this article were drawn on such a plotter. I must warn you though, drawing mile after mile of convoluted, twisted wheels and whorls is the quickest way I know of drying up pens.

OK, color spirographers! Here are some new techniques which have been developed especially for this issue of **The Color Computer Magazine**. These techniques will bring you eye-bedazzling new effects which would be physically *impossible* in the real world of plastic cogs and wheels. That's part of what drew me into it; this is a small example of taking reality, feeding it into a computer, and making it go beyond reality. Oooh, heavy stuff! It all came about because of my fascination with the Spirograph (trademark) set which I have at home. I wanted to work out some of the math involved in drawing those intricate patterns, and see if it was feasible to write an algorithm to draw such wonders on the computer. Not only did I manage to achieve that, but I managed some painless extrapolation (some what?) and invented the super-spirograph. Once you understand the technique, you'll be able to invent the hyper-spirograph all on your own. Rather you than me when it comes to putting that into practice!

Math — Groan!

Right! You're just dying to learn the math — I can tell. Well, don't let your eyes glaze over; it's honestly quite simple, involving just a weensy bit of trigonometry, and we all have to earn our BS degree somehow. Follow the diagrams and we'll walk through each dimension in turn.

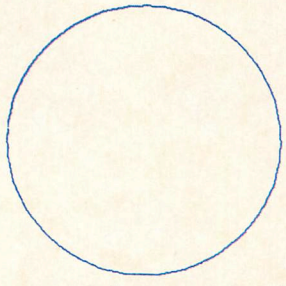

Figure 1. Radius 0=120, Radius 1=0, Radius 2=0; Ratio 1=4, Ratio 2=10; Start Number sides = 100, End Number sides = 0; Color sequence 1 1 1 1, Line type 0.

The first thing to understand is the plain old circle (Figure 1). Without this, we aren't going anywhere. Don't imagine the circle as a continuous line twisting around 360 degrees, but see it as lots of dots which are so small as to appear continuous. The position of each dot in the circle can be calculated as two coordinates — one to ascertain its left/right (X-axis) position and one to determine its up/down (Y-axis) position. Dead easy!

The X-axis location is calculated by multiplying the radius of the circle (your choice) by the sine of the angle where the dot is located. The Y-axis follows the same pattern, but we use the cosine instead of the sine. This gives us two numbers. If we draw a dot at the intersection of the calculated coordinates we get:

A dot...

Not to worry though. A single dot is only the start. If the angle is changed by a small amount (say six degrees) and we plot again we now get:

Another dot.

Still not to worry — after we do this 60 times, we'll have gone through 360 degrees (that's 60 times six degrees). Now we have something resembling a circle. I told you it was easy. Not only was it easy but the computer's the poor sucker that has to do all this while we sit comfortably and watch.

There's one thing to note at this point and file away for a few moments. When each dot is drawn to build up a circle, we can leave them as dots (we might be able to see gaps), or we can join them up with lines. In our example, we'd end up with 60 lines making up a 60-sided polygon masquerading quite successfully as a circle. Ruminate on that for a while.

more

You may think there's a lot of difference between a circle and a spirograph, and you're darned right! But there's not as much difference as you'd think. Here comes the step to understanding these beauties.

Imagine, instead of drawing dots at each coordinate, we draw circles. Now you'd get a circular pattern of circles. Aha, caught you out: you won't get a circleful of circles because we're drawing our new circles from dots too. So each dot now drawn is part of a small circle going around the circumference of a central circle. If the dots are drawn close enough together we'll retain a semblance of continuity. So, in fact we don't actually plot a whole circle at each point on the inner circle — we simply plot one dot of the outside circle. If we then move very slowly around the perimeter of the inside circle, the outside circles get stretched out like a long continuous spring. Viola! A spirograph (Figure 2)! Notice how this is larger than the circle, because the outer circle spins inside and outside of the inner circle.

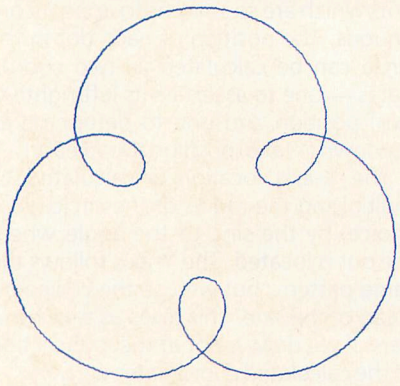

Figure 2. Radius 0=120, Radius 1=60, Radius 2=0; Ratio 1=4, Ratio 2=10; Start Number sides = 100, End Number sides = 0, Color sequence 1 1 1 1, Line type 0.

Ugh! Trig!

The trigonometry for this is easy as well; we just go one single step past the example for the circle. First, as already described, we get the X/Y position of the dot that *would* be plotted if a circle was being drawn. This position is *not* plotted, but is used as the center of the next circle. The angle of the dot actually being plotted on the outside circle is worked out relative to this position.

Notice that two angles now have to be taken into account. One is the angle of the dot on the perimeter of the inside circle (this becomes the center of the outside circle), and the second is the angle of the dot on the outside circle. To get a graphic idea, conjure up an image of a clock's hand with another clock's hand whirling round at the end of it. This is where the super and hyper (ad infinitum) spirograph comes in; every clock hand you imagine can have another hand spinning at its end. It's enough to drive a person to microcomputing.

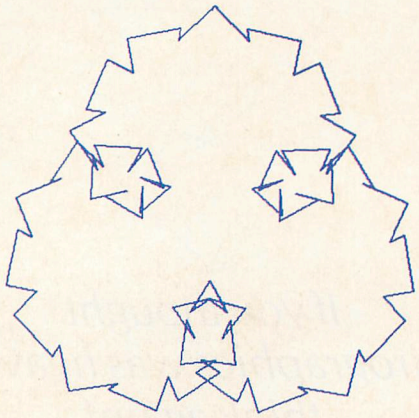

Figure 3. Radius 0=120, Radius 1=60, Radius 2=15; Ratio 1=4, Ratio 2=10; Start Number sides = 100, End Number sides = 0; Color sequence 1 1 1 1, Line type 0.

The general method is the same. You just work out the position of the end of each "clock-hand" (which becomes the center of the next) until you come to the last. This is where the dot is actually plotted. For the sake of everybody's sanity — my own included — I've gone no further than three clock-hands. The more you use, the harder it becomes to produce discernible patterns. Figure 3 is an example of a super-spirograph following our progression so far. This looks a little weird. Read on and you'll see why. Figure 4 is how it should look and Figure 5 is an example of decreasing the inner circle's radius with such a super-spirograph.

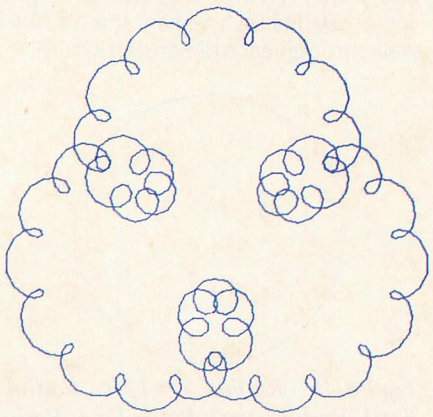

Figure 4. Radius 0 = 120, Radius 1=60, Radius 2=15; Ratio 1=4, Ratio 2=10; Start Number sides = 400, End Number sides = 0; Color sequence 1 1 1 1; Line type 0.

As far as *normal* spirographs go, to alter their characteristics, you can change two things: the ratio of the radii of the circles involved and the relative rotational speed of the outside circles. This gives an immediate cursory control over the type of spirograph produced. For instance, the faster the outside circle goes (the higher its turning ratio), the more lobes are produced. Also, the larger the outside circle's radius, the deeper those lobes are. If you think about it, you'll see that if the outside circle's radius is smaller than the inside circle's radius, the lobes won't meet at the center of the inside circle. (The outside clock-hand is unable to reach the inner extremity of the hand driving it.) This gives patterns with holes in the middle, whereas longer outside radii overlap in the center giving Tudor Rose effects.

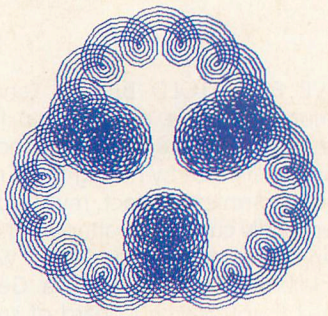

Figure 5. No details - custom produced!

Lines

Back to the lines; I bet you forgot. In using the CGP-115 plotter, these spirographs are drawn using lines to join up the dots. This is where a nifty technique comes in which produces some extraordinary results. It also explains why Figure 3 needed more resolution to become Figure 4.

Imagine if you drew a circle using the dot technique, but only plotted a dot every 90 degrees. You'd end up with four dots around the circumference and a very unconvincing circle. If you joined these dots together you'd end up with an even less convincing circle — it's called a square! If you used three dots you'd have a triangle, five would give you a pentagon, and so on. All in the cause of drawing a circle.

However, as the number of lines increases, the accuracy of the drawn figure improves. This is great with spirographs and I've produced my magnum opus using this technique (Figure 6). This is a 14-lobed super-spirograph drawn at first with low and then increasingly higher resolution, until at the end, the lines are

to page 18

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small enough to fool the eye into seeing curves. By this time, an incredible series of interconnecting lines produces some spectacular effects which more than make up for the lack of color.

The program accompanying this article lets you experiment with the lengths of the three radii, ratio of rotation of the two outer circles, and number of lines making up the spiral to start and to end

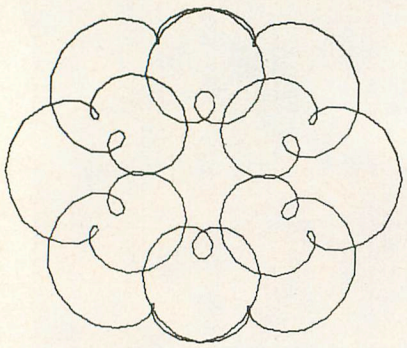

Figure 6. Super Spiro 1:Radius 0=100, Radius 1=50, Radius 2=25; Ratio 1=7, Ratio 2=3; Start Number sides = 250; End Number sides = 0; Color sequence 0 0 0 0; Line type 0.

with. I've also allowed for a sequence of up to four colors to enable multicolored graphics. This can be increased to a longer color sequence if desired. Be careful with color; unlike pixels on a TV screen, ink mixes color subtractively, meaning that more color means darker color. Finally, the type of line used for drawing can be specified — the CGP-115 allows types of lines from continuous to coarse dashes — which allows an extra dimension with which to experiment. Don't use all these options at once, though. You'll only waste ink and produce something more akin to a punkograph. I know this for a fact — the research for this article resulted in most of a print roll ending up "on the cutting-room floor" and a set of pens permanently retired. But, oh, what fun! ■ ■ ■

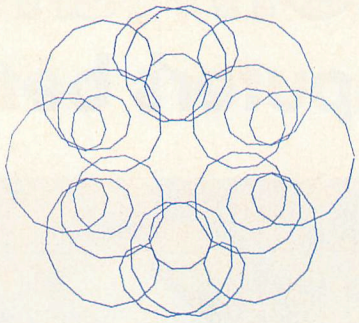

Figure 7. Super Spiro 2:Radius 0=120, Radius 1=40, Radius 2=50; Ratio 1=7, Ratio 2=3; Start Number sides = 230; End Number sides = 0; Color sequence 0 0 0 0; Line type 0.

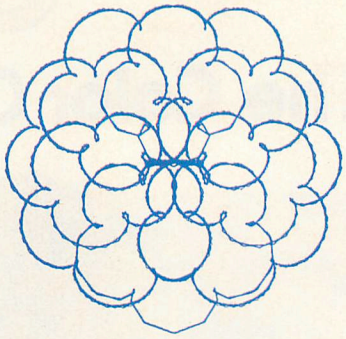

Figure 8. Super Spiro 3:Radius 0=100, Radius 1=85, Radius 2=20; Ratio 1=8, Ratio 2=6; Start Number sides = 270; End Number sides = 280; Color sequence 1 1 1 1; Line type 0.

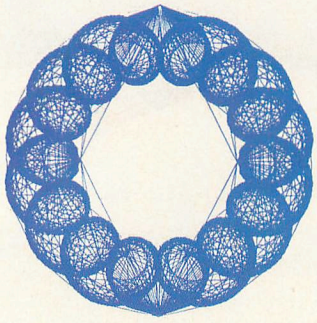

Figure 9. Magnum Opus: Radius 0=180, Radius 1=60, Radius 2=5; Ratio 1=15, Ratio 2=10; Start Number sides = 4; End Number sides =128; Color sequence 0 0 0 0; Line type 0.

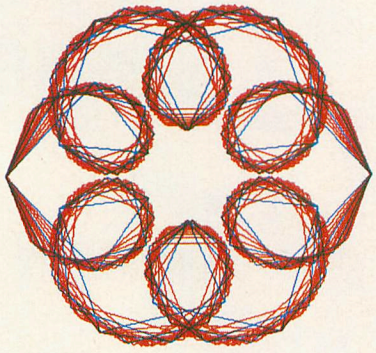

Figure 10. Radius 0=100, Radius 1=60, Radius 2=0; Ratio 1=7, Ratio 2=0; Start Number sides = 24; End Number sides =54; Color sequence 1 3 3 3; Line type 0.

Figure 11. Radius 0=90, Radius 1=120, Radius 2=0; Ratio 1=17, Ratio 2=0; Start Number sides = 4; End Number sides = 12; Color sequence 3 3 3 3; Line type 3.

Program Listing. Super Spiros

```
10 PI=3.142:INPUT"R0";R0:INPUT"R
1";R1:INPUT"R2";R2:INPUT"G1";G1:
INPUT"G2";G2:INPUT"Start # sides
";SS:INPUT"End # sides";ES:INPUT
"Color sequence";C(0),C(1),C(2),
C(3):INPUT"Line type";L
20 PRINT#-2,CHR$(18);"S0":FORNS=
SS TO ES STEP2:ST=PI*2/NS
30 PRINT#-2,"L";STR(L):PRINT#-2,
"C";STR$(C(C)):PC$="M"
40 FORA0=0TO6.29STEPST
50 GOSUB120:PRINT#-2,PC$;STR$(24
0+XP+X0);",";STR$(YP+YO)
70 PC$="D"
80 NEXTA0:C=C+1AND3:NEXTNS:PY=2*
(R0+R1+R3)+8:PRINT#-2,"M0,-";STR
$(PY)
90 PRINT#-2,"PRadius 0="R0"Radiu
s 1="R1"Radius 2="R2"Ratio 1="G1
"Ratio 2="G2:PRINT#-2,"M0,-"str$
(PY+10):PRINT#-2,"PStart # sides
="SS"End # sides ="ES"Color sequ
ence"C(0);C(1);C(2);C(3)"Line ty
pe"L:END
100 XP=SIN(A0)*R0:YP=COS(A0)*R0:
RETURN
110 GOSUB100:XP=XP+SIN(A0*G1)*R1
:YP=YP+COS(A0*G1)*R1:RETURN
120 GOSUB110:XP=XP+SIN(A0*G1*G2)
*R2:YP=YP+COS(A0*G1*G2)*R2:RETUR
N
```

■■■

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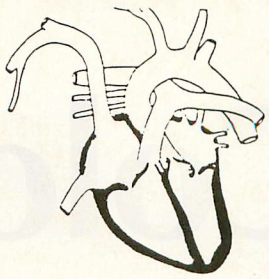

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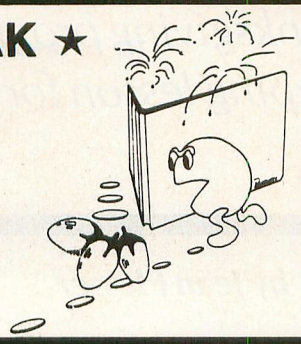

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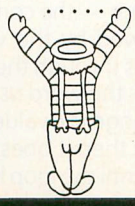

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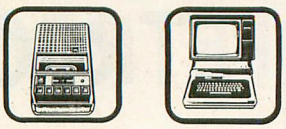

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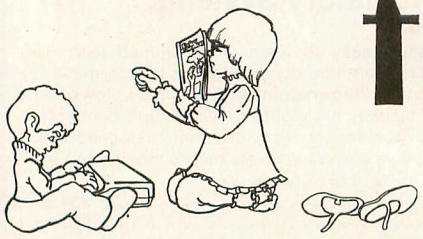


FOR/NEXT loops, a Thanksgiving program, and a typing lesson for P.T.s!

by Jean Plesser

HELLO P.T.S.!
That stands for "Programmer Trainees," and going into our third lesson the title is official. You've been following all my directions (thaank you!), working very hard (oouch!), and having some fun (Goood!). You've discovered magic in your typing finger (ooooh!) and by now you deserve a bag of Reese's Pieces, but I can't reach out to all of you, so for your reward — you guessed it — P.T., PHONE HOME!

Now, to keep earning that prestigious title...

The FOR/NEXT Loop

This month we're going to work with one of the most useful statements in computer programming — the FOR/NEXT loop. It is used in nearly every program to repeat a programming step a specific number of times. This saves the programmer a lot of time because it makes a program shorter — the statements need only be entered one time, and the computer will read and process them as many times as the FOR/NEXT loop specifies. This statement saves memory space, also, and when programs are lengthy that can be a very important saving.

Since the FOR/NEXT loop has an incredible number of uses, and because it is so important, I spent a lot of time thinking about how I could present it so you would understand it clearly. I would get an idea, think it through, sigh, shake my head, then search for another idea. This went on for several hours until maybe five ideas later, *I GOT IT!!*

My idea process can be illustrated in a FOR/NEXT loop to show you how this statement works. If we let the letter "I" represent the number of ideas I had, the loop would look like this:

```
10 FOR I = 1 TO 5
20 PRINT "IDEA #" I
30 NEXT I
40 PRINT "I GOT IT!!"
```

Before you enter this program and run it, carefully read the following explanation for each line:

Line 10 — the word FOR tells the computer that a loop is beginning. Any letter can be used in place of I — the letter is used to store a number each time the computer goes through the loop — I = 1,, then I = 2, then I = 3, and so on, until the loop is complete. In this program I will equal one to five.

Line 20 here — the computer will print IDEA#, followed by the value of 1 each time it passes through the loop.

Line 30 — the word NEXT tells the computer to change the value of I. In this case it adds one, then it goes back to the FOR statement until the loop is complete.

```
10 CLS
20 K=1 : S=0
30 IF K >= 10 THEN 100
40 PRINT"THE SUM OF THE FIRST"K
50 S=S + K
60 PRINT"DIGITS IS"S
70 PRINT
80 K=K+1
90 GO TO 30
100 END
OK
```

Photo 1. A. A program screen without FOR/NEXT loops.

```
10 CLS
20 S=0
30 FOR K = 1 TO 10
40 PRINT"THE SUM OF THE FIRST"K
50 S=S + K
60 PRINT"DIGITS IS"S
70 PRINT
80 NEXT K
100 END
OK
```

Photo 1. B. The same screen with FOR/NEXT loops.

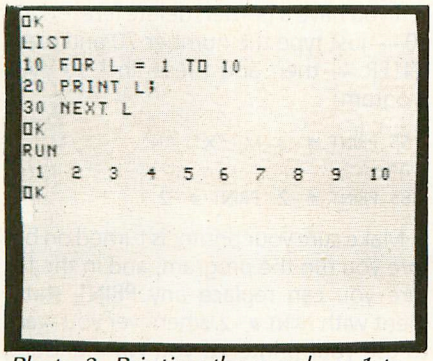


Photo 2. Printing the numbers 1 to 10.

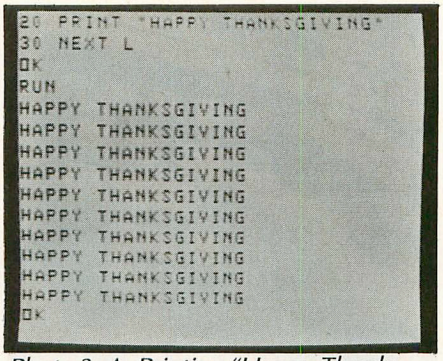


Photo 3. A. Printing "Happy Thanksgiving" without a semicolon.

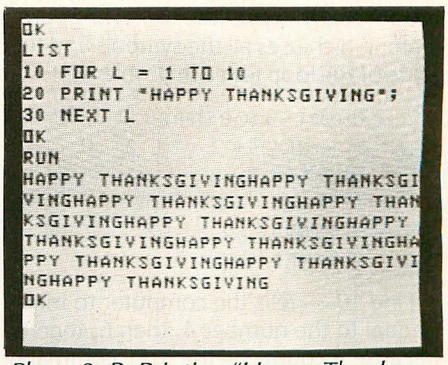


Photo 3. B. Printing "Happy Thanksgiving" with a semicolon.

Line 40 — prints I GOT IT!!

Now that you're beginning to get the idea — off to your computer, turn it on, and type the program exactly as you see it. If you need to, now would be a good time to review the NEW, LIST and RUN commands from last month's article. Also, don't forget to use the CLEAR key whenever you start typing anything new on the screen.

After you RUN the program, check the listing until you clearly see where and when the values of I changed. All FOR/NEXT loops work in the same way, but you can do many different things with them, so as soon as you're ready for another example, type NEW.

When you run the following program it will print the numbers from one to ten, but because a semicolon (;) follows the PRINT statement, the numbers will be printed on the same line — try it:

```
10 FOR L = 1 TO 10
20 PRINT L;
30 NEXT L
```

This program will loop from FOR to NEXT ten times, printing the value of L each time. After you see it run, change Line 20 to each of these examples (RUN the program after each change):

```
20 PRINT "HAPPY THANKSGIVING"
```

then,

```
20 PRINT "HAPPY THANKSGIVING ";
```

For each change the computer still made ten loops, but we didn't use the values of L in our PRINT statements this time — L was used only for counting. Change Line 20 once again to print your name, and change the value of 10 to other numbers.

The STEP Command

If we add a STEP command to the FOR statement, we can control the way the FOR/NEXT loop counts. Here's an example of a loop that counts backwards:

```
10 FOR S = 10 TO 1 STEP -1
20 PRINT S
30 NEXT S
```

Line 10 — tells the computer that S will start at ten and end at 1. The STEP command of −1 tells the computer to subtract 1 each time it passes through the loop. RUN the program to see how S gets smaller.

Now, change Line 10 to each of the following examples, and RUN the program after each change to see the difference, then try the next example when you understand how the STEP command controlled the counting values:

```
10 FOR S = 2 TO 20 STEP 2
10 FOR S = 20 TO 2 STEP -2
10 FOR S = 5 TO 50 STEP 5
10 FOR S = 100 TO -10 STEP -10
```

As you can see, the values (numbers) of a loop can start and stop at any number and the STEP value can increase or decrease the loop. Keep trying numbers of your own in Line 10, and also make these changes in Line 20:

```
20 PRINT S;
20 PRINT S,
20 PRINT "S =" S
```

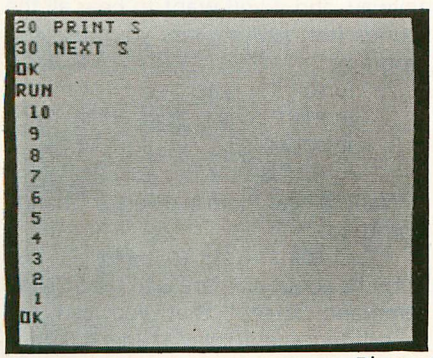
Arithmetic Symbols

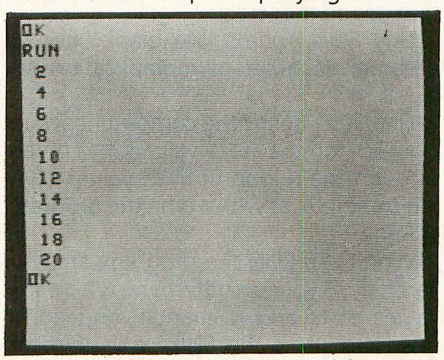
As you've already seen, the FOR/NEXT loop always counts the number of times it goes through the loop, but it can do much more than just print out that number. The computer can also do addition, subtraction, multiplication, and division, using the value number of the loop. Before we try this you need to know the right symbols to use. BASIC, the language your computer understands, uses these arithmetic symbols: + = Addition; − = Subtraction; × = Multiplication; and / = Division.

Type NEW to erase memory, then try these examples, pressing the ENTER key after each one. In this way you're using the computer as a calculator and the answer will always appear on the next line:

```
PRINT 4 + 2
PRINT 4 - 2
PRINT 4 * 2
PRINT 4 / 2
```

There is more to be known about computer math, but that will come in a future lesson. In the meantime, keep your arithmetic problems simple and try numbers of your own using these symbols. When





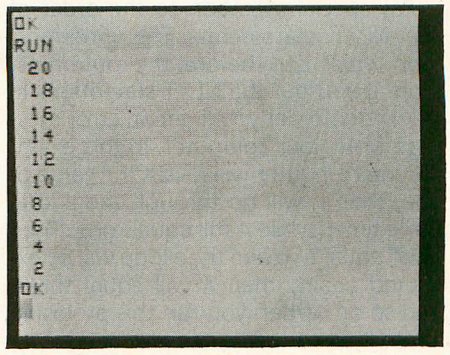


Photo 4. A, B and C — Three versions of the STEP command.

more

you're ready, type the following program, which uses all the symbols and the value of the loop for each problem:

```
10 FOR L=4 TO 8 STEP 2
20 PRINT L "+ 2 =" L+2
30 PRINT L "- 2 =" L-2
40 PRINT L "X 2 =" L*2
50 PRINT L "/ 2 =" L/2
60 NEXT L
```

Line 10 — tells the computer to make L equal to the number 4, then 6, then 8, because it counts by the STEP command of two.

Line 20 through Line 50 — tell the computer to print the value of L, then print what's inside the quotation marks (" "). It then gives the computer the problem (equation) to calculate, and the answer is printed after the equal (=) sign.

Line 60 — adds to the values of L and sends the computer back to Line 10; or, the loop ends if all L's are complete.

Again, try other values for L and for the STEP command until you feel comfortable in your understanding of what is happening each time the computer makes a loop.

NOTE (that means "pay special attention to this"): Because the screen contains only sixteen lines, we can easily run out of screen space when using FOR/NEXT loops. If this happens to you and lines begin scrolling up the screen faster than you can read them, just press the SHIFT key and the @ key at the same time. The printing will stop for as long as you want. To start the printing again, press *any* key. You can do this as often as you want, until the end of your program.

Nested Loops

FOR/NEXT loops can be placed inside other FOR/NEXT loops, making nested loops. Here's an example using two loops together:

```
10 FOR A = 1 TO 3
20 FOR B = 1 TO 3
30 PRINT "A =" A, "B =" B
40 NEXT B
50 NEXT A
```

Pay special attention to the order of the NEXT statements. The innermost loop *must* end before the outermost loop. If you put the NEXT statements in the wrong order you'll get an error message from your computer. In this example the computer will give A the value of one, then it will go through the B loop three times while A still equals one. Then A will equal two and the B loop will be executed again; then A will equal three, and so on. When you run this program, carefully read the values of A and B — A will change one time for every three values of B — take some extra time here if you need to.

Photo 5. Press the SHIFT and @ keys at the same time to stop the video screen scrolling.

Nested loops require time and practice to be used properly, but here's a program that should help you understand them a little better:

```
10 REM -A MULTIPLICATION TABLE
20 CLS
30 FOR M = 1 TO 12
40 FOR N = 1 TO 12
50 PRINT M "X" N "=" M*N
60 NEXT N
70 FOR D = 1 TO 500 : NEXT D
80 PRINT : PRINT
90 NEXT M
```

Line 10 — is a remark statement (REM statement) giving the program a name.

Line 20 — clears the screen before the program starts.

Line 30 — tells the computer to loop 12 times for M.

Line 40 — tells the computer to loop 12 times for N.

Line 50 — prints and calculates each problem using the values of M and N.

Line 60 — sends the computer back to Line 40 for the next value of N and when 12 values are complete the computer will go on to the next line in the program.

Line 70 — this FOR/NEXT loop creates a pause, or delay, in the program. The computer counts to 500, giving you time to press the SHIFT key and the @ key to stop the printing long enough to read the lines on the screen.

Line 80 — prints two blank lines to separate each set of multiplication tables.

Line 90 — sends the computer back to Line 30 for the next value of M, then through the N loop until all values of M are complete, at which time the program will end.

When you RUN the program, study it carefully so you can determine where the values of M and N change, and don't forget to press the SHIFT and @ keys when you reach a pause.

If you have a printer, delete (erase) Line 70 — just type the number 70 and press ENTER — then add these lines to your program:

```
55 PRINT #-2, M; "X"; "N"; "="; M*N
```

and

```
85 PRINT #-2: PRINT #-2
```

Make sure your printer is turned on before you run the program, and in the future you can replace any PRINT statement with PRINT #-2 whenever you want to use your printer. If you want a listing of your program on the printer, just type LLIST and press the ENTER key.

FOR/NEXT Color

This loop will color your screen with all nine colors:

```
10 FOR C = 0 TO 8
20 CLS(C)
30 FOR D = 1 TO 500 : NEXT D
40 NEXT C
```

Line 20 — uses the value of C to determine the color in the CLS() statement.

I think that by now you're gaining an understanding of how FOR/NEXT loops work and how valuable they can be to a programmer — even to a Programmer Trainee. They have many different uses, and I'll give you a few more examples as we go on to another command.

Let's Hear From You

Your computer has a voice and it's time we let it SOUND off! The command looks like this: SOUND x,y. In place of the x use any number from 1 to 255. This is the tone — 1 is the lowest tone and 255 is the highest. In place of the y you can again use any number from 1 to 255. This number tells the computer how long you want the tone to sound off. As close as I can figure it, 17 = one second; 50 = three seconds; 100 = six seconds; and so on.

Let's try it. Turn up the volume on your TV and type: SOUND 1,17, then, SOUND 255,17.

Impressed? Well, try other numbers anyway, and if you want to hear all the sounds (this *will* impress you), use this program:

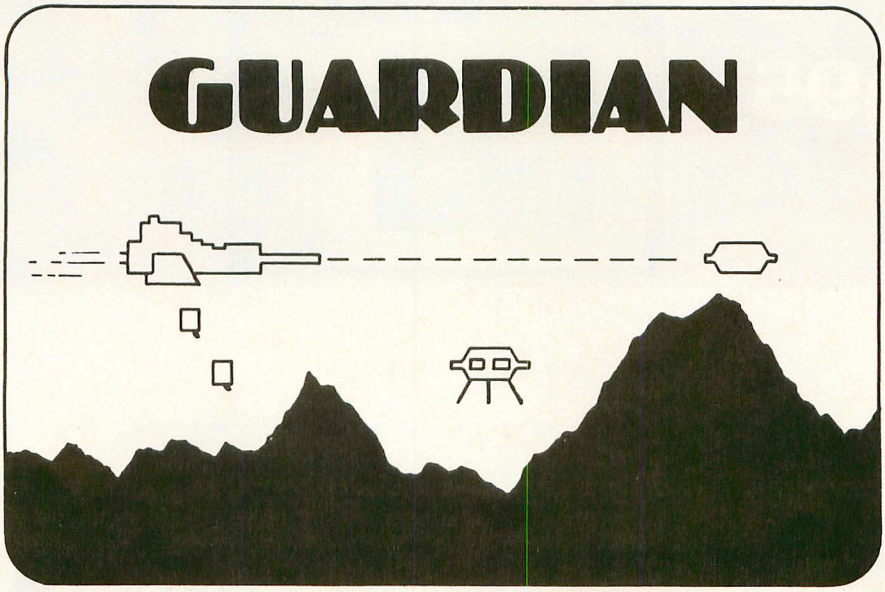
```
10 FOR S = 1 TO 255
20 PRINT "THIS IS TONE #" S
30 SOUND S,1
40 NEXT S
```

Want to hear them in reverse? Change Line 10 to:

```
10 FOR S = 255 TO 1 STEP -1
```

That's about all there is to the SOUND command, except that you can put sounds together to play a tune, but since

to page 26



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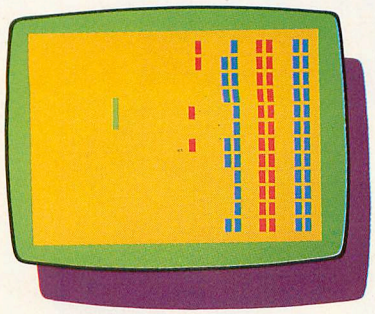

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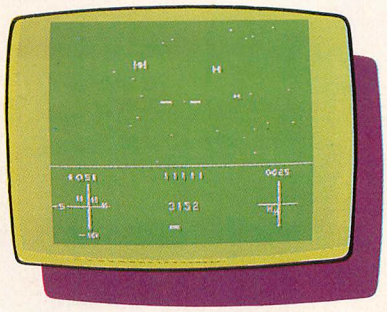

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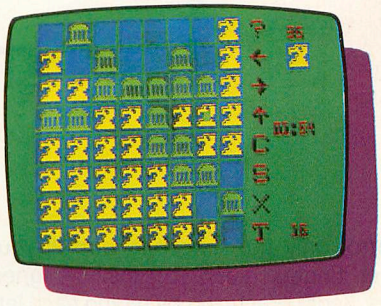

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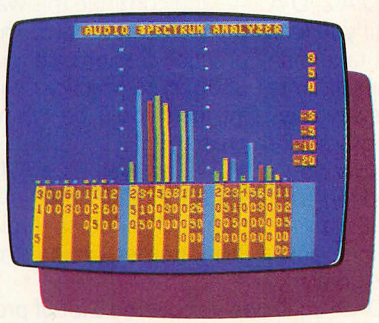

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Figure 1. Keyboard and Finger Assignments

I have a "tin ear," I'll refer you to Radio Shack's *Getting Started With Color Basic* — the manual you received with your computer. There's a program on page 52 that uses a nested loop to play "Three Blind Mice."

All Together Now

I'm not a quitter, so I'll show you how to add sounds to a program just for fun. I've put together all you've learned in this lesson — the FOR/NEXT loop, plus SOUND, plus a few little Pilgrims and little Indians — and we get something along the lines of "Ten Little Indians." This program won't *play* it, but *think* of the tune as you watch it run.

Here's my Thanksgiving contribution: I hope you like it, but more than that, I hope it gives you ideas of your own (see Program Listing 1).

A Typing Guide

A computer programmer does a lot of typing; right — so does a P.T. You can get by using one or two fingers, and while two are faster than one, ten are fastest. Learning to type properly isn't hard, but it does take practice — just a little each day using the right fingers on the right keys, and soon you'll be a whiz at the keyboard.

I can't really teach you to type, but I can guide you with the help of a Typing Chart. As you look at the chart, you'll see that lines are drawn through sections of the keyboard, and each section is numbered to match the numbers of each finger at the bottom of the chart. As you practice, do your best to reach for each key with the matching numbered finger. Some keys are too hard to reach, so just press them with any finger that's comfortable. Now, let's put some of this information to work.

Hold both hands over the keyboard (palms down). Put your number one finger on the A key; number two finger on the S key; number three finger on the D key, number four finger on the F key, and put your left thumb on the spacebar. Your right thumb goes on the spacebar also, then your number five finger goes on the J key, your number six finger on the K key, number seven finger on the L key, and number eight finger on the semicolon key. This may feel strange and uncomfortable, but practice will change that in time, so don't give up yet.

These keys are called the "home" keys, and your fingers return to this position after typing anything. Your thumbs control only the spacebar, but all your other fingers reach for their assigned keys. Begin practicing by typing each letter of the "home" keys one at a time. Start with the A key and go across the row to the semicolon key. Say the letter as you press it and continue doing this until you know the "home" keys without looking at them.

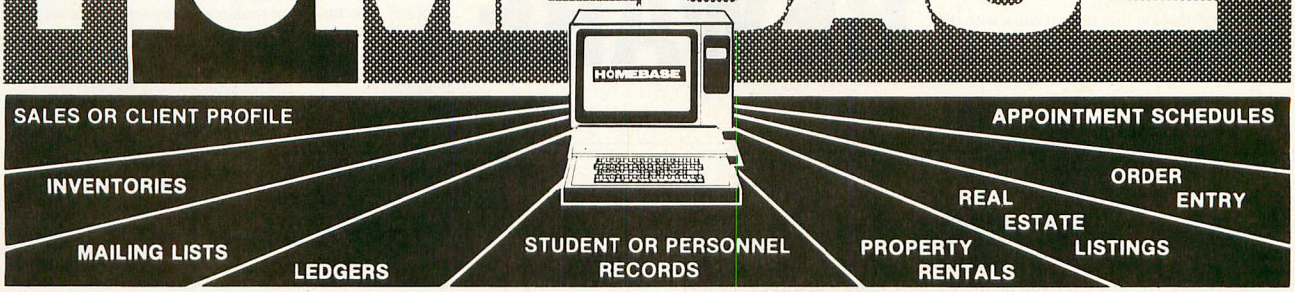
Once you've mastered the "home" keys, use the chart and practice with one finger at a time. Start with your number one finger, say each letter as you press it — Q A Z, Q A Z — and continue this way until you learn the entire keyboard. This will take many practice sessions, so give yourself time, but do try to practice nearly every day. One day you'll be typing programs like a pro!

Now you're a P.T. as well as a T.T., working toward a P.T.P: did I lose you? That's a Programmer Trainee, a Typist Trainee and a Programmer Typing Professionally!

Once again we've covered a lot of programming steps, and next month all our lessons will come together in a graphics lesson for the December holidays. In the meantime, have a happy and delicious Thanksgiving. But, remember: "BEEE GOOOD, P.T." — Practice! ■ ■ ■

Program on page 29

HOMEBASE



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BEWARE of products that do not work with disk systems. Many won't, but ours will because they are fully decoded. Remember, even if you don't own a disk now, you will someday and you don't want to be stuck.

BEWARE

BEWARE of products that are housed in cheap plastic. Ours are encased in a sturdy metal case to eliminate TV interference.

BEWARE of manufacturers that do not offer software support. The library of music and speech synthesis programs shown below is only the beginning of our support.

BEWARE of manufacturers that try to cut corners. Our boards have gold plated fingers and important IC's are socketed.

MUSICA

Speech Systems was the first to offer the CoCo community 4 voice music with the **COMPOSER**. We now offer you an incredible 4 voice music program that contains features typically only available on hardware music synthesizers costing 10 times the price.

- The notes are displayed on the screen in high resolution graphics.
- Treble and bass staffs are shown individually.
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- You can insert a few notes and listen to it immediately.
- You can stop and start the music at any point for editing or crucial analysis.
- You can develop an unlimited number of timbre definitions using a super-fast waveform synthesis option.
- You probably don't believe that one either. But it's true.
- The tempo can be varied during compositions.
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- The music may be directed to the TV speaker or the **STEREO COMPOSER** (see below).
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- **MUSICA** automatically adjusts to 16K, 32K, and 64K machines.
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THE COMPOSER

The **COMPOSER** is a 4 voice music compiler with a 7 octave range. A unique waveshape is provided for each voice. Dotted and double dotted notes are supported, as well as sixteenth and thirty-second notes.

The **COMPOSER** allows music to be played at any tempo in any key. While the music plays, a changing random kaleidoscope pattern is displayed. This may be disabled to allow the user to display anything including the words to a song.

Music compiled using the **COMPOSER** may be played independent of all other software. The **COMPOSER** is menu driven making it extremely easy to use. Nearly 20 minutes of music is provided.

For reviews see June '83 *Rainbow*, p. 192 and May '83 *Color Computer News*, p. 74.

COMPOSER (16K or 32K Cassette) $24.95
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THE STEREO COMPOSER $10?

Well not really. But when you consider that when you purchase the **STEREO COMPOSER** you get both the **COMPOSER** software and **MUSICA** software, the difference is very close to $10.

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The **STEREO COMPOSER** comes assembled, tested, burned in, with all the necessary hardware and software and a 90 day warranty.

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Demonstration Tape (Stereo Audio Cassette) $7.00

THE VOICE

The **VOICE** is a hardware speech synthesizer that plugs into the Color Computer's cartridge slot. It uses the sophisticated SC-01 by VOTRAX to reproduce any word in English as well as other languages.

The **VOICE** has two outputs. Speech may be heard through the TV speaker or the built-in audio power amplifier with volume control may be connected to your own external speaker.

The **VOICE** comes assembled, tested, burned in, with all the necessary hardware and software, and a 90-day warranty. Runs in 16K, 32K, or 64K machines.

BINGO The VOICE announces the BINGO tiles while you play the game.

MATH TUTOR The VOICE tutors your child in learning arithmetic.

HIGH LOW The VOICE gives you hints in guessing a number it has picked.

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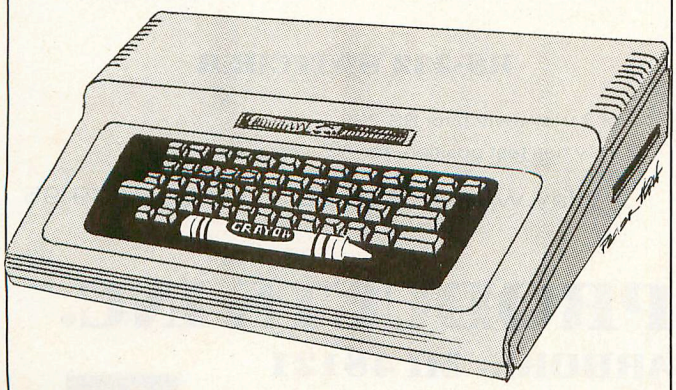
from page 26

Program Listing 1. Thanksgiving Program

```
10 REM- A PILGRIM PROGRAM
20 CLS
30 PRINT "AT THE FIRST THANKGIVI
NG WERE:"
40 FOR D = 1 TO 500 : NEXT D
50 FOR P = 1 TO 3
60 PRINT P "LITTLE,"
70 SOUND P,8 : SOUND P+10,8
80 NEXT P
90 PRINT "  PILGRIMS."
100 SOUND 150,7 : SOUND 150+10,7

110 FOR P = 4 TO 6
120 PRINT P "LITTLE,"
130 SOUND P,8 : SOUND P+10,8
140 NEXT P
150 PRINT "  PILGRIMS."
160 SOUND 155,8 : SOUND 150+10,7

170 FOR P = 7 TO 9
180 PRINT P "LITTLE,"
190 SOUND P,8 : SOUND P+10,8
200 NEXT P
210 PRINT "  PILGRIMS -- AND,"
220 SOUND 155,7 : SOUND 155+10,7
 : SOUND 200,17
230 PRINT "  TEN LITTLE INDIAN G
UESTS!!"
240 FOR S = 100 TO 140 STEP 10
250 SOUND S,6
260 NEXT S
270 GOTO 270
```



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- ML file length

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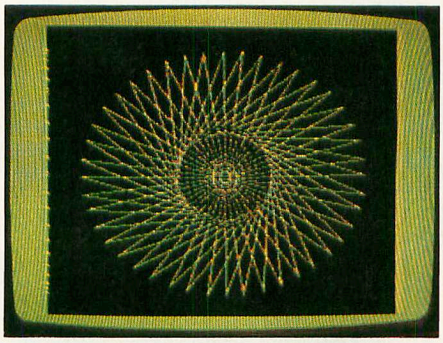
16K Extended Color Basic

STAR *

A very short graphics treasure.



by David Lauta

SHORT COMPUTER GRAPHICS have always intrigued me. Probably the biggest contributing factor to my buying a computer was the special-effects arcade games that can be incorporated into computer programming. Choosing the Color Computer was influenced by the ease with which graphics programs can be written.

I came up with "Star" by accident. I was playing with a program that plots a circle on an Atari computer and realized what it takes to draw a circle on most home computers. Then I drew 200 or so circles in the same amount of time on the Color Computer. It makes me want to thank Radio Shack or MicroSoft or Motorola (or whoever is responsible) for the powerful, responsive machine the Color Computer is.

Star requires 16K Extended Basic. I incorporated the Line statement with the PSET statement and produced what I believe is a truly creative graphics program. I hope the simple beauty and artistic symmetry of this program will inspire some of you not-so-amateur programmers to incorporate this design into your programs.

Show the program to your friends and neighbors who own more expensive machines. They will be amazed at the ease and simplicity with which a Color Computer operates.

Line by Line

Line 5 selects graphics mode, clears the screen, and picks color set.

Line 10 is the For/Next loop. I chose 44 as the final value, to put 45 points on the star.

Line 15 and Line 20 are the work-horse lines. B and C calculate sine and cosine values of A. D and E get values of sine and cosine for A+1. This is important because H and I plot B and C at the points of the star. D and E make the short leg of the star.

Line 30 is the line doing the actual drawing. H and I are the points of the star, and F and G are the points the short leg is drawn to. The rest of the program just adds a little polish.

The simplicity of this program allows many easy changes. Selecting a different PMODE will change the appearance of the star. In Line 20 the values 128 and 96 could be changed to move the star off center. Caution should be used to make sure the star will fit on the screen. Changing the values 35 and 27 to smaller numbers will make the star smaller but make sure the star will fit on the screen. Lines 40, 45 and 50 could be changed to alter my finishing touches; delete them altogether, and build from there. ■ ■ ■

Program Listing. Star

```
1 REM MY STAR
2 REM WRITTEN BY
3 REM DAVID LAUTA
4 REM 61483,ROCHESTER N.Y.
5 PMODE 4,1:PCLS:SCREEN 1,0
10 FOR A=1 TO 44
15 B=SIN(A):C=COS(A):D=SIN(A+1):
   E=COS(A+1):B=B*3:C=C*3
20 F=(128+D*35):G=(96+E*27):H=(1
   28+B*35):I=(96+C*27)
30 PSET(H,I,1):LINE(128,96)*-(H,
   I),PSET:LINE*-(F,G),PSET
35 NEXT A
40 FOR K=1 TO 35 STEP 2.5
45 CIRCLE(128,96),K,4
50 NEXT K
999 GOTO 999
```

■■■

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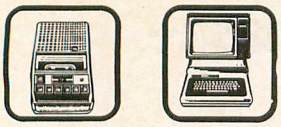
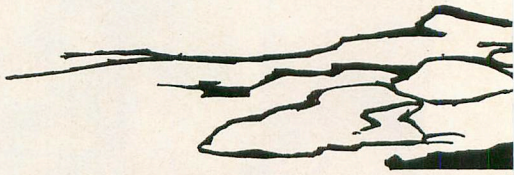


16K Extended Color Basic
4K Color Basic

SORCERER'S PUZZLES

Oh no! The Sorcerer has been kidnapped by Questigians! Quick—solve these puzzles!



by Richard Ramella

SORCERER GOLDBERG has been kidnapped by the Questigians," announced Bob, the twisted major domo who runs the Sorcerer's castle.

"Oh no!" cried Sunflower.

"What should we do?" wondered Poke. He and Sunflower were apprentice sorcerers.

"Do whatever you want," said Bob. "As for me, I've raided the Sorcerer's private supply of strawberry seltzer tonic, and I'm going to relax with a cool drink."

"You don't care about the Sorcerer's plight?" asked Sunflower.

"Of course I care," said Bob. "Without his magic, the strawberry seltzer tonic won't last forever." He mused to himself, "I wonder if the wizard made a will or if I simply become lord of the manor by default?"

"As his apprentices, we've got to look for him," Poke said. Sunflower nodded.

"Whatever," said Bob, "but if you come back, I'm boss. I'd advise you not to go. It's dangerous out there."

"You forget we traveled overland to get here," Sunflower reminded him.

"You came from the south, which has only dragons, pitfalls, slime creatures, giant rabbits and ambulatory poison ivy. Questigian Country is to the north, and it really gets rough that way."

"What are the Questigians like?" Poke wanted to know.

Bob shuddered. "The worst of the worst. You'll know when you meet one."

"And why have they kidnapped the Sorcerer?" Sunflower asked.

"For the sheer exhilaration of being mean," answered Bob.

And with that encouraging thought, the boy and the girl left the castle on a cold, gray and windless morning, trekking north across a sere landscape of moors and winter-dead meadowland toward the blue mountains of the north.

In the afternoon they rounded a bend in a rocky path and came face to face with a Questigian. It was fat, half their size, and its face was faintly reminiscent of a bulldog's slobbery scowl. It stood on quite bowed legs. "Stand and deliver!" it commanded in a high voice, at the same time drawing back a pace.

"We're already standing," said Sunflower, "and I'm going to deliver a quick shot to that lightbulb you call a nose if you don't tell us quickly what you've done with Sorcerer Goldberg!"

The fierce and pugnacious Questigian responded by squealing and retreating forty feet up the path. "You'll never find him! No one can get past the clever traps we've set with Vortex, Jump Away Solitaire, Flat Cubes and Logicolor. Want to know the rules of play?"

"Put this guy down for about two watts of brainpower," Sunflower murmured to Poke. "And take notes. It looks as if we're going to have to pass some tests before we find Sorcerer Goldberg."

The Questigian spilled out all the rules of play for the traps ahead, then hopped up the mountain and out of sight. When he was gone, Poke read his notes aloud.

Vortex

An orange square is drawn, and within each of its four sides is a small cyan section. At the center of the square is a magenta dot representing the player. The player dot is maneuvered by tapping the four directional arrow keys. The dot will be drawn back toward the center of the vortex if the secret, correct sequence of moves is not made. The correct sequence may be understood by the clue

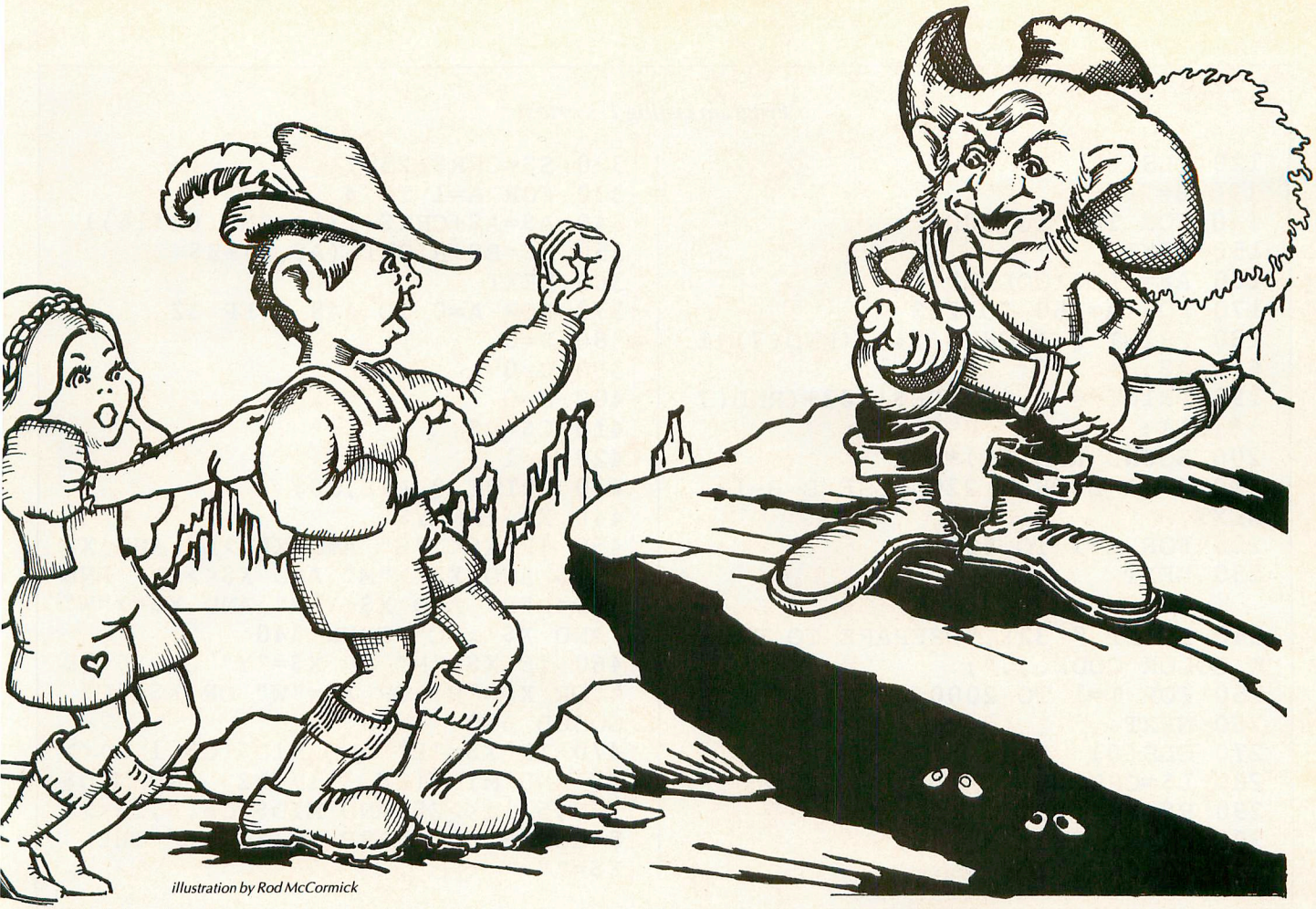


illustration by Rod McCormick

provided by the Questigian: *Traveling somewhat like a knight, some forward and half of that right.* Escape comes when any of the cyan wall sections are touched. The game is lost if an orange section of the wall is touched.

Jump Away Solitaire

Forty-eight orange checkers are drawn within a white square. The checker at top left seems to have double length, but by tapping N for north, S for south, W for west and E for east, the player will see the checker is actually a cursor which can be moved to any of the 64 available positions on the board. The object is to eliminate as many checkers as possible, using regular diagonal checker moves. To jump and eliminate a checker, use these keys: left arrow key jumps northwest, right arrow key jumps northeast. The < key jumps southwest, and the > key jumps southeast. (The Questigians never revealed a winning strategy, so you're on your own here.)

Flat Cubes

Picture four cubes with various colors on each face. Now picture each of those cubes presented with its six sides shown in vertical rows. In this manner, the rows across show the front, bottom, top, back, left and right faces of each of the four cubes.

The object is to maneuver the cubes so the top four rows across — front, bottom, top and back — each has four different colors in it. Be aware that the moves you make simulate reality. Revolving a cube in any direction changes its faces logically.

Think of the four cubes as 1, 2, 3 and 4 reading across. The movement commands are L for left, R for right, U for up and D for down. Thus, the command 1U will turn the first cube upward one move. The command 3L would turn the third cube leftward one move.

Enter move commands when you see the prompt: DECISION? Illegal move commands are not allowed. The test then recognizes and acknowledges a winning position.

Logicolor

A hidden four-color code is generated. The object is to guess the code within 15 tries. Colors used in the code are yellow, blue, red, white, cyan and magenta. The code may be of four different colors, all the same or a combination of the six.

After the program flashes the words PREPARE TO BREAK COLOR CODE, an orange cursor will appear at top right of the screen. This cursor can be moved among four positions on the line by tapping the left and right arrow keys. To set a color in any of the four positions, tap the first letter of the color chosen: Y for yellow, B for blue, R for red, W for white, C for cyan and M for magenta. The color will then blink on to the left of the cursor. You may change the color by simply setting another over it.

When you have set four colors on a line, tap the E key to register the turn. At this point the program checks your guess against the hidden code, and to the right of the line gives two kinds of clues: POS for correct color in correct position and COLOR for correct color in wrong position. Example: If you guess red-red-white-white and the hidden code is red-white-blue-blue, the clue message will be POS: 1 COLOR: 1, meaning the red guess is the right color in the right position and the white guess is the right color in the wrong position.

After clues are given, the orange cursor goes to the next line for another round. You have 15 tries to guess the code. If the code remains unsolved after that turn, the color code is shown. The program also acknowledges winning guesses. ■ ■ ■

▸ *Programs*

Program Listing 1. Vortex

```
120 CLS(0)
130 B=246
140 FOR T=1 TO 500
150 NEXT
160 A$="LOGICOLOR"
170 FOR A=160 TO 223
180 PRINT @ A,CHR$(143+(RND(7)*1
6));A$;
190 PRINT @ B,A$;CHR$(143+(RND(7
)*16));
200 SOUND RND(15)*8,1
210 IF A=B THEN 220 ELSE B=B-1:
NEXT
220 FOR T=1 TO 500
230 NEXT

240 PRINT @ 321,"PREPARE TO BREA
K COLOR CODE...";
250 FOR T=1 TO 2000
260 NEXT
270 CLS(0)
280 L$=CHR$(8)
290 R$=CHR$(9)
300 D$=STRING$(8,128)
310 Z$=CHR$(128)
320 S$=CHR$(255)
330 FOR A=1 TO 4
340 A$=A$+CHR$(131+(RND(6)*16))
350 B$=B$+RIGHT$(A$,1)+Z$
360 NEXT
370 FOR A=0 TO 448 STEP 32
380 P=0
390 G=0
400 J=0
410 C$=D$
420 B=1
430 PRINT @ A+B,S$;
440 X$=INKEY$
450 IF X$<>"E" AND X$<>L$ AND X$
<>R$ AND X$<>"M" AND X$<>"Y" AND
 X$<>"B" AND X$<>"R" AND X$<>"W"
 AND X$<>"C" THEN 440
460 IF X$="M" OR X$="Y" OR X$="B
" OR X$="R" OR X$="W" OR X$="C"
GOSUB 630
470 IF X$="E" AND MID$(C$,1,1)<>
Z$ AND MID$(C$,3,1)<>Z$ AND MID$
(C$,5,1)<>Z$ AND MID$(C$,7,1)<>Z
$ GOSUB 670 ELSE IF X$="E" THEN
X$=""
```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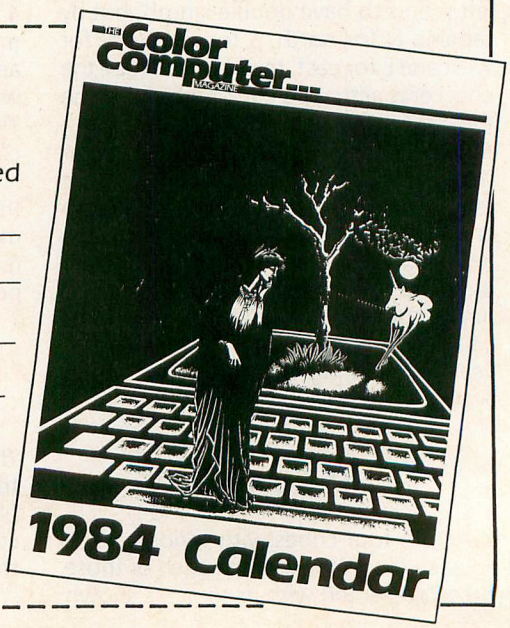
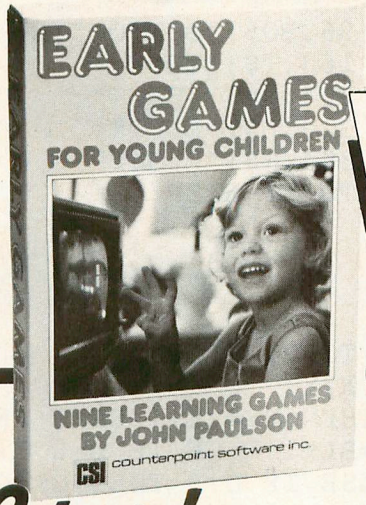


```
480 IF X$<>"E" THEN PRINT @ A,C$
;: PRINT @ A+B,Z$;: QQ=0
490 IF X$=L$ AND B>2 THEN SOUND
B*20,1: B=B-2 ELSE IF X$=R$ AND
B<6 THEN B=B+2: SOUND B*20,1
500 PRINT @ A+B,S$;
510 IF X$="E" AND J=>4 THEN PRIN
T @ A+B,Z$;: NEXT A
520 IF PP=15 GOTO 530 ELSE PRINT
 @ A+B,S$;: GOTO 440
530 PRINT @ 480,"GAME OVER. SEQU
ENCE:"Z$+B$;
540 FOR T=1 TO 3
550 SOUND 147,3
560 SOUND 176,2
570 FOR G=1 TO 50
580 NEXT G
590 NEXT T
600 SOUND 147,2
610 SOUND 89,3
620 GOTO530
630 J=J+1
640 IF X$="Y" THEN W=16 ELSE IF
X$="B" THEN W=32 ELSE IF X$="R"
THEN W=48 ELSE IF X$="W" THEN W=
64 ELSE IF X$="C" THEN W=80 ELSE
 IF X$="M" THEN W=96
650 MID$(C$,B,1)=CHR$(131+W)
660 RETURN
670 QQ=1
680 PP=PP+1
690 K$=B$
700 IF C$=B$ GOTO 850 ELSE FOR F
=1 TO 7 STEP 2
710 IF MID$(C$,F,1)=MID$(K$,F,1)
THEN P=P+1: MID$(C$,F,1)=Z$: MID
$(K$,F,1)=Z$
720 NEXT F
730 FOR F=1 TO 7 STEP 2
740 FOR Q=1 TO 7 STEP 2
750 IF MID$(C$,F,1)=MID$(K$,Q,1)
 AND MID$(K$,Q,1)<>Z$ THEN G=G+1
: MID$(K$,Q,1)=Z$: MID$(C$,F,1)=
Z$
760 NEXT Q
770 NEXT F
780 PRINT @ A+10,"";
790 IF PP<10 THEN PRINT" ";
800 PRINT PP"- POS:"P"COLOR:"G;
810 FOR T=1 TO 10
```

more



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Circle No. 18 on Reader Service Card

```
820 SOUND RND(10)+150,1
830 NEXT
840 RETURN
850 N=N+1
860 IF N/2=INT(N/2) GOSUB 1000 E
LSE GOSUB 1020
870 FOR T=1 TO 4
880 SOUND 176,1
890 SOUND 193,1
900 NEXT
910 FOR T=1 TO 4
920 SOUND 193,1
930 SOUND 204,1
940 NEXT
950 FOR T=1 TO 3
960 SOUND 210,1
970 SOUND 218,1
980 NEXT
990 GOTO 850
1000 PRINT @ 480,"WINNER IN"PP"T
URNS.          ";
1010 RETURN
1020 PRINT @ 480,"THAT WAS VERY
GOOD!";
1030 RETURN
1040 END
```

Program Listing 2. Jump Away Solitaire

```
120 CLS(0)
130 PRINT @ 266," FLAT CUBES ";
140 FOR T=1 TO 500
150 NEXT
160 CLS(0)
170 CLEAR 350
180 FOR A=1 TO 61
190 K$=K$+CHR$(128)
200 NEXT
210 O$=CHR$(255)
220 Y$=CHR$(159)
230 B$=CHR$(175)
240 G$=CHR$(223)
250 FOR A=1 TO 2
260 O$=O$+O$
270 Y$=Y$+Y$
280 B$=B$+B$
290 G$=G$+G$
300 NEXT
310 S$=CHR$(128)
320 A$(1)=O$+S$+Y$+S$+Y$+S$+G$+S
$+B$+S$+B$+S$
330 A$(2)=O$+S$+O$+S$+B$+S$+Y$+S
$+B$+S$+G$+S$

340 A$(3)=G$+S$+G$+S$+O$+S$+Y$+S
$+B$+S$+O$+S$
350 A$(4)=B$+S$+G$+S$+G$+S$+G$+S
$+O$+S$+Y$+S$
360 Y=18
370 FOR X=0 TO 54
380 SET(X,Y,5)
390 NEXT
400 T$=""
410 BA$=""
420 L$=""
430 R$=""
440 F$=""
450 BO$=""
460 FOR A=1 TO 4
470 BA$=BA$+MID$(A$(A),1,5)
480 L$=L$+MID$(A$(A),6,5)
490 F$=F$+MID$(A$(A),11,5)
500 R$=R$+MID$(A$(A),16,5)
510 BO$=BO$+MID$(A$(A),21,5)
520 T$=T$+MID$(A$(A),26,5)
530 NEXT
540 PRINT @ 0,F$;"FRONT ";
550 PRINT @ 32,F$;
560 PRINT @ 96,BO$;"BOTTOM";
570 PRINT @ 160,T$;"TOP";
580 PRINT @ 224,BA$;"BACK";
590 PRINT @ 320,L$;"LEFT";
600 PRINT @ 384,R$;"RIGHT";
610 FOR Y=2 TO 14 STEP 4
620 BL=0
630 GR=0
640 RE=0
650 YE=0
660 FOR X=0 TO 30 STEP 10
670 D=POINT(X,Y)
680 IF D=2 THEN YE=YE+1 ELSE IF
D=3 THEN BL=BL+1 ELSE IF D=8 THE
N RE=RE+1 ELSE IF D=6 THEN GR=GR
+1
690 NEXT X
700 IF GR=1 AND RE=1 AND BL=1 AN
D YE=1 THEN NEXT Y ELSE GOTO 780

710 PRINT @ 480,"WIN";
720 SOUND 147,1
730 SOUND 159,2
740 SOUND 147,2
750 SOUND 125,3
760 SOUND 89,5
770 GOTO 710
```

to page 42

COLORSOFT™ BUSINESS SOFTWARE

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COLORSOFT tm General Ledger is an integrated, journal-type double entry accounting package for a small business that includes General Ledger, Accounts Payable, and Accounts Receivable programs. Outputs of the system include an income statement, balance sheet, accounts payable and receivable status lists, accounts payable and receivable aging reports, journal reports, account listing and a closing summary. During each user established accounting period (monthly, quarterly, annually, etc.), it will handle accounts of up to $1,000,000.00 for approximately 800 accounts payable/receivable. Accounts are automatically numbered and each transaction is carried separately so that an account number will correspond to a specific purchase rather than a specific vendor/customer.

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PRICE: $129.95

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FEATURES

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*** DETAILED USER'S MANUAL WITH SAMPLE TRANSACTIONS ***
*** USER IS PROMPTED FOR COMPANION ENTRIES AS REQUIRED ***
*** APPROXIMATELY 800 ACCOUNTS RECEIVABLE/PAYABLE FILES ***
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"BEING BOSS" is a collection of six programs and is the first in an ongoing series of computer assisted management development tools. Those who can benefit include corporate executives, managers, heads of teams, group leaders, supervisors, foremans, teachers, and parents. In fact, anyone who must take a leadership role can benefit from these programs.

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FEATURES

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*** ACCOUNTS ARE CARRIED BY CUSTOMER ***
*** USER FRIENDLY AND FULLY MENU DRIVEN ***
*** PREPARES INVOICES AND MAILING LABELS ***
*** USER DOES NOT NEED TO BE AN ACCOUNTANT ***
*** DETAILED USER'S MANUAL WITH SAMPLE TRANSACTIONS ***
*** MENU PROMPTS MAKE ENTRIES EASY, FAST, AND EFFICIENT ***

COLORSOFT tm Accounts Receivable provides the user with detailed audit trails and history files on all transactions by a customer. It also prepares invoices, mailing labels, aging lists, customer history reports, and an alphabetized customer listing. The user can define discount/net terms for commercial accounts and finance charge and minimum payments for revolving accounts.

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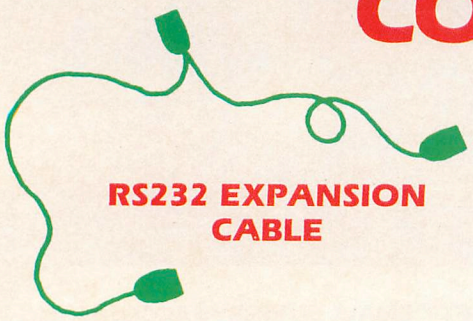

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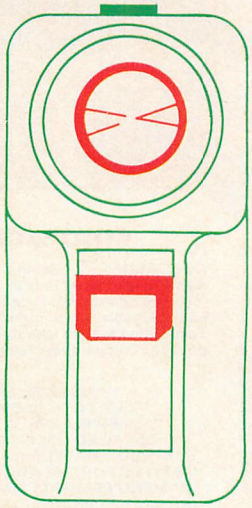

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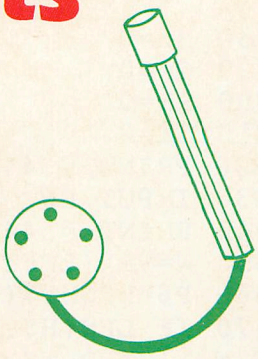

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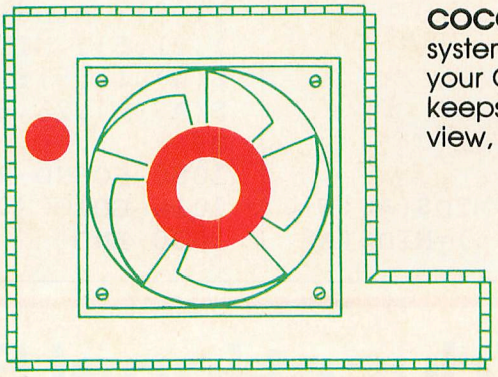

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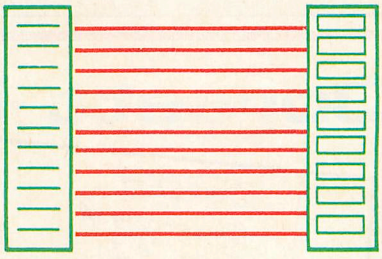

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Circle No. 20 on Reader Service Card

from page 38

```
780 BL=0
790 GR=0
800 RE=0
810 YE=0
820 PRINT @ 448,"DECISION";
830 INPUT H$
840 PRINT @ 448,K$;
850 W=VAL(LEFT$(H$,1))
860 P$=RIGHT$(H$,1)
870 IF LEN(H$)>2 THEN 880 ELSE I
F W<>1 AND W<>2 AND W<>3 AND W<>
4 THEN 880 ELSE IF P$<>"U" AND P
$<>"L" AND P$<>"R" AND P$<>"D" T
HEN 880 ELSE GOTO 950
880 PRINT @ 448,K$;
890 PRINT @ 480,"ILLEGAL CHOICE.
 TRY AGAIN.";
900 FOR T=1 TO 1000
910 NEXT
920 PRINT @ 448,K$;
930 GOTO 780
940 GOTO 400
950 P$=RIGHT$(H$,1)
960 IF P$="R" THEN U$=MID$(A$(W)
,16,5): MID$(A$(W),16,5)=MID$(A$
(W),11,5): MID$(A$(W),11,5)=MID$
(A$(W),6,5): MID$(A$(W),6,5)=MID
$(A$(W),1,5): MID$(A$(W),1,5)=U$

970 IF P$="L" THEN U$=MID$(A$(W)
,1,5): MID$(A$(W),1,5)=MID$(A$(W
),6,5): MID$(A$(W),6,5)=MID$(A$(
W),11,5): MID$(A$(W),11,5)=MID$(
A$(W),16,5): MID$(A$(W),16,5)=U$

980 IF P$="U" THEN U$=MID$(A$(W)
,1,5): MID$(A$(W),1,5)=MID$(A$(W
),26,5): MID$(A$(W),26,5)=MID$(A
$(W),11,5): MID$(A$(W),11,5)=MID
$(A$(W),21,5): MID$(A$(W),21,5)=
U$
990 IF P$="D" THEN U$=MID$(A$(W)
,1,5): MID$(A$(W),1,5)=MID$(A$(W
),21,5): MID$(A$(W),21,5)=MID$(A
$(W),11,5): MID$(A$(W),11,5)=MID
$(A$(W),26,5): MID$(A$(W),26,5)=
U$
1000 SOUND RND(8)*20,1
1010 GOTO 400
1020 END
```


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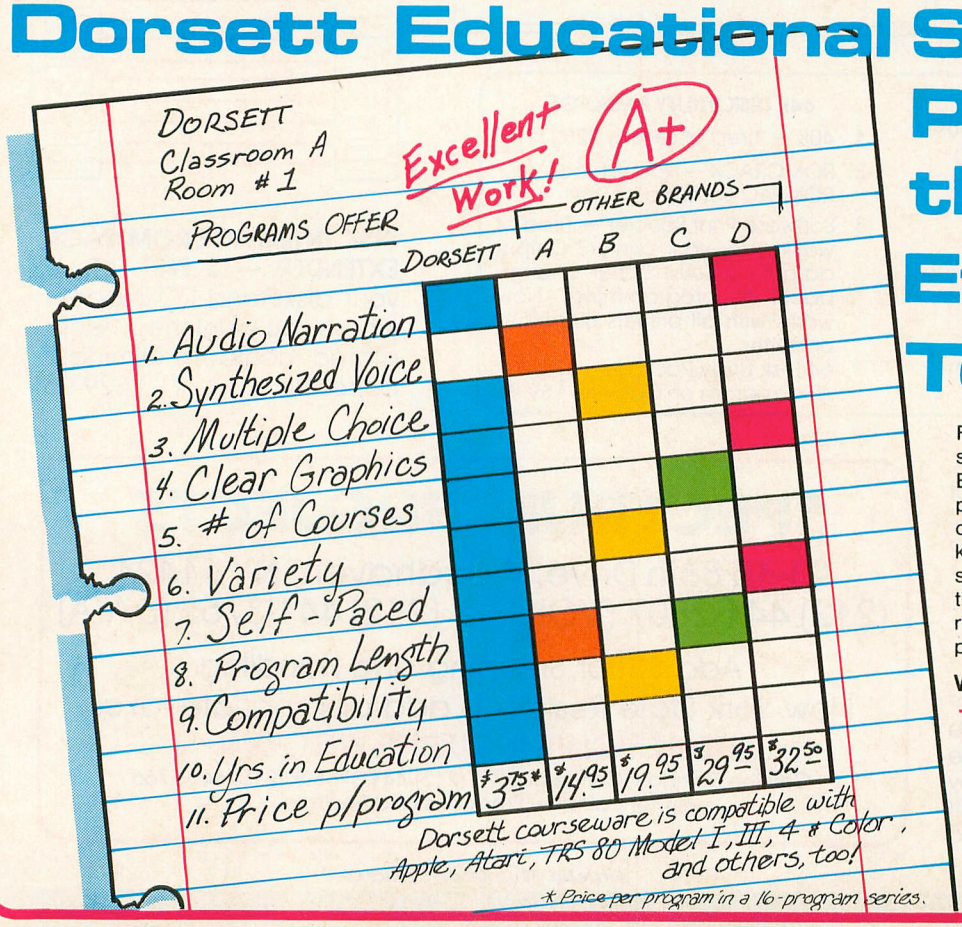

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Circle No. 21 on Reader Service Card

Program Listing 3. Flat Cubes

```
120 CLS(0)
130 Z$=CHR$(223)
140 U$=CHR$(94)
150 D$=CHR$(10)
160 L$=CHR$(8)
170 R$=CHR$(9)
180 B$=CHR$(255)
190 FOR A=0 TO 30
200 PRINT @ A,B$;
210 PRINT @ A+480,B$;
220 NEXT A
230 FOR A=0 TO 480 STEP 32
240 PRINT @ A,B$;
250 PRINT @ A+30,B$;
260 NEXT A
270 PRINT @ RND(28)+1,Z$;
280 PRINT @ 481+RND(28),Z$;
290 PRINT @ 32+(RND(12)*32),Z$;
300 PRINT @ 62+(RND(12)*32),Z$;
310 X=31
320 Y=15
330 SET(X,Y,7)
340 FOR A=1 TO 3
350 E=X
360 F=Y
370 C$=INKEY$
380 IF C$<>D$ AND C$<>U$ AND C$<
>L$ AND C$<>R$ THEN 370
390 J$=J$+C$
400 IF C$=L$ THEN X=X-1
410 IF C$=R$ THEN X=X+1
420 IF C$=D$ THEN Y=Y+1
430 IF C$=U$ THEN Y=Y-1
440 RESET(E,F)
450 SET(X,Y,7)
460 IF POINT(X-1,Y)=8 OR POINT(X
+1,Y)=8 OR POINT(X,Y-1)=8 OR POI
NT(X,Y+1)=8 THEN 550
470 IF POINT(X-1,Y)=6 OR POINT(X
+1,Y)=6 OR POINT(X,Y-1)=6 OR POI
NT(X,Y+1)=6 THEN 590
480 NEXT A
490 IF J$=L$+L$+U$ OR J$=U$+U$+R
$ OR J$=R$+R$+D$ OR J$=D$+D$+L$
THEN J$="": GOTO 330
500 RESET(X,Y)
510 IF Y>15 THEN Y=Y-3 ELSE IF Y
<15 THEN Y=Y+3
520 IF X>31 THEN X=X-3 ELSE IF X
<31 THEN X=X+3
```

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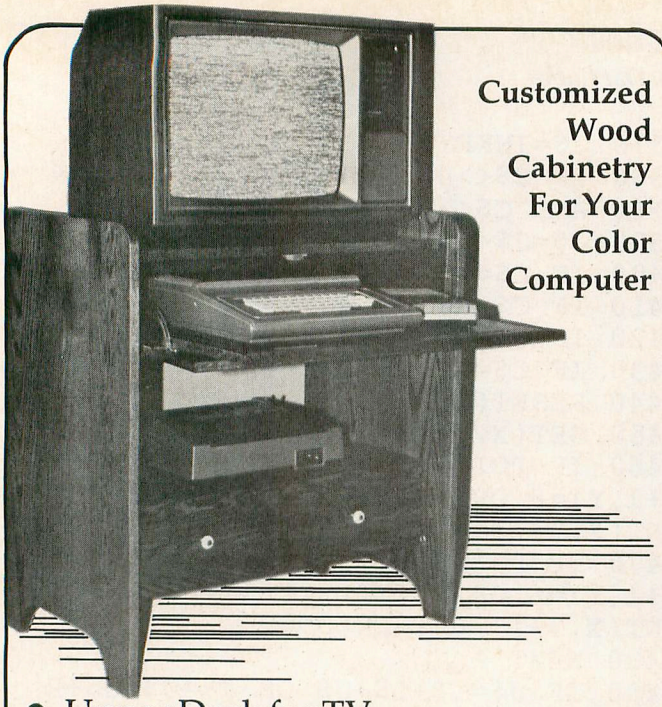

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```
530 J$=""
540 GOTO 330
550 SOUND RND(13)*10,3
560 N=N+1
570 IF N/2=INT(N/2) THEN PRINT @
 230,"D I S A S T E R   "; ELSE
PRINT @ 230,"   D I S A S T E R"
;
580 GOTO 550
590 PRINT @ 230,"F R E E D O M
 ";
600 GOSUB 640
610 PRINT @ 230,"   F R E E D O
M";
620 GOSUB 640
630 GOTO 590
640 SOUND 204,3
650 SOUND 193,2
660 SOUND 185,2
670 SOUND 176,2
680 SOUND 185,2
690 SOUND 193,2
700 N=N+1
710 IF N/2=INT(N/2) THEN SOUND 1
76,4: RETURN
720 SOUND 176,2
730 SOUND 147,2
740 RETURN
750 END
```

Program Listing 4. Logicolor

```
120 CLS(0)
130 P=48
140 K$="JUMP AWAY"
150 Q$="SOLITAIRE"
160 N$="N"
170 E$="E"
180 S$="S"
190 W$="W"
200 U$=CHR$(44)
210 D$=CHR$(46)
220 L$=CHR$(8)
230 R$=CHR$(9)
240 Y=0
250 FOR X=0 TO 48
260 SET(X,Y,5)
270 SET(X,Y+27,5)
280 NEXT X
290 X=0
300 FOR Y=0 TO 27
310 SET(X,Y,5)
320 SET(X+48,Y,5)
330 NEXT Y
340 FOR Y=3 TO 24 STEP 3
350 FOR X=3 TO 45 STEP 6
360 IF X>9 AND X<39 AND Y>6 AND
```

```
Y<21 THEN 380
370 SET(X,Y,8)
380 NEXT X
390 NEXT Y
400 K=1
410 FOR A=186 TO 474 STEP 32
420 PRINT @ A,MID$(K$,K,1);
430 PRINT @ A+4,MID$(Q$,K,1);
440 K=K+1
450 NEXT A
460 X=3
470 Y=3
480 A$=INKEY$
490 IF A$<>N$ AND A$<>S$ AND A$<
>E$ AND A$<>W$ AND A$<>L$ AND A$
<>R$ AND A$<>U$ AND A$<>D$ THEN
530
500 IF A$=S$ AND Y=24 OR A$=N$ A
ND Y=3 OR A$=E$ AND X=45 OR A$=W
$ AND X=3 THEN 530
510 IF A$=S$ THEN Y=Y+3 ELSE IF
A$=N$ THEN Y=Y-3 ELSE IF A$=W$ T
HEN X=X-6 ELSE IF A$=E$ THEN X=X
+6
520 RESET(A,B)
530 SET(X,Y+1,8)
540 A=X
550 B=Y+1
560 IF X<15 OR Y<9 THEN 570 ELSE
 IF A$=L$ AND POINT(X,Y)=8 AND P
OINT(X-6,Y-3)=8 AND POINT(X-12,Y
-6)=0 THEN RESET(A,B): RESET(X,Y
): RESET(X-6,Y-3): X=X-12: Y=Y-6
: P=P-1: SET(X,Y,8)
570 IF X>33 OR Y<9 THEN 580 ELSE
 IF A$=R$ AND POINT(X,Y)=8 AND P
OINT(X+6,Y-3)=8 AND POINT(X+12,Y
-6)=0 THEN RESET(A,B): RESET(X,Y
): RESET(X+6,Y-3): X=X+12: Y=Y-6
: P=P-1: SET(X,Y,8)
580 IF X<15 OR Y>18 THEN 590 ELS
E IF A$=U$ AND POINT(X,Y)=8 AND
POINT(X-6,Y+3)=8 AND POINT(X-12,
Y+6)=0 THEN RESET(A,B): RESET(X,
Y): RESET(X-6,Y+3): X=X-12: Y=Y+
6: P=P-1: SET(X,Y,8)
590 IF X>33 OR Y>18 THEN 600 ELS
E IF A$=D$ AND POINT(X,Y)=8 AND
POINT(X+6,Y+3)=8 AND POINT(X+12,
Y+6)=0 THEN RESET(A,B): RESET(X,
Y): RESET(X+6,Y+3): X=X+12: Y=Y+
6: P=P-1: SET(X,Y,8)
600 PRINT @ 26,"SCORE"
610 PRINT @ 58,P"  ";
620 GOTO 480
630 END
```


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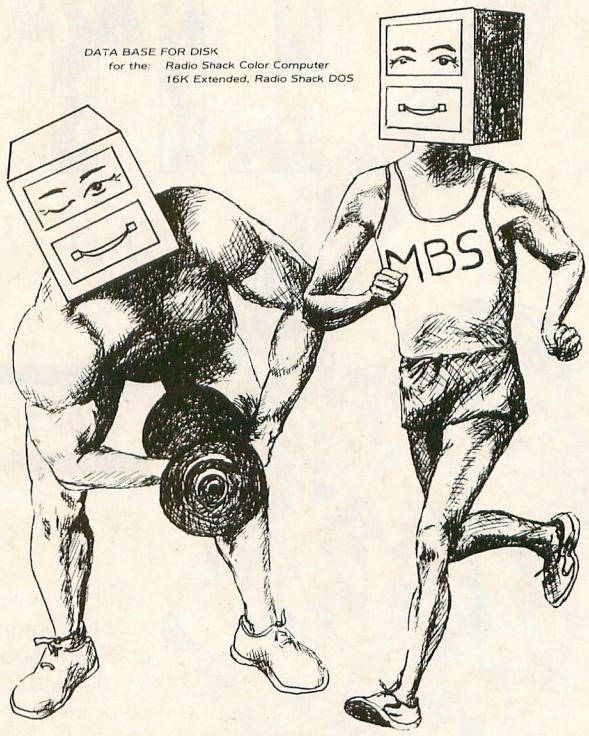

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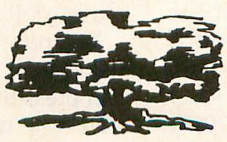

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SLITHER

Slip-sliding away.

by Stephen P. Allen

SLITHER, ORIGINALLY WRITTEN by Don McGarry, appeared in the November, 1982, *Color Computer News.*

I liked the game so much I decided to translate it into machine code. The game involves guiding a hyperactive "snake" around the screen, trying to run into targets, scoring as you go. To complicate and frustrate, you can't double back on yourself or run into the wall at the edge. To top things off, the snake grows longer, and longer, and longer...

I wrote my version using EDTASM+ on a 32K machine. All the benefits of speaking directly to the machine are here: smoothness, speed, and the ability to do things that are difficult or impossible in Basic.

My version of Slither has two special enchancements over the original. It has eight selectable speeds; the slowest is slightly faster than the Basic version, while the fastest is very, very fast. After the snake reaches a length of 200, it stops growing but speeds up, and the score-sound rises in pitch.

How to Play

The Basic version asks if you want instructions, the machine code version asks at what tempo you'd like to play, from 1 to 8. Answering either question starts the game.

After all targets are placed, there is a pause for a few seconds for you to put your fingers onto the arrow keys. Using them, guide the snake toward a target as it "grows" out of the lower right hand corner of the screen.

There are always a number of targets on screen, so don't panic if you miss. You can't cross yourself, so don't get trapped into "death spirals." Actually, pressing two arrow keys simultaneously gets you going diagonally; and, if you can aim it right, you *can* cross a diagonal with another diagonal. Watch out that you don't try to "go into reverse," as it isn't locked out (Right Arrow works when moving left, and results in a crash).

You have five crashes to use up before the score is final, but if you get tired you can press Break. The machine code version will return to the Enter Tempo prompt, where pressing Break again will return you to Basic.

The program is relocatable to any suitable page boundary in RAM (i.e., $1000, $1100, and so on). To have both versions co-resident in a machine, type PCLEAR 1 Enter. CLOAD the Basic game. Then: CLOADM "SLITHER". Now you can RUN the Basic or EXECute the machine language at will.

Alterations

If you would like to alter this program, start with the following on a 32K machine (source and object won't fit into 16K together): Insert the EDTASM+ program pack and turn on the machine. Do not load the program yet!

Get into ZBUG (type: Z Enter). Type: W Enter FD/7000 Down Arrow 2000 Enter GC006 Enter. This protects memory for assembling the game directly to RAM.

Type in or load the program (make sure you leave out the comments), and make the following changes:

Delete Line 130. Change Line 140 to: SETDP $70. Replace Line 5320RTS with SWI.

Assemble the program with these commands: A/IM/MO/WE.

Now you can manipulate the program to your heart's content, setting breakpoints, single-stepping, examining and changing instructions and memory. Be sure to save the source code on tape first!

The Program

I made generous use of the 6809's ability to manipulate 16-bit data. For instance, LDD PX loads A with PX and B with PY. The Direct Page is organized with this in mind, as is GETPOS.

The sound routine provides the timing of the game, in addition to sound. SOUND executes every time through the main loop, whether or not any sound is produced.

The sound routine works by putting two values out to the D/A converter, SNDBYT and 0. No sound is produced if SNDBYT contains a zero. A value of $FE in SNDBYT produces maximum volume.

This program uses two values, $70 for score and $8E for crash.

The main loop loads the B register with TEMPO and calls SOUND. The CLR SND BYT command occurs upon return, so there will be only one score-sound per score.

You can alter the speed of the snake in two ways. TEMPO contains the number of cycles of sound that will be produced. To speed up the snake, decrease the number of cycles. TTBL stores the eight possible values for TEMPO.

The other way to change the game's tempo is to alter SDELAY, which controls the pitch of the tone. This is done when the snake's length reaches 200. The less time SOUND spends on one cycle, the less time it spends on the entire routine.

GETPOS determines the screen position for a pair of coordinates. Upon entry, the A register has the X coordinate and the B register has the Y coordinate. Upon return, the X register has the screen location and the quadrant is in BITSET.

Once you understand the format for SemiGraphics 4, GETPOS is easy (see diagram). In hexadecimal, the colors are $80 through $FO. The four least significant bits determine which quadrant(s) will be set.

CLR BITSET, INC BITSET puts a 1 in BITSET without disturbing the A or B registers. BITA #1 tells you whether the X coordinate is odd or even. BIT is the same as AND, except that it doesn't change the contents of the register — it's a test that sets the zero and sign flags as if AND had been performed. BITA #1 on an odd number in the A register returns a non-zero result, because any odd number has a 1 in its least significant bit. If the X coordinate is odd, set quadrant 1 or 4. If the X coordinate is even, set 2 or 8.

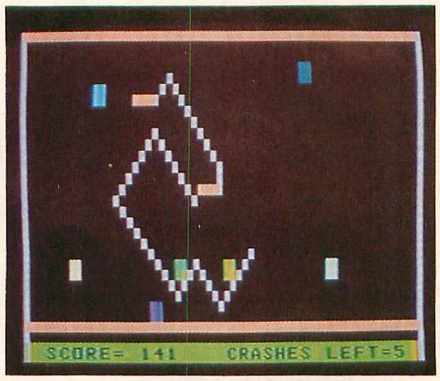
On even X coordinates ASL BITSET multiplies BITSET by 2. Same for the Y coordinate, except that ASL is done twice, which multiplies BITSET by 4.

1560 ADDA #4 is the same as ADDD #$400, but more compact. $400 is the start of display memory.

Arthur Metheney wrote the random number generator for the 6502 and presented it in the August, 1982 issue of *80 Micro*. He says that the sequence of numbers generated will not repeat itself until 232 passes. Lines 3540 – 60 get the value of TIMER to seed the random number generator and make it truly random.

HEXDEC has two parts: it converts a number in the D register (0 – 9999) into a string of decimal digits in RESULT, and displays them at the screen address pointed to by the U register.

Lines 3510 – 30 set up a relocatable Direct Page (DP) register. BITSET is the first byte of program memory. It is also the first byte of a block of variables that will be considered to be on the Direct Page. Assuming the program is assembled at $3000, if $30 is put in the DP register you can access these variables more quickly and efficiently by specifying only the last half of their address with Direct Page Addressing.



"Slither" In Progress

However, I wanted to be able to move these variables around with the program, so that no matter where the program is loaded in memory the variables would go with it. I needed a way to automatically adjust the DP register; these three instructions do it. If you CLOADM" SLITHER",&H4000, the DP register is accordingly set to $70 when the game is run, and the variables are snuggled up to the rest of the program, making a nice, compact unit.

Line 3570 turns off the regular interrupt. Basic uses the interrupt to time sound and increment TIMER. Unfortunately, that interruption every 1/60 second gives the warbly tone of a defective power supply to Basic sound. This program doesn't use the interrupt, and turning it off helps make the sound clean. Before Returning to Basic it turns the interrupt back on.

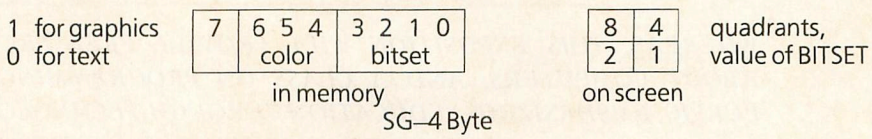
Lines 3580 – 90 put a negative number in TMPONO (tempo number). The only other possible values for TMPONO are 0 – 7, all positive. $FF is a flag to the computer, indicating that this is the first game and there is no last tempo.

4350 LDD #$20CD Fill the arrays with dummy addresses. Register A has $20, or 32 decimal. This goes into the X and Y arrays. When the snake grows, it does so by resetting position (32,32), which is just off the screen (try that in Basic!). The count in Register B, $CD, equals 205, the size of the arrays.

1860 CLRA makes a 16-bit number in the D register from an 8-bit unsigned number in the B register. Sign EXtend (SEX) would do the same thing for signed numbers (where the most significant of the 8 bits is assumed to be the sign).

Many thanks to Don McGarry for permission to reprint his game, and to everyone who helped. ■ ■ ■

Diagram. Semi Graphics 4



Program Listing. Slither — Basic

```
500 OX=DX:OY=DY:DX=0:DY=0:C=0
510 IFPEEK(UP)=KP THENDY=-1:C=1
520 IFPEEK(DN)=KP THEN DY=1:C=1
530 IFPEEK(LT)=KP THENDX=-1:C=1
540 IFPEEK(RT)=KP THEN DX=1:C=1
550 IF C=0 THEN DX=OX:DY=OY
560 PX=PX+DX:PY=PY+DY
570 WX(HP)=PX:WY(HP)=PY:HP=HP+1
580 IF HP>EL THEN HP=0
```

to page 50

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from page 47

```
590 PT=POINT(PX,PY):IF PT<1 THEN
 620
600 IF PT=WC THEN 2000
610 GOSUB 1000
620 SET(PX,PY,WC)
630 RESET(WX(TP),WY(TP))
640 TP=TP+1:IF TP>EL THEN TP=0
650 GOTO500
1000 SC=SC+PT    'SCORE
1010 SOUNDT1,1
1020 PB=SW*INT(PY/2) + INT(PX/2)
 + UL
1030 POKE PB,BL
1040 PRINT@LL,USING PR$;SC,CT-CS
;
1050 EL=EL+1-(PT>3)-(PT>5)
1060 IF EL>EM THEN EL=EM
1100 TL=RND(RH)*SW+RND(RW)+UL
1110 IF PEEK(TL)/DV<>INT(PEEK(TL
)/DV) THEN 1100
1120 IF TL=PB THEN 1100
1130 POKE TL,CL(PT)
1140 RETURN
2000 FOR I=1 TO 5        'CRASH
2010 SET(PX,PY,WC)
2020 SOUND T2,1
2030 RESET(PX,PY)
2040 SOUNDT3,1
2050 NEXT I
2060 CS=CS+1
2070 FOR I=0 TO EL
2080 WX(I)=0:WY(I)=0
2090 NEXT I
2100 IF CS=CT THEN5000 ELSE4080
3000 CLS0    'DRAW BORDER
3010 FOR I= 1 TO 62
3020 SET (I,1,WC):SET(I,28,WC)
3030 NEXTI
3040 FOR I=1 TO 31
3050 SET(1,I,WC):SET(62,I,WC)
3060 NEXTI
3070 RETURN
4000 DIM WX(205),WY(205):WC=8
4010 CT=5: UL=1024: LL=481: WC=8
: BL=128: RW=30: RH=13: SW=32
4020 T1=176: T2=89: T3=58: EM=20
0: DV=16
4030 UP=341: DN=342: LT=343: RT=
344: KP=247
4040 CL(1)=143: CL(2)=159: CL(3)
=175: CL(4)=191: CL(5)=207: CL(6
)=223: CL(7)=239
4050 PR$=" SCORE=####     CRASHES
 LEFT=# "
```

```
4060 GOSUB3000: GOSUB6000
4070 SC=0: CS=0
4080 EL=10: HP=9: TP=0
4090 PX=60: PY=27
4100 GOSUB3000
4110 PRINT@LL,USING PR$;SC,CT-CS
;
4120 DX=0:DY=-1
4130 FOR PT=1 TO 7
4140 GOSUB1100
4150 NEXT PT
4160 GOTO 500
5000 IF SC>HS THEN HS=SC
5010 CLS:PRINT@167,USING "YOUR S
CORE WAS ####";SC
5020 PRINT@231,USING "HIGH SCORE
 IS ####"; HS
5030 PRINT@295,"WANNA PLAY AGAIN
?"
5040 AN$=INKEY$:IF AN$="Y" THEN4
070
5050 IF AN$<> "N" THEN5040
5060 CLS:END
6000 TI$(0)="SLITHER":TI$(1)="sl
ither"
6010 I=1:J=0
6020 PRINT@481,"      NEED INSTR
UCTIONS?      ";
6030 PRINT@204,LEFT$(TI$(J),I);
6040 I=I+1:IF I=8 THEN I=1:J=ABS
(J-1)
6050 SOUND 60 + 5*I - 10*I*J,2
6060 AN$=INKEY$: IF AN$="N" THEN
 RETURN
6070 IF AN$<>"Y" THEN 6030
6080 CLS:PRINT@12,"SLITHER"
6090 PRINT"SCORE AS MANY POINTS
AS YOU     CAN BEFORE YOU CRASH
"CT"TIMES."
6100 PRINTTAB(10)CHR$(138)" "CHR
$(133)," 1 POINT"
6110 FOR I=2 TO 7
6120 PRINTTAB(10)CHR$(138) CHR$(
CL(I))CHR$(133),I"POINTS"
6130 NEXT
6140 PRINT" THE ARROW KEYS CONTR
OL YOUR     DIRECTION.  YOU CAN
ALSO MOVE   DIAGONALLY. THE 'SNA
KE' GETS    LONGER AFTER EACH TA
RGET HIT."
6150 PRINT@485,"PRESS <ENTER> TO
 BEGIN";
6160 IF INKEY$ = CHR$(13) THEN R
ETURN ELSE6160
```

Program next page

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Program Listing. Slither — Assembly Language

Note: The lines generated by FCC instructions in this listing have been artificially compressed to save space.
— Eds.

```
3000                    00130          ORG     $3000
        30              00140          SETDP   $30
                        00150
3000                    00160 BITSET   RMB     1
3001                    00170 OX       RMB     1
3002                    00180 OY       RMB     1
3003                    00190 DX       RMB     1
3004                    00200 DY       RMB     1
3005                    00210 PX       RMB     1
3006                    00220 PY       RMB     1
3007                    00230 EL       RMB     1
3008                    00240 PELLET   RMB     1
3009                    00250 HP       RMB     1
300A                    00260 TP       RMB     1
300B                    00270 SDELAY   RMB     2
300D                    00280 TEMPO    RMB     1
300E                    00290 TMPONO   RMB     1
300F                    00300 SNDBYT   RMB     1
3010                    00310 KEYFLG   RMB     1
3011                    00320 CS       RMB     1
3012                    00330 SCOTBL   RMB     2
3014                    00340 RESULT   RMB     4
3018                    00350 HSTBL    RMB     2
        00F0            00360 WC       EQU     $F0
                        00370
301A 16 0230            00380 START    LBRA    INIT
                        00390
301D 109E 0B            00400 SOUND    LDY     <SDELAY TIME FOR 1/2 CYCLE
3020 96   0F            00410          LDA     <SNDBYT VOLUME
3022 B7   FF20          00420          STA     $FF20   TO D/A
3025 31   3F            00430 SLOOP1   LEAY    -1,Y    WAIT FOR
3027 26   FC            00440          BNE     SLOOP1  1/2 CYCLE
3029 4F                 00450          CLRA            ZERO VOLTAGE
302A B7   FF20          00460          STA     $FF20   TO D/A
302D 109E 0B            00470          LDY     <SDELAY TIME FOR
3030 31   3F            00480 SLOOP2   LEAY    -1,Y    1/2 CYCLE
3032 26   FC            00490          BNE     SLOOP2
3034 5A                 00500          DECB            DONE ALL CYCLES?
3035 26   E6            00510          BNE     SOUND   NO
3037 39                 00520          RTS             YES
                        00530
                        00540    ***** MAIN LOOP *****
                        00550
3038 D6   0D            00560 MLOOP    LDB     <TEMPO  NUMBER OF SOUND CYCLES
303A 8D   E1            00570          BSR     SOUND
303C 0F   0F            00580          CLR     <SNDBYT TURN OFF SOUND
                        00590 **CHECK KEYBOARD**
303E DC   03            00600          LDD     <DX     SAVE WORM DIRECTION X,Y
3040 DD   01            00610          STD     <OX     IN CASE NO KEYPRESS
3042 4F                 00620          CLRA            PREP FOR
3043 5F                 00630          CLRB            NEW TRAVEL
3044 DD   03            00640          STD     <DX
3046 97   10            00650          STA     <KEYFLG FLAG=0
3048 BD   A1C1          00660          JSR     $A1C1   SET ROLLOVER TABLE
304B 81   03            00670          CMPA    #3      BREAK?
304D 1027 035D          00680          LBEQ    DONE    YES
3051 8E   0155          00690          LDX     #341    IN ROLLOVER TABLE
3054 86   F7            00700          LDA     #247    ROLLOVER VALUE FOR ARROWS
3056 A1   80            00710          CMPA    ,X+     UP ARROW?
3058 26   06            00720          BNE     LBL1    NO
305A C6   FF            00730          LDB     #$FF    DY=-1
305C D7   04            00740          STB     <DY
305E 0C   10            00750          INC     <KEYFLG SHOW KEYPRESS
3060 A1   80            00760 LBL1     CMPA    ,X+     DOWN ARROW?
3062 26   06            00770          BNE     LBL2    NO
3064 C6   01            00780          LDB     #1
3066 D7   04            00790          STB     <DY
3068 0C   10            00800          INC     <KEYFLG
306A A1   80            00810 LBL2     CMPA    ,X+     LEFT ARROW?
306C 26   06            00820          BNE     LBL3    NO
306E C6   FF            00830          LDB     #$FF    -1
3070 D7   03            00840          STB     <DX
3072 0C   10            00850          INC     <KEYFLG
3074 A1   84            00860 LBL3     CMPA    ,X      RIGHT ARROW?
3076 26   06            00870          BNE     LBL4    NO
3078 C6   01            00880          LDB     #1
307A D7   03            00890          STB     <DX
307C 0C   10            00900          INC     <KEYFLG
307E 0D   10            00910 LBL4     TST     <KEYFLG ANY KEY PRESSED?
3080 26   04            00920          BNE     LBLZ    YES
3082 DC   01            00930          LDD     <OX     NO, RESTORE
3084 DD   03            00940          STD     <DX     OLD DIRECTION
3086 DC   05            00950 LBLZ     LDD     <PX     WORM POS X,Y
3088 9B   03            00960          ADDA    <DX     PLUS XTRAVEL
308A DB   04            00970          ADDB    <DY     PLUS YTRAVEL
308C DD   05            00980          STD     <PX     = NEW POS X,Y
308E 30   8D 037F       00990          LEAX    XARRAY,PCR
3092 D6   09            01000          LDB     <HP
3094 3A                 01010          ABX             WX(HP)
3095 A7   84            01020          STA     ,X      =PX
3097 96   06            01030          LDA     <PY
3099 30   8D 0441       01040          LEAX    YARRAY,PCR
309D 3A                 01050          ABX             WY(HP)
309E A7   84            01060          STA     ,X      =PY
30A0 5C                 01070          INCB            HP=HP+1
30A1 D1   07            01080          CMPB    <EL     IF HP>=EL
30A3 25   01            01090          BLO     LBL5
30A5 5F                 01100          CLRB            THEN HP=0
30A6 D7   09            01110 LBL5     STB     <HP
                        01120
                        01130 *TEST FOR CRASH OR SCORE*
                        01140
30A8 DC   05            01150          LDD     <PX     WORM X,Y
30AA 17   0045          01160          LBSR    GETPOS
30AD A6   84            01170          LDA     ,X      FROM SCREEN
30AF 81   80            01180          CMPA    #$80    BACKGROUND COLOR?
30B1 27   14            01190          BEQ     LBL6    YES
30B3 84   F0            01200          ANDA    #$F0    DROP ALL BUT COLOR
```

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GOLDLABEL™

BLANK CASSETTES

PREMIUM 5 SCREW SHELL
COMPUTER QUALITY

SATISFACTION GUARANTEED

MADE IN U.S.A.

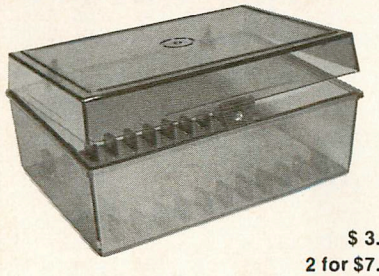
SCHOOL/CLUB DISCOUNTS

IF YOU ARE SERIOUS ABOUT SAVING PROGRAMS AND DATA ON TAPE, THEN "GO FOR THE GOLD"

1 dozen	C 10	$ 8.50 + $ 2.50 shipping
2 dozen	C-10	$ 16.00 + $ 3.50 shipping
1 dozen	C-30	$ 12.50 + $ 2.50 shipping
2 dozen	C-30	$ 23.50 + $ 3.50 shipping

INDIVIDUAL CASSETTE STORAGE BOXES (SOLD ONLY WITH CASSETTES) $2.40 PER DOZEN

CASSETTE CADDY



HOLDS 12 CASSETTES

HINGED TOP

STACKABLE

EDGE LABELS INCLUDED

$ 3.95 + $ 2.00 shipping
2 for $7.00 + $ 2.50 shipping

FREE SHIPPING WHEN PURCHASED WITH CASSETTES

BRANTEX, INC.
COLOR SOFTWARE SERVICES DIV.
P. O. Box 1708
Greenville, Texas 75401

BRANTEX

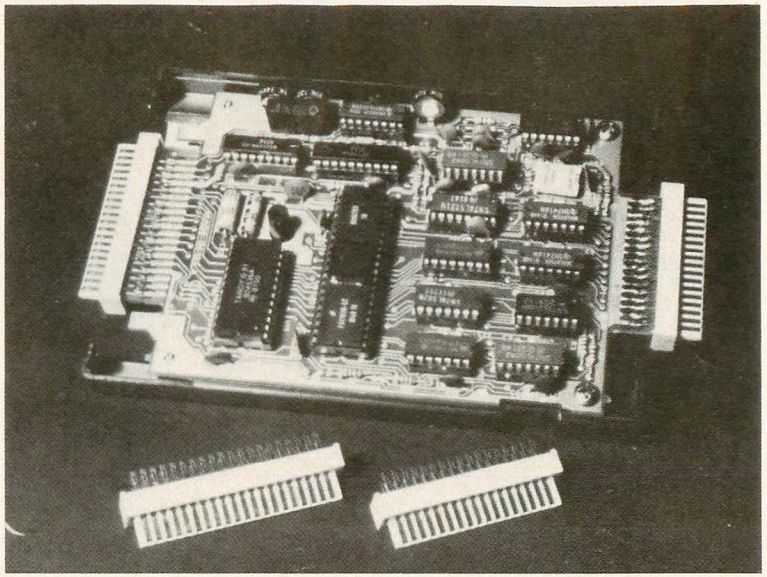
TELEPHONE ORDERS
(214) 454-3674
COD/VISA/MASTERCARD

Texas residents add 5% tax
Foreign orders add $2 per order
QUANTITY DISCOUNTS AVAILABLE

ATTENTION DEALERS: WE OFFER THE BEST DEALER PLANS AVAILABLE

ATTENTION DISK USERS

ARE YOU TIRED OF I/O ERRORS AND LOST DIRECTORY FAILURES



GOLD EDGE CONNECTORS

When these edge connectors are attached to the Color Computer/System 100 Disk controllers, the dreaded I/O error and lost directory failures may be virtually eliminated. These problems can be caused by oxidation of the tinned connectors on the disk controller; which can cause a poor electrical contact between the disk controller and the computer. The installation of these connectors DOES REQUIRE SOLDERING. THESE GOLD CONNECTORS ARE SOLDERED DIRECTLY TO THE EDGE CONNECTORS OF THE DISK CONTROLLER. INSTALLATION OF THESE CONNECTORS MAY VOID THE WARRANTY ON THE DISK CONTROLLER.

KIT INCLUDES TWO CONNECTORS AND COMPLETE INSTRUCTIONS FOR EASY INSTALLATION.

PRICE: $ 17.95 + $ 1.00 shipping (Installation not included)

★ ASK YOUR DEALER ABOUT THEIR INSTALLATION SERVICES ★

CUSTOM INSTALLATION (includes connectors)
$ 35.95 + $ 4.00 return shipping

INSTALLATION AND UPS 2nd DAY SERVICE WITHIN 5 DAYS OF RECEIPT OF DISK CONTROLLER

Circle No. 28 on Reader Service Card

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```
30B5 81   F0       01210          CMPA    #WC      IS,OR WAS, WORM HERE?
30B7 27   04       01220          BEQ     LBLB     YES
30B9 8D   58       01230          BSR     SCORE    NO, MUST BE PELLET
30BB 20   10       01240          BRA     TRNOFF
30BD A6   84       01250 LBLB     LDA     ,X       FROM SCREEN
30BF 95   00       01260          BITA    <BITSET  IS WORM THERE NOW?
30C1 1026 0272     01270          LBNE    CRASH    YES
30C5 20   02       01280          BRA     LBLD     NO
30C7 86   F0       01290 LBL6     LDA     #WC
30C9 9A   00       01300 LBLD     ORA     <BITSET  ADD WORM TO SCREEN BYTE
30CB A7   84       01310          STA     ,X       PUT ON SCREEN
                   01320
                   01330 *****TURN OFF TAIL*****
                   01340
30CD 30   8D 0340  01350 TRNOFF   LEAX    XARRAY,PCR
30D1 D6   0A       01360          LDB     <TP
30D3 3A            01370          ABX
30D4 A6   84       01380          LDA     ,X       WX(TP)
30D6 30   8D 0404  01390          LEAX    YARRAY,PCR
30DA 3A            01400          ABX
30DB 5C            01410          INCB             TP=TP+1
30DC D1   07       01420          CMPB    <EL      IF TP>=EL
30DE 25   01       01430          BLO     LBL12
30E0 5F            01440          CLRB             THEN TP=0
30E1 D7   0A       01450 LBL12    STB     <TP
30E3 E6   84       01460          LDB     ,X       WY(TP)
30E5 17   000A     01470          LBSR    GETPOS
30E8 96   00       01480          LDA     <BITSET
30EA 43            01490          COMA             SAVE ALL BUT
30EB A4   84       01500          ANDA    ,X       SEGMENT TO TURN OFF
30ED A7   84       01510          STA     ,X       PUT IT ON SCREEN
30EF 16   FF46     01520          LBRA    MLOOP    DO ANOTHER CYCLE
                   01530
                   01540 *COMPUTE SCREEN POSITION*
                   01550
30F2 0F   00       01560 GETPOS   CLR     <BITSET
30F4 0C   00       01570          INC     <BITSET
30F6 85   01       01580          BITA    #1       TRIAL AND
30F8 26   02       01590          BNE     NEXT1    XPOS IS ODD
30FA 08   00       01600          ASL     <BITSET  EVEN, MUL BY 2
30FC C5   01       01610 NEXT1    BITB    #1       YPOS ODD?
30FE 26   04       01620          BNE     POSTOX   YES
3100 08   00       01630          ASL     <BITSET  EVEN, MUL BY 2
3102 08   00       01640          ASL     <BITSET  BY 2 AGAIN
3104 34   02       01650 POSTOX   PSHS    A        SAVE XPOS
3106 57            01660          ASRB             YPOS/2
3107 86   20       01670          LDA     #32      # BYTES PER ROW
3109 3D            01680          MUL
310A 8B   04       01690          ADDA    #4       D REGISTER +$400
310C 1F   01       01700          TFR     D,X
310E 35   04       01710          PULS    B        XPOS TO B
3110 57            01720          ASRB             XPOS/2
3111 3A            01730          ABX              ADD TO TOTAL
3112 39            01740          RTS
                   01750
                   01760  ******SCORE******
                   01770
```

```
3113 E6   84       01780 SCORE    LDB     ,X       BYTE FROM SCREEN
3115 D7   08       01790          STB     <PELLET  SAVE FOR REPLACEMENT
3117 C4   70       01800          ANDB    #$70     GET COLOR INFO
3119 54            01810          LSRB             MOVE HIGH-ORDER
311A 54            01820          LSRB             NYBBLE TO
311B 54            01830          LSRB             LOW-ORDER NYBBLE
311C 54            01840          LSRB
311D 5C            01850          INCB             MAKE 0-7,1-8
311E 4F            01860          CLRA             SEX COULD BE HAD HERE
311F D3   12       01870          ADDD    <SCOTBL  ADD TO SCORE
3121 DD   12       01880          STD     <SCOTBL
3123 CE   05E9     01890          LDU     #$5E9    SCREEN POS FOR SCORE
3126 8D   6A       01900          BSR     HEXDEC   PUT IT UP
3128 86   70       01910          LDA     #$70     MEDIUM VOLUME
312A 97   0F       01920          STA     <SNDBYT  FOR SCORE SOUND
                   01930
                   01940 *MAKE LONGER WORM*
                   01950
312C A6   84       01960          LDA     ,X       FROM SCREEN
312E 0C   07       01970          INC     <EL      WORM LONGER BY 1
3130 81   AF       01980          CMPA    #175
3132 23   08       01990          BLS     LBL8
3134 0C   07       02000          INC     <EL      IF 4 OR MORE POINTS
3136 81   CF       02010          CMPA    #207
3138 23   02       02020          BLS     LBL8
313A 0C   07       02030          INC     <EL      IF 6 OR 7 POINTS
313C 86   C8       02040 LBL8     LDA     #200     MAX WORM LENGTH
313E 91   07       02050          CMPA    <EL
3140 22   04       02060          BHI     LBL9     NOT THERE YET
3142 97   07       02070          STA     <EL      HOLD AT 200
3144 0A   0C       02080          DEC     <SDELAY+1       MAKE HIGHER SOUND
3146 86   F0       02090 LBL9     LDA     #WC      NEW COLOR HERE
3148 9A   00       02100          ORA     <BITSET
314A A7   84       02110          STA     ,X       WORM TO SCREEN
                   02120
                   02130 *REPUT EATEN COLOR*
                   02140
314C 8D   22       02150 MORE     BSR     RANDOM   FOR YPOS
314E 84   1F       02160          ANDA    #$1F     MAX 31
3150 4C            02170          INCA             MOVE PAST TOP BORDER
3151 81   1D       02180          CMPA    #29      INTO LOWER BORDER?
3153 24   F7       02190          BHS     MORE     YES, TRY AGAIN
3155 34   02       02200          PSHS    A        SAVE YPOS
3157 8D   17       02210 LBL10    BSR     RANDOM   FOR XPOS
3159 84   3F       02220          ANDA    #$3F     MAX 63
315B 4C            02230          INCA             MOVE PAST LEFT BORDER
315C 81   3E       02240          CMPA    #62      INTO RIGHT BORDER?
315E 22   F7       02250          BHI     LBL10    YES, TRY AGAIN
3160 35   04       02260          PULS    B        RESTORE YPOS
3162 17   FF9F     02270          LBSR    POSTOX   SEE WHERE IT'S GOING
3165 A6   84       02280          LDA     ,X       FROM SCREEN
3167 85   0F       02290          BITA    #$0F     ANYTHING THERE?
3169 26   E1       02300          BNE     MORE     YES, TRY AGAIN
316B 96   08       02310          LDA     <PELLET  EATEN COLOR
316D A7   84       02320          STA     ,X       TO NEW LOCATION
316F 39            02330          RTS
                   02340
```

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VIP™ Library

ANNOUNCING The VIP Library™ With a Terrific Sale!

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

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

The Library Concept

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

State Of The Art

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

Perfection With 16, 32 or 64K

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

Lowercase Displays

State-of-the-Art graphics allow instant use of four display colors, and eight lowercase displays featuring descending lowercase letters. You can select from 51, 64 or 85 columns by 21 or 24 lines per screen, with wide or narrow characters in the 64 display. These screens provide a pleasant and relaxing way to perform your tasks, with as much text on the screen as is possible. Each program is easy to learn and a joy to use. We take pride in the stringent testing done to make these programs perform flawlessly. Every feature, every convenience, sleek, simple and elegant.

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

Total Compatibility

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

The Library Programs

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

Mini Disk Operating System

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

Professionalism

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

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

©1983 by Softlaw Corporation

VIP Writer™

(Formerly Super "Color" Writer II)

By Tim Nelson

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

The Official Dragon Microcomputer Word Processor†

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

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

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

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

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

Professional features of particular note:

- Memory-Sense with **BANK SWITCHING** to fully utilize 64K, giving not just 24 or 30K, but up to 61K of workspace with the rompak version and 50K with the disk version.
- TRUE FORMAT WINDOW to EXACTLY replicate the printed page ON THE SCREEN BEFORE PRINTING, showing centered line headers, FOOTNOTES, page breaks, page numbers, & margins in line lengths of up to 240 characters. It makes HYPHENATION a snap.
- A TRUE EDITING WINDOW in all 9 display modes for those extra wide reports and graphs (up to 240 columns!).
- FREEDOM to imbed any number of PRINTER CONTROL CODES anywhere, **EVEN WITHIN JUSTIFIED TEXT**.
- Full 4-way cursor control, sophisticated edit commands, the ability to edit any BASIC program or ASCII textfile, SEVEN DELETE FUNCTIONS, LINE INSERT, LOCATE AND CHANGE, wild card locate, up to TEN SIMULTANEOUS block manipulations, word wrap around, programmable tabs, display memory used and left, non-breakable space, and headers, footers and FOOTNOTES.
- The ability to control ANY PRINTER, using dynamic text formatting with 27 comprehensive format parameters.
- Automatic justification, automatic pagination, automatic centering, automatic flush right, underlining, superscripts, subscripts, pause print, single-sheet pause, and print comments.
- Type-ahead, typamatic key repeat and key beep for the pros, ERROR DETECTION and UNDO MISTAKE features, 3 PROGRAM-MABLE functions, auto phrase insert, column creation, an instant HELP TABLE, and a 110 page, fully indexed tutorial.

16K ROMPAK $59.95 **32K DISK $59.95**

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

VIP Speller™

(Formerly Super "Color" Speller)

THE WRITER'S ESSENTIAL COMPANION

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

DISK ONLY $49.95

Lowercase displays not available with this program.

VIP™ Library

VIP Calc™

(Formerly Super "Color" Calc)

TRUE VISICALC™ POWER!

By Kevin Herrboldt

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

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

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

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

16K ROMPAK $59.95 **32K DISK $59.95**

NEW SALE PRICES!

- Nine Display Formats: 32 by 16 51, 64, 85 by 21 or 24
- True Lowercase & Descenders
- Four Different Display Colors
- 16, 32 & 64K Compatible
- Memory Sense - Bank Switching
- Up to 51K Disk, 61K Rompak
- Mini Disk Operating System
- Compatible With All Printers

A SPECIAL OFFER ON THE WHOLE LIBRARY —

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

VIP Terminal™

(Formerly Super "Color" Terminal)

THE FINEST TERMINAL PROGRAM ANYWHERE!

By Dan Nelson

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

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

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

16K ROMPAK $49.95 **16K DISK $49.95**

Disk version requires 32K for lowercase displays.

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INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

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

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32K DISK $59.95

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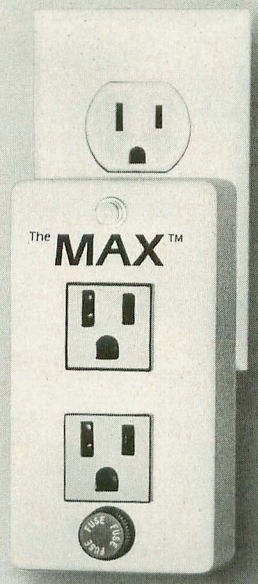

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from page 54

```
                    02350 **RANDOM NUMBER GENERATOR**
                    02360
3170 34  14        02370 RANDOM  PSHS   B,X
3172 30  8D 0018   02380         LEAX   RNDNOS,PCR
3176 C6  03        02390         LDB    #3
3178 4F            02400         CLRA
3179 A6  85        02410         LDA    B,X
317B 5A            02420         DECB
317C A9  85        02430 RLOOP1  ADCA   B,X
317E A7  85        02440         STA    B,X
3180 5A            02450         DECB
3181 2A  F9        02460         BPL    RLOOP1
3183 C6  03        02470         LDB    #3
3185 6C  85        02480 RLOOP2  INC    B,X
3187 26  03        02490         BNE    RNDEND
3189 5A            02500         DECB
318A 2A  F9        02510         BPL    RLOOP2
318C 35  94        02520 RNDEND  PULS   B,X,PC
318E               02530 RNDNOS  RMB    4
                   02540
                   02550 ***PUT NUMBERS ON SCREEN***
                   02560
3192 34  10        02570 HEXDEC  PSHS   X          SAVE IT
3194 30  8D FE7F   02580         LEAX   3+RESULT,PCR
3198 6F  84        02590         CLR    ,X          CLEAR OUT ARRAY
319A 6F  82        02600         CLR    ,-X
319C 6F  82        02610         CLR    ,-X
319E 6F  82        02620         CLR    ,-X
31A0 6C  84        02630 LBLMS   INC    ,X          ADD 1 TO THOUSANDS
31A2 83  03E8      02640         SUBD   #1000
31A5 2A  F9        02650         BPL    LBLMS
31E6 8D  53        02960         BSR    SETD
31E8 CC  FCFC      02970         LDD    #$FCFC      TOP BORDER
31EB 8E  0400      02980         LDX    #$400       WHERE IT GOES
31EE 108E 0020     02990         LDY    #32         HOW LONG IT IS
31F2 8D  47        03000         BSR    SETD
31F4 CC  F3F3      03010         LDD    #$F3F3      LOWER BORDER
31F7 108E 0020     03020         LDY    #32         HOW LONG IT IS
31FB 8E  05C0      03030         LDX    #$5C0       WHERE IT GOES
31FE 8D  3B        03040         BSR    SETD
                   03050 *VERTICAL BARS*
3200 86  FA        03060         LDA    #$FA        LEFT BORDER
3202 C6  0E        03070         LDB    #14         HOW LONG IT IS
3204 8E  0420      03080         LDX    #$420       WHERE TO START
3207 8D  39        03090         BSR    SETA
3209 86  F5        03100         LDA    #$F5        RIGHT BORDER
320B 8E  043F      03110         LDX    #$43F       WHERE IT GOES
320E C6  0E        03120         LDB    #14         HOW LONG IT IS
3210 8D  30        03130         BSR    SETA
3212 86  FE        03140         LDA    #$FE        UPPER LEFT CORNER
3214 B7  0400      03150         STA    $400
3217 86  FD        03160         LDA    #$FD        UPPER RIGHT CORNER
3219 B7  041F      03170         STA    $41F
                   03180 *MESSAGES*
321C CE  05E1      03190         LDU    #$5E1       ADDRESS ON SCREEN
321F 30  8D 0167   03200         LEAX   SCMES,PCR
3223 8D  0A        03210         BSR    PUTMES      SCORE=
3225 CE  05EF      03220         LDU    #$5EF       SCREEN ADDRESS
3228 30  8D 0166   03230         LEAX   CLMES,PCR
322C 8D  01        03240         BSR    PUTMES      CRASHES LEFT
322E 39            03250         RTS
                   03260
```

```
                                                  03270 ***PUT A MESSAGE***
                                                  03280
                                        322F E6  80 03290 PUTMES  LDB   ,X+    LENGTH OF MESSAGE
                                        3231 A6  80 03300 MESLP   LDA   ,X+    GET A LETTER
                                        3233 80  40 03310         SUBA  #$40    MAKE LOWER-CASE
                                        3235 A7  C0 03320         STA   ,U+     PUT ON SCREEN
                                        3237 5A     03330         DECB          LAST LETTER?
                                        3238 26  F7 03340         BNE   MESLP   NOT YET
                                        323A 39     03350         RTS
                                                    03360
                                        323B ED  81 03370 SETD    STD   ,X++
                                        323D 31  3E 03380         LEAY  -2,Y
                                        323F 26  FA 03390         BNE   SETD
                                        3241 39     03400         RTS
                                        3242 AA  84 03410 SETA    ORA   ,X
                                        3244 A7  84 03420         STA   ,X
                                        3246 30  88 20 03430      LEAX  32,X
                                        3249 5A     03440         DECB
                                        324A 26  F6 03450         BNE   SETA
                                        324C 39     03460         RTS
                                                    03470
                                                    03480 ***INITIALIZE***
                                                    03490
                                        324D 30  8D FDAF 03510 INIT   LEAX  BITSET,PCR
                                        3251 1F  10 03520         TFR   X,D     SET UP RELOCATABLE
                                        3253 1F  8B 03530         TFR   A,DP    DIRECT PAGE
                                                    03535
                                        3255 FC  0112 03540       LDD   $112    FROM TIMER
                                        3258 ED  8D FF32 03550    STD   RNDNOS,PCR
                                        325C ED  8D FF30 03560    STD   2+RNDNOS,PCR
31A7 C3 03E8 02660         ADDD  #1000  TOO FAR, ADJUST
31AA 6A 80   02670         DEC   ,X+    ADJUST AND MOVE UP
31AC 6C 84   02680 LBLCS   INC   ,X     ADD 1 TO HUNDREDS
31AE 83 0064 02690         SUBD  #100
31B1 2A F9   02700         BPL   LBLCS
31B3 C3 0064 02710         ADDD  #100   TOO FAR, ADJUST
31B6 6A 80   02720         DEC   ,X+    ADJUST COUNTER
31B8 6C 84   02730 LBLXS   INC   ,X     ADD 1 TO TENS
31BA 83 000A 02740         SUBD  #10
31BD 2A F9   02750         BPL   LBLXS
31BF C3 000A 02760         ADDD  #10    TOO FAR
31C2 6A 80   02770         DEC   ,X+    ADJUST COUNTER
31C4 6C 84   02780 LBLIS   INC   ,X     ADD 1 TO ONES
31C6 83 0001 02790         SUBD  #1
31C9 2A F9   02800         BPL   LBLIS
31CB 6A 84   02810         DEC   ,X     ADJUST
31CD C6 03   02820         LDB   #3     INDEX
31CF 30 1D   02830         LEAX  -3,X   BACK TO START OF ARRAY
31D1 A6 85   02840 SCOLUP  LDA   B,X    MAKE LOWER-CASE ASCII
31D3 8B 30   02850         ADDA  #$30   TO SCREEN
31D5 A7 C5   02860         STA   B,U    ALL 4 DIGITS?
31D7 5A      02870         DECB
31D8 2A F7   02880         BPL   SCOLUP NO
31DA 35 90   02890         PULS  X,PC   RESTORE AND RETURN
             02900
             02910 ****BORDER****
             02920
31DC CC 8080 02930 BORDER  LDD   #$8080 BLACK TO A AND B
31DF 8E 0400 02940         LDX   #$400  SCREEN START
31E2 108E 0200 02950       LDY   #$200  AMT OF SCREEN MEMORY
```

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```
3260 1A    10      03570                ORCC   #$10     MASK INTERRUPT
3262 86    FF      03580                LDA    #$FF     FLAG FOR FIRST GAME
3264 97    0E      03590                STA    <TMPONO
3266 CC    0000    03600                LDD    #0       NO HIGH SCORE YET
3269 DD    18      03610                STD    <HSTBL
326B 17    FF6E    03620                LBSR   BORDER
326E 30    8D 0171 03630                LEAX   TITLE,PCR
3272 CE    048C    03640                LDU    #$48C    SCREEN ADDRESS
3275 17    FFB7    03650                LBSR   PUTMES
                   03660
3278 CC    0000    03670 NEWGAM         LDD    #0       NO SCORE
327B DD    12      03680                STD    <SCOTBL
327D 97    11      03690                STA    <CS      NO CRASHES
327F 30    8D 0168 03700                LEAX   TMPMES,PCR
3283 CE    04C7    03710                LDU    #$4C7    ADDRESS FOR 'ENTER TEMPO'
3286 17    FFA6    03720                LBSR   PUTMES
3289 17    FFA3    03730                LBSR   PUTMES   '1-8'
328C 96    0E      03740                LDA    <TMPONO  LAST TEMPO
328E 2B    10      03750                BMI    FIRST    IF NO LAST TEMPO
3290 30    8D 0168 03760                LEAX   LSTTMP,PCR
3294 CE    05A8    03770                LDU    #$5A8    SCREEN ADDRESS
3297 17    FF95    03780                LBSR   PUTMES
329A 96    0E      03790                LDA    <TMPONO
329C 8B    31      03800                ADDA   #$31     MAKE LOWER-CASE ASCII
329E A7    C4      03810                STA    ,U       TO SCREEN
32A0 30    8D 0165 03820 FIRST          LEAX   TTBL,PCR
32A4 BD    A1C1    03830 INTEMP         JSR    $A1C1
32A7 27    FB      03840                BEQ    INTEMP   NO KEYPRESS
32A9 81    03      03850                CMPA   #3       BREAK?
32AB 1027  012E    03860                LBEQ   EXIT     YES
32AF 80    31      03870                SUBA   #$31     TRY TO MAKE 0-7
32F3 B7    05FF    04180                STA    $5FF     PUT CRASHES LEFT
32F6 CC    0070    04190                LDD    #$70     SET (OR RESTORE)
32F9 DD    0B      04200                STD    <SDELAY  PITCH FOR SOUND
32FB 0F    0F      04210                CLR    <SNDBYT  NO SOUND YET
32FD 86    8F      04220                LDA    #$8F     FIRST PELLET COLOR
32FF 97    08      04230                STA    <PELLET
3301 C6    07      04240                LDB    #7       7 COLORS TO DO
3303 34    04      04250                PSHS   B
3305 17    FE44    04260 BUGS           LBSR   MORE     PUT A PELLET
3308 96    08      04270                LDA    <PELLET
330A 8B    10      04280                ADDA   #$10     NEXT COLOR
330C 97    08      04290                STA    <PELLET
330E 6A    E4      04300                DEC    ,S       DONE ALL PELLETS?
3310 26    F3      04310                BNE    BUGS     NO
3312 32    61      04320                LEAS   1,S      CLEAN UP STACK
3314 30    8D 00F9 04330                LEAX   XARRAY,PCR
3318 33    8D 01C2 04340                LEAU   YARRAY,PCR
331C CC    20CD    04350                LDD    #$20CD   SEE TEXT
331F A7    80      04360 LOOP5          STA    ,X+
3321 A7    C0      04370                STA    ,U+
3323 5A            04380                DECB
3324 26    F9      04390                BNE    LOOP5
3326 CC    00FF    04400                LDD    #$0FF    DX=0:DY=-1
3329 DD    03      04410                STD    <DX
332B 86    03      04420                LDA    #3
332D 31    3F      04430 WAIT           LEAY   -1,Y     LET THE PLAYER
332F 26    FC      04440                BNE    WAIT     GET READY
3331 4A            04450                DECA
3332 26    F9      04460                BNE    WAIT
3334 16    FD01    04470                LBRA   MLOOP    GO TO IT
                   04480
```

```
32B1 25 F1 03880          BCS   INTEMP  TOO LOW, TRY AGAIN
32B3 81 08 03890          CMPA  #8
32B5 24 ED 03900          BHS   INTEMP  TOO HIGH, TRY AGAIN
32B7 E6 86 03910          LDB   A,X     GET DURATION
32B9 D7 0D 03920          STB   <TEMPO  AND STORE IT
32BB 97 0E 03930          STA   <TMPONO STORE OFFSET
32BD B6 FF01 03940        LDA   $FF01   SELECT
32C0 84 F7 03950          ANDA  #$F7    6-BIT SOUND
32C2 B7 FF01 03960        STA   $FF01   IN THE PIA'S
32C5 B6 FF03 03970        LDA   $FF03
32C8 84 F7 03980          ANDA  #$F7
32CA B7 FF03 03990        STA   $FF03
32CD 86 08 04000          LDA   #8      ENABLE AUDIO
32CF BA FF23 04010        ORA   $FF23   TO SPEAKER
32D2 B7 FF23 04020        STA   $FF23
             04030
32D5 86 0A 04040 PHASE    LDA   #10
32D7 97 07 04050          STA   <EL     EL=10
32D9 4A 04060             DECA
32DA 97 09 04070          STA   <HP     HP=9
32DC 5F 04080             CLRB
32DD D7 0A 04090          STB   <TP     TP=0
32DF CC 3D1D 04100        LDD   #$3D1D  PX=61
32E2 DD 05 04110          STD   <PX     PY=29
32E4 17 FEF5 04120        LBSR  BORDER
32E7 DC 12 04130          LDD   <SCOTBL
32E9 CE 05E9 04140        LDU   #$5E9   SCREEN ADDRESS
32EC 17 FEA3 04150        LBSR  HEXDEC  PUT SCORE
32EF 86 35 04160          LDA   #$35
32F1 90 11 04170          SUBA  <CS
32B1 25 F1 03880          BCS   INTEMP  TOO LOW, TRY AGAIN
32B3 81 08 03890          CMPA  #8
32B5 24 ED 03900          BHS   INTEMP  TOO HIGH, TRY AGAIN
32B7 E6 86 03910          LDB   A,X     GET DURATION
32B9 D7 0D 03920          STB   <TEMPO  AND STORE IT
32BB 97 0E 03930          STA   <TMPONO STORE OFFSET
32BD B6 FF01 03940        LDA   $FF01   SELECT
32C0 84 F7 03950          ANDA  #$F7    6-BIT SOUND
32C2 B7 FF01 03960        STA   $FF01   IN THE PIA'S
32C5 B6 FF03 03970        LDA   $FF03
32C8 84 F7 03980          ANDA  #$F7
32CA B7 FF03 03990        STA   $FF03
32CD 86 08 04000          LDA   #8      ENABLE AUDIO
32CF BA FF23 04010        ORA   $FF23   TO SPEAKER
32D2 B7 FF23 04020        STA   $FF23
             04030
32D5 86 0A 04040 PHASE    LDA   #10
32D7 97 07 04050          STA   <EL     EL=10
32D9 4A 04060             DECA
32DA 97 09 04070          STA   <HP     HP=9
32DC 5F 04080             CLRB
32DD D7 0A 04090          STB   <TP     TP=0
32DF CC 3D1D 04100        LDD   #$3D1D  PX=61
32E2 DD 05 04110          STD   <PX     PY=29
32E4 17 FEF5 04120        LBSR  BORDER
32E7 DC 12 04130          LDD   <SCOTBL
32E9 CE 05E9 04140        LDU   #$5E9   SCREEN ADDRESS
32EC 17 FEA3 04150        LBSR  HEXDEC  PUT SCORE
32EF 86 35 04160          LDA   #$35
32F1 90 11 04170          SUBA  <CS
             04490
             04500        ***** CRASH! *****
             04510
3337 C6 13   04520 CRASH  LDB   #19     TURN OFF AND ON 19 TIMES
3339 34 04   04530        PSHS  B       COUNT TO STACK
333B CC 0015 04540        LDD   #$15    VERY HIGH PITCH
333E DD 0B   04550        STD   <SDELAY
3340 86 8E   04560        LDA   #$8E    VERY LOUD SOUND
3342 97 0F   04570        STA   <SNDBYT
3344 C6 20   04580 CLOOP  LDB   #$20    NUMBER OF SOUND CYCLES
3346 96 00   04590        LDA   <BITSET
             04600        COMA
3348 43      04610        ANDA  ,X        RESET(PX,PY)
3349 A4 84   04620        STA   ,X
334B A7 84   04630        STA   SOUND
334D 17 FCCD 04640        LBSR  LBSR
3350 DC 0B   04650        LDD   <SDELAY
3352 C3 0005 04660        ADDD  #5        MAKE A LOWER PITCH
3355 DD 0B   04670        STD   <SDELAY
3357 A6 84   04680        LDA   ,X
3359 9A 00   04690        ORA   <BITSET   SET(PX,PY,WC)
335B A7 84   04700        STA   ,X
335D C6 20   04710        LDB   #$20      NUMBER OF SOUND CYCLES
335F 17 FCBB 04720        LBSR  SOUND
3362 6A E4   04730        DEC   ,S        OFF AND ON 19 TIMES?
3364 26 DE   04740        BNE   CLOOP     NOT YET
3366 32 61   04750        LEAS  1,S       CLEAN UP STACK
3368 96 00   04760        LDA   <BITSET   ONCE MORE,
             04770        COMA            WITH FEELING
336A 43      04780        ANDA  ,X        RESET(PX,PY)
336B A4 84   04790        STA   ,X
336D A7 84   04800        STA   ,X
336F C6 80   04810        LDB   #$80      LONNNG TONE
```

to page 64

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Circle No. 37 on Reader Service Card

```
3371 17    FCA9      04800          LBSR    SOUND
3374 0C    11        04810          INC     <CS       ONE MORE CRASH
3376 86    35        04820          LDA     #$35      MAKE LOWER-CASE ASCII
3378 90    11        04830          SUBA    <CS
337A B7    05FF      04840          STA     $5FF      DISPLAY # CRASHES
337D 31    3F        04850 PAUSE    LEAY    -1,Y
337F 26    FC        04860          BNE     PAUSE     LET 'EM SEE IT
3381 81    30        04870          CMPA    #$30      5TH CRASH?
3383 1027  0027      04880          LBEQ    DONE      YES
3387 16    FF4B      04890          LBRA    PHASE     SET UP ANOTHER BOARD
                     04900
                     04910      *****
                     04920
338A       07        04930 SCMES    FCB     7         LENGTH OF MESSAGE
338B 53434F524520    04940          FCC     /SCORE /
3391       7D        04950          FCB     $7D       "="
3392       0E        04960 CLMES    FCB     14        LENGTH OF MESSAGE
3393 435241534845    04970          FCC     /CRASHES/
     53
339A 204C45465420    04980          FCC     / LEFT /
33A0       7D        04990          FCB     $7D       "="
33A1       0C        05000 HSMES    FCB     12        LENGTH OF MESSAGE
33A2 484947482053    05010          FCC     /HIGH SCORE /
     434F524520
33AD       7D        05020          FCB     $7D       "="
                     05030
                     05040
                     05050    *****LAST CRASH*****
                     05060
33AE 86    02        05070 DONE     LDA     #2
33B0 31    3F        05080 COOLIT   LEAY    -1,Y
33B2 26    FC        05090          BNE     COOLIT
33B4 4A              05100          DECA
33B5 26    F9        05110          BNE     COOLIT
33B7 17    FE22      05120          LBSR    BORDER
33BA DC    12        05130          LDD     <SCOTBL
33BC 1093  18        05140          CMPD    <HSTBL    NEW HIGH SCORE?
33BF 25    02        05150          BLO     LOWER     NOPE
33C1 DD    18        05160          STD     <HSTBL    YEP, STORE IT
33C3 CE    05E9      05170 LOWER    LDU     #$5E9
33C6 17    FDC9      05180          LBSR    HEXDEC    SHOW SCORE THIS GAME
33C9 DC    18        05190          LDD     <HSTBL
33CB CE    05FC      05200          LDU     #$5FC     OVERWRITE 'CRASHES'
33CE 17    FDC1      05210          LBSR    HEXDEC    PUT HIGH SCORE
33D1 30    8C CD     05220          LEAX    HSMES,PCR
33D4 CE    05EF      05230          LDU     #$5EF     OVERWRITE 'CRASHES'
33D7 17    FE55      05240          LBSR    PUTMES
33DA 16    FE9B      05250          LBRA    NEWGAM    TEMPT THE PLAYER
                     05260
                     05270
                     05280
33DD 4F              05290 EXIT     CLRA              RESTORE DIRECT PAGE
33DE 1F    8B        05300          TFR     A,DP      FOR RETURN TO BASIC
33E0 1C    EF        05310          ANDCC   #$EF      RE-ENABLE INTERRUPTS
33E2 39              05320          RTS               BACK TO BASIC
                     05330
                     05340
                     05350
33E3       07        05360 TITLE    FCB     7         LENGTH OF MESSAGE
33E4 534C49544845    05370          FCC     /SLITHER/
     52
33EB       0C        05380 TMPMES   FCB     12        LENGTH OF MESSAGE
33EC 454E54455220    05390          FCC     /ENTER TEMPO /
     54454D504F20
33F8       03        05400          FCB     3         LENGTH OF MESSAGE
33F9       71        05410          FCB     $71       '1'
33FA       6D        05420          FCB     $6D       '-'
33FB       78        05430          FCB     $78       '8'
33FC       0C        05440 LSTTMP   FCB     12        LENGTH OF MESSAGE
33FD 4C4153542054    05450          FCC     /LAST TEMPO/
     454D504F
3407       7A        05460          FCB     $7A       ':'
3408       D0        05470          FCB     $D0       SPACE
                     05480
3409       3A        05490 TTBL     FCB     $3A       TABLE OF TEMPOS:
340A       34        05500          FCB     $34       NUMBER OF CYCLES
340B       2D        05510          FCB     $2D       FOR SOUND,
340C       27        05520          FCB     $27       LENGTH OF SOUND
340D       21        05530          FCB     $21
340E       1B        05540          FCB     $1B
340F       15        05550          FCB     $15
3410       0E        05560          FCB     $0E
                     05570
3411                 05580 XARRAY   RMB     205
34DE                 05590 YARRAY   RMB     205
                     05600
           35AB      05610 ZEND     EQU     .    MESSAGE TO ME:PROGRAM LENGTH
           301A      05620          END     START
00000 TOTAL ERRORS
```

```
BITSET  3000    LBL1    3060    MORE    314C    SCOTBL  3012
BORDER  31DC    LBL10   3157    NEWGAM  3278    SDELAY  300B
BUGS    3305    LBL12   30E1    NEXT1   30FC    SETA    3242
CLMES   3392    LBL2    306A    OX      3001    SETD    323B
CLOOP   3344    LBL3    3074    OY      3002    SLOOP1  3025
COOLIT  33B0    LBL4    307E    PAUSE   337D    SLOOP2  3030
CRASH   3337    LBL5    30A6    PELLET  3008    SNDBYT  300F
CS      3011    LBL6    30C7    PHASE   32D5    SOUND   301D
DONE    33AE    LBL8    313C    POSTOX  3104    START   301A
DX      3003    LBL9    3146    PUTMES  322F    TEMPO   300D
DY      3004    LBLB    30BD    PX      3005    TITLE   33E3
EL      3007    LBLCS   31AC    PY      3006    TMPMES  33EB
EXIT    33DD    LBLD    30C9    RANDOM  3170    TMPONO  300E
FIRST   32A0    LBLIS   31C4    RESULT  3014    TP      300A
GETPOS  30F2    LBLMS   31A0    RLOOP1  317C    TRNOFF  30CD
HEXDEC  3192    LBLXS   31B8    RLOOP2  3185    TTBL    3409
HP      3009    LBLZ    3086    RNDEND  318C    WAIT    332D
HSMES   33A1    LOOP5   331F    RNDNOS  318E    WC      00F0
HSTBL   3018    LOWER   33C3    SCMES   338A    XARRAY  3411
INIT    324D    LSTTMP  33FC    SCOLUP  31D1    YARRAY  34DE
INTEMP  32A4    MESLP   3231    SCORE   3113    ZEND    35AB
KEYFLG  3010    MLOOP   3038
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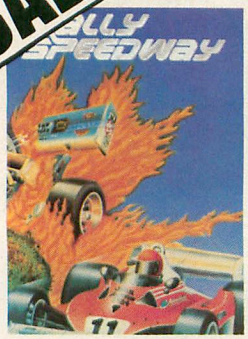

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by John Anderson

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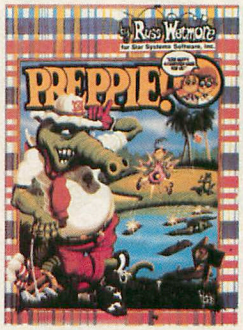

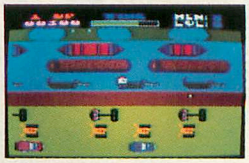

Atari Version

ATARI

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by Russ Wetmore

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Real-time machine language graphics bring it all to energetic life while coaxing a full twenty-eight colors from your ATARI 400 or 800. And PREPPIE! also features an outrageous musical repertoire that supplements the rib-tickling sound effects. Joystick required.

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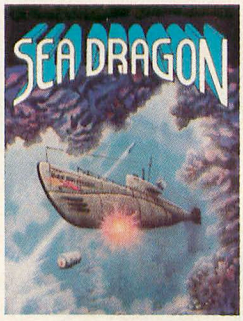

Atari Version

APPLE CoCo
ATARI IBM
TRS-80 COM. 64

SEA DRAGON

Nominated by Electronic Games Magazine for "1984 Best Action Computer Game"

by Wayne Westmoreland & Terry Gilman
Atari Version by Russ Wetmore
Apple Version by John Anderson
Color Computer Version by Coniah Software
IBM Version by Dan Rollins
Commodore 64 Version by Dave Simmons

Secure all hatches! Prepare to dive! Sea Dragon puts you in command of a nuclear sub that's armed to the hilt with deadly missiles and torpedoes. You guide your submarine past underwater mountains and through labyrinthine passages while avoiding webs of explosive mines that rise from the seabottom. And two-player option and sounds go hand in hand with the kind of graphics you've come to expect from Adventure International. Joystick required on Atari version.

Please Note: The above is a description of the TRS-80 version; all other versions are similar.

APPLE 2 48K DOS 3.3	042-0146	$34.95	(£25.49 inc. VAT)
ATARI 32K DISK	052-0146	$34.95	(£25.49 inc. VAT)
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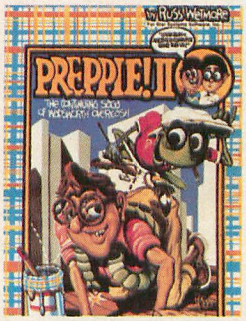
TRS-80 32K TAPE CoCo	060-0146	$34.95	(£25.49 inc. VAT)
IBM 128K DISK	132-0146	$34.95	(£25.49 inc. VAT)
COMMODORE 64 TAPE	190-0146	$34.95	(£25.49 inc. VAT)
COMMODORE 64 DISK	192-0146	$34.95	(£25.49 inc. VAT)



Atari Version

ATARI

PREPPIE II!

by Russ Wetmore

In PREPPIE II! Wadsworth returns to face a battery of tests designed to test his mettle as a Brother. Surviving, er. . . passing, the tests means advancement to the next level for further "evaluation." The "testing area" will include an array of pits, traps, secret passageways, revolving doors, and a surprise, unknown hazard. And — there will be special cameo appearances by "guests" from PREPPIE!, too!

The prepster you couldn't keep down on the Nasty Nine is back and as resilient as Bubble Yum. Make a date today for fun — PREPPIE II! Joystick required.

ATARI 400/800/1200 16K TAPE 050-0175
$34.95 (£25.49 inc. VAT)
ATARI 400/800/1200 32K DISK 052-0175
$34.95 (£25.49 inc. VAT)

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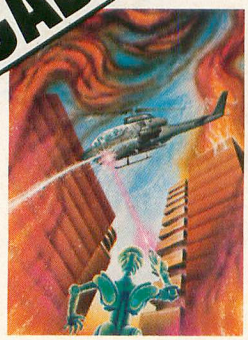

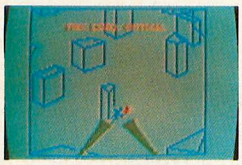

Color Computer Version

CoCo

FIRE COPTER

by Dale Lear

FIRE COPTER serves up a tasty helping of coin-op realism as the player is treated to a bird's-eye view of flight over a huge city. The object of FIRE COPTER is to extinguish as many fires as possible before the entire city burns. Along the way, fire-starting androids may be encountered which should be dispatched with your lasers posthaste!

FIRE COPTER is joystick-controlled and accommodates one or two players. Ready for **three-dimensional realism?** Then you're ready for FIRE COPTER — the hot new game from Adventure International! Great sounds too!

COLOR COMPUTER 16K TAPE 060-0176
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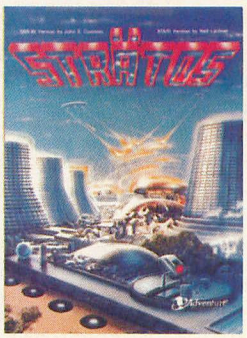

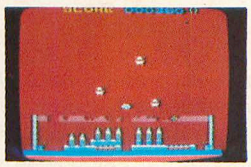

Atari Version

ATARI
COM. 64
TRS-80

STRATOS

ATARI and COMMODORE 64 Versions by Neil Larimer
TRS-80 Version by John E. Cominio

This is STRATOS — a kaleidoscopic explosion of awesome graphics and other-worldly sounds. STRATOS puts you in TOTAL control of the devastating Armageddon Wave — the only weapon capable of decimating the attacking alien ships. STRATOS comes loaded with the professional features you've come to expect, including one or two player option, high score save, and mind-melting sounds.

Designed for the home arcader who takes his action white-hot, you can be certain the thrills don't let up with this scorcher! Joysticks optional on TRS version; required for ATARI version.

ATARI 400/800 16K TAPE	200-0161	$34.95	(£25.49 inc. VAT)
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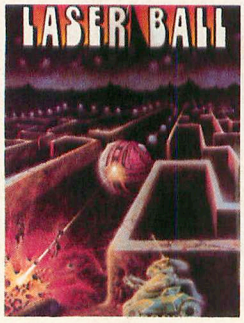

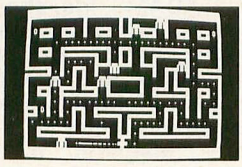

TRS-80 Version

COM. 64
TRS-80

LASER BALL

by Neil Matson & Matthew T. McMahon

The action begins when your Laser Ball comes to life in the center of a twisting maze. Maneuver it using either joystick or keyboard controls. The object of the game is to fill the maze completely with dots while avoiding the deadly destructoids that inhabit this lethal network of twists and turns.

LASER BALL! All of the extras you demand are here: two player option, multiple skill levels, speedy machine language graphics, running high score, great sounds and action like you've never had with a micro!

TRS-80 16K TAPE	170-0217	$24.95	(£17.99 inc. VAT)
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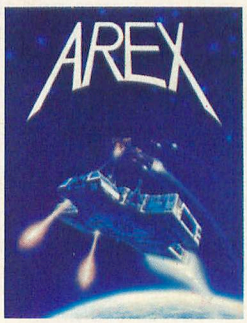
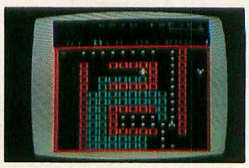
COMMODORE 64 DISK	172-0217	$24.95	(£17.99 inc. VAT)





Color Computer Version

APPLE COM. 64
ATARI IBM
CoCo TRS-80

AREX

by William Muk
Atari & Commodore 64 Versions by John Anderson
Apple Version by Gordon Eastman
IBM Version by John White
Color Computer Version by Roger Schrag

AREX — Enter and neutralize at least 90% of the enemy's territory while avoiding 3 distinct types of alien ships. A successful invasion earns advancement to subsequent (and, of course, more difficult) levels of play.

AREX features phenomenal graphics routines, high score retention, one- or two-player option and multiple skill levels.

ATARI 16K TAPE	200-0172	$34.95	(£25.49 inc. VAT)
ATARI 16K DISK	202-0172	$34.95	(£25.49 inc. VAT)
COMMODORE 64 TAPE	200-0172	$34.95	(£25.49 inc. VAT)
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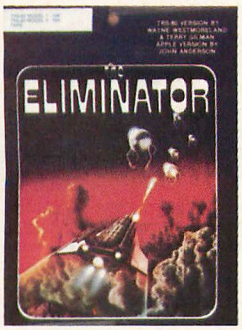

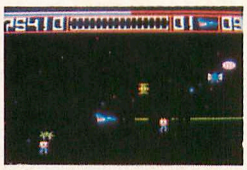

Apple Version

APPLE
ATARI
CoCo
COM. 64
TRS-80

THE ELIMINATOR

by Wayne Westmoreland & Terry Gilman
APPLE Version by John Anderson
ATARI Version by Steve Coleman
COLOR COMPUTER Version by Britt Monk
Commodore 64 Version by Americomp

Your mission unfolds at a breakneck pace as you pilot your Eliminator craft over alien terrain and square off against hoards of marauding enemy ships. But the action doesn't stop there! THE ELIMINATOR pulverizes the competition with realistic sounds, superlative graphics, running high score and joystick compatibility on ALL versions — and these are just a few of the many "extras" included.

*TRS-80 16K TAPE Model 1 & 3	010-0134	$24.95	(£17.99 inc. VAT)
*TRS-80 32K DISK Model 1 & 3.	012-0134	$24.95	(£17.99 inc. VAT)
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COMMODORE 64 TAPE	190-0134	$24.95	(£17.99 inc. VAT)
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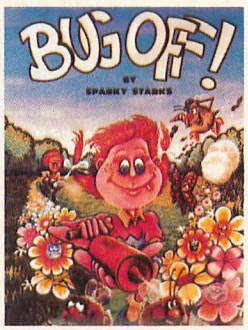
*The TRS-80 version is licensed as a "Defender" game from Williams Electronics!



Atari Version

ATARI

BUG OFF!

by Sparky Starks

Your garden has fallen into a Florida sinkhole where weird forces have mutated a bevy of bizarre bugs into a contingent of killers! In this case, relief is spelled D-D-T, and you'll need oodles of it to dispatch these pesky pests!

The object of the game is to control the seven different types of bugs that are threatening to run helter-skelter over everything. Features great sounds and multiple skill levels. For one or two players. Joysticks required.

ATARI 400/800 16K TAPE 050-0167
$9.95 (£6.42 inc. VAT)
ATARI 400/800 32K DISK 052-0167
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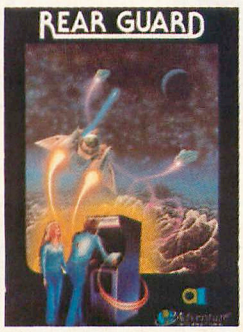


Atari Version

APPLE
ATARI
CoCo
TRS-80

REAR GUARD

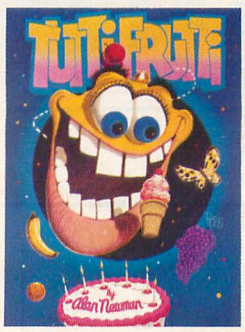
by Wayne Westmoreland and Terry Gilman
Color Computer and Com-64 Versions by Coniah Software
APPLE Version by John Anderson
ATARI Version by Neil Larimer, assisted by Sparky Starks

You are charged with protecting your mothership from the deadly waves of inhuman Cyborgs. Destroy them before they reach the mothership.

REAR GUARD flaunts the full range of your computer's sound capabilities, and features graphics so *crisp* and *fluid* that they actually seem to border on advanced computer animation! REAR GUARD also includes advanced play levels, running high score, sharp graphics, horizontal scrolling and truly mind-boggling sounds. For one or two players. Joysticks optional on TRS-80 version.

TRS-80 16K TAPE Model 1 & 3 .	010-0143	$24.95	(£17.99 inc. VAT)
TRS-80 32K DISK Model 1 & 3 .	012-0143	$24.95	(£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE	060-0143	$24.95	(£17.99 inc. VAT)
ATARI 400/800 16K TAPE	050-0143	$19.95	(£14.49 inc. VAT)
ATARI 400/800 32K DISK	052-0143	$24.95	(£17.99 inc. VAT)
APPLE 48K DISK DOS 3.3	042-0143	$29.95	(£21.99 inc. VAT)
COMMODORE 64 TAPE	190-0143	$24.95	(£17.99 inc. VAT)
COMMODORE 64 DISK	190-0143	$24.95	(£17.99 inc. VAT)

Apple version slightly different from above description.



Atari Version

ATARI

TUTTI FRUTTI

by Alan M. Newman

TUTTI FRUTTI is a colorful, machine language game for one or two players that'll have the whole family camped out around the ATARI! The action takes place in a jungle clearing where your joystick-controlled Hungry chows down on a variety of exotic fruits and pastries. Eat everything, and advance to the next level.

TUTTI FRUTTI will give your ATARI a real workout with its hi-res graphics, vivid colors, and lively sounds. And, you have complete control over numerous options, including the speed of the attacking bugs, the amount of fruit available on each level and lots more.

Guaranteed to be "grape fun" for one or two players!

ATARI 400/800 16K TAPE 050-0160
$9.95 (£6.42 inc. VAT)
ATARI 400/800 32K DISK 052-0160
$9.95 (£6.42 inc. VAT)

ADVENTURE

THE ADVENTURE SERIES: AN OVERVIEW

By definition, an adventure is a dangerous or risky undertaking. On your personal computer, Adventure is that and more!

Playing any of the Adventures includes three elements: you, the user; the games themselves; and the author, Scott Adams of Orlando, Florida.

In beginning any Adventure, you will find yourself in a specific location: in a forest, maybe on board a small spaceship, or perhaps in a desert. The top portion of your video display will tell you where you are and what you see; the bottom section of the display is devoted to inputting commands to your robot computer and receiving messages that may arise as the result of your orders.

By using two-word commands you move from location to location (they're called "rooms", though some rooms represent outdoor sites like a swamp), manipulate objects that you find in different rooms (pick them up, put them down, carry them, etc.) and perform actions as if you were really there.

The object of the game is to amass treasure for points or accomplish a specified task. Successfully completing a game, however, is far easier to discuss than to achieve. In many cases you will find a treasure but be unable to take it until you are carrying the right combination of objects that you'll find in various locations.

If you're tired of video games with bouncing balls, or bored with shooting at targets, and you're ready for an intellectual challenge that transports you to new worlds of experience; if you want to see what a skilled programmer can do with a micro, then invest in one of Scott Adams' games. An early Adventure (Adventureland or Pirate Adventure) is a good place to start, because the more Adams creates, the tougher his puzzles get.

by Ken Mazur

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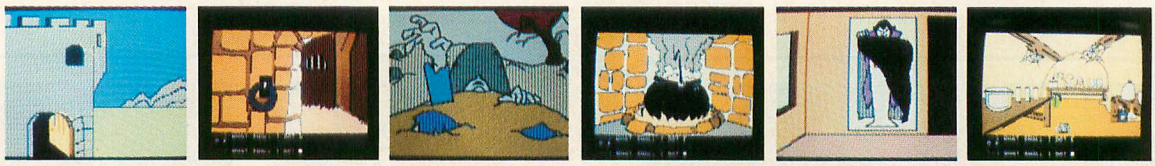
THE GRAPHIC ADVENTURES

As the name implies, the Scott Adams Graphic Adventures are Scott's classic text Adventures enhanced with exciting hi-res graphics — graphics which colorfully depict your voyage into wonderment each and every step of the way. Each Adventure challenges the player to accumulate points, crack a mystery or accomplish a goal using the unique tools of Adventuring: two-word commands, some common sense and a little ingenuity.

If you've never played an Adventure, here's the place to begin. If you're an experienced Adventurer, prepare for a magical encounter unlike any other. Remember: Anything can happen when you play a Scott Adams Graphic Adventure . . . and it usually does!

See individual descriptions on opposite page.

Scott Adams Graphic Adventure™



ADV. NO.	S.A.G.A.™ APPLE 2 PLUS 48K DISK Requires DOS 3.3	S.A.G.A.™ ATARI 48K DISK	STANDARD ATARI 400/800 24K TAPE 400/800	TEXAS INSTRUMENTS TAPE* *(Requires Command Module) See Below	STANDARD COLOR COMPUTER 16K TAPE	ADV. NO.	STANDARD ATARI 400/800 TRS-80 MODEL 1 & 3 32K DISK	NORTHSTAR CP/M HORIZON & ADVANTAGE 5¼" DISK
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3	042-0203 $39.95	052-0203 $39.95	050-0003 $19.95	110-0003 $29.95	060-0003 $19.95	†7-8-9	072-0012 $39.95	152-0012 $49.95
4	042-0204 $39.95	052-0204 $39.95	050-0004 $19.95	110-0004 $29.95	060-0004 $19.95	†10-11-12	072-0130 $39.95	152-0130 $49.95
5	042-0205 $39.95	052-0205 $39.95	050-0005 $19.95	110-0005 $29.95	060-0005 $19.95			
6	042-0206 $39.95	052-0206 $39.95	050-0006 $19.95	110-0006 $29.95	060-0006 $19.95			
7	Coming Soon	Coming Soon	050-0007 $19.95	110-0007 $29.95	060-0007 $19.95			
8	Coming Soon	Coming Soon	050-0008 $19.95	110-0008 $29.95	060-0008 $19.95			
9	Coming Soon	Coming Soon	050-0009 $19.95	110-0009 $29.95	060-0009 $19.95			
10	Coming Soon	Coming Soon	050-0098 $19.95	#10 & #11 Comb.	060-0010 $19.95			
11	Coming Soon	Coming Soon	050-0128 $19.95	110-0156 $39.95	060-0011 $19.95			
12	Coming Soon	Coming Soon	050-0129 $19.95	110-0129 $29.95	060-0012 $19.95			

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See page 8 for details on Scott's newest Adventure!

TRS-80 MODEL 2 - 8" DISK — Adventures 1 thru 12 (REQUIRES TRSDOS 2.0) . . 022-0137 $129.95 (£93.49 inc. VAT)
CP / M (Z-80) SINGLE DENSITY 8" DISK — Adventures 1 thru 12 . . . . . 122-0137 $129.95 (£93.49 inc. VAT)
CP / M CONVERSIONS by Russ Wetmore — Color Computer versions by Roger Schrag

† Special Value Packs

New — Adventure #13, See Page 8

HINT AND SOLUTION BOOK

Our hint book provides additional clues to help you out of some of those sticky spots you've gotten into, while still letting you solve the Adventure yourself. So if you can't seem to get out of the bog or locate the pharoah's heart, then you've come to the right place for help! This expanded edition includes hints for all 14 Adventures, and a special section on the making of Adventure maps. **$7.95**

SKILL KEY

BEGINNER: Ideal for younger players or first-time Adventurers. Minimum problem-solving skills required. Average completion time: 5 hours or more.

MODERATE: Some Adventuring experience needed. Moderate problem-solving skills required. Average completion time: 7 hours or more.

ADVANCED: Recommended for experienced players. Advanced problem-solving skills required. Completion time varies substantially with experience.

THE ADVENTURES

#1 ADVENTURELAND — Wander through an enchanted realm and try to uncover the 13 lost treasures. There are wild animals and magical beings to reckon with as well as many other perils and mysteries. This is the Adams Classic that started it all! Difficulty Level: Moderate

#2 PIRATE ADVENTURE — Only by exploring this strange island will you be able to uncover the clues necessary to lead you to your elusive goal — recovering the lost treasures of Long John Silver. Difficulty Level: Beginner

#3 ADVENTURE #3 — In this exciting Adventure, time is of the essence as you race the clock to complete your mission in time- or else the world's first automated nuclear reactor is doomed! If you survive this challenging mission, consider yourself a true Adventurer! Difficulty Level: Advanced

#4 VOODOO CASTLE — The Count has fallen victim to a fiendish curse placed on him by his enemies. There he lies, with you his only possible hope. Will you pull off a rescue, or is he really down for the Count?! Difficulty Level: Moderate

#5 THE COUNT — It begins when you awake in a large brass bed in a castle somewhere in Transylvania. Who are you, what are you doing here and WHY did the postman deliver a bottle of blood? Difficulty Level: Moderate

#6 STRANGE ODYSSEY — At the galaxy's rim, there are rewards aplenty to be harvested from a long-dead alien civilization, including fabulous treasures and advanced technologies far beyond human ken! Prepare yourself for the incredible! Difficulty Level: Moderate

#7 THE MYSTERY FUN HOUSE — As Adventure #7 begins, you find yourself hopelessly lost in the middle of a carnival fun house. While escape may elude you, one thing is very clear — you're NOT here to have a good time! Difficulty Level: Moderate

#8 PYRAMID OF DOOM — This is an Adventure that will transport you to a dangerous land of crumbling ruins and trackless desert wastes into the PYRAMID OF DOOM! Jewels, gold — it's all here for the plundering — IF you can find the way. Difficulty Level: Moderate

#9 GHOST TOWN — You must explore a once-thriving mining town in search of the 13 hidden treasures. With everything from rattlesnakes to runaway horses, it sure ain't going to be easy! Includes a special bonus scoring system too! Difficulty Level: Advanced

#10 SAVAGE ISLAND PART I — A small island holds an awesome secret — will you be able to discover it? This is the beginning of a two-part Adventure. (The story continues in SAVAGE ISLAND PART 2, ADVENTURE #11.) NOTE: This one's a toughie — for experienced Adventurers only! Difficulty Level: Advanced

#11 SAVAGE ISLAND PART II — The suspense begun in Adventure #10 now comes to an incredible conclusion with SAVAGE ISLAND PART II! This Adventure requires you to have successfully finished #10, wherein you were given the secret password to begin this final half. NOTE: For experienced Adventurers only! Difficulty Level: Advanced

#12 GOLDEN VOYAGE — The king lies near death in the royal palace. You have only three days to bring back the elixir needed to rejuvenate him. Journey through the lands of magic fountains, sacred temples, stormy seas and gold, gold, GOLD! This one is for experienced Adventures only! Difficulty Level: Advanced

#13 SCORCERER OF CLAYMORGUE CASTLE — New! See page 8.

ADVENTURE

ADVENTURE #13

Long ago, in times passed beyond remembrance, Solon the Master Wizard and wearer of the Secret Cloak lost the 13 Stars of Power. The grasping Vileroth believed the Stars to be the only source of Solon's expert wizardry. But, unbeknownst to Vileroth, it was the Secret Cloak that controlled the Stars and protected the wearer from their awesome power. Unable to master the Stars, Vileroth was undone.

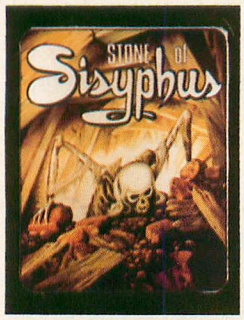
In his final days, as Vileroth's strength slipped from him, he concealed the 13 Stars of Power within the Castle of Claymorgue, determined that no one save he should possess them. Solon, learning of Vileroth's destruction, dispatched his faithful young apprentice Beanwick to retrieve the Stars.

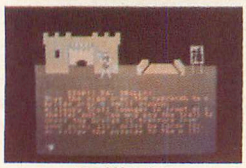
"Tread carefully, O Beanwick! Would that I could assume this quest myself, but alas, I can only send with you these few spells. Claymorgue Castle harbors further spells, but beware – one unskilled in the magical arts cannot predict their outcome."

At last! The long-awaited Adventure #13 by Scott Adams!

The Scorcerer of Claymorgue is Scott's best yet. Difficulty Level: **Advanced**

TRS-80 32K DISK Model 1 & 3	012-0013	$24.95	(£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE	060-0013	$19.95	(£14.49 inc. VAT)
S.A.G.A. APPLE 2 PLUS 48K DISK	042-0013	$39.95	(£25.77 inc. VAT)
Requires DOS 3.3			
S.A.G.A. ATARI 48K DISK	052-0013	$39.95	(£25.77 inc. VAT)





Atari Version

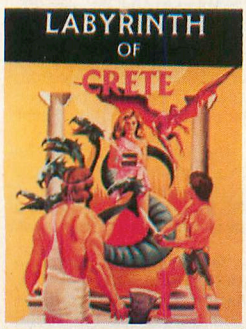
STONE OF SISYPHUS

APPLE
ATARI
TRS-80

Chameleon Software
Graphic Versions by David Simmons

"Ah, welcome to our dungeon!" Yes there's adventure and treasure aplenty here. What's that you ask? Any monsters, trolls or orcs? Well, maybe a few teeny weeny ones. Not to worry though, we're very generous about giving your character hordes of "prime attributes" — you know, lots of strength, luck, charisma, and the like. And you'll find comfort in the fact that your character has three (count 'em, 3) lives! Course, I'd be less than honest if I didn't say I think you'll need them — but step inside. I think I've got a suit of armor you can't live without (heh, heh!). Skill Level: Moderate. Suggested age group 12-Adult. Graphics available on Apple Version. Includes Two Full Disks of Data! (will work on 1 or 2 Disk Drive Systems)

TRS-80/I 32K DISK	032-0100	$29.95	(£21.99 inc. VAT)
TRS-80/III 48K DISK	032-0100	$29.95	(£21.99 inc. VAT)
ATARI 48K DISK	052-0100	$39.95	(£28.99 inc. VAT)
APPLE 2 PLUS or APPLE 2 - 48K with Applesoft in ROM WORKS ON 3.2 OR 3.3	032-0100	$29.95	(£21.99 inc. VAT)



Apple Version

LABYRINTH OF CRETE

APPLE
ATARI
COM. 64

by Cliff Johnson and Allen Pinero
Atari and Commodore Versions by Ralph Jones

This graphic Adventure challenges you to guide Jason and Hercules (yes, TWO characters) through the Labyrinth of Crete to recover the captured golden fleece of Greek myth. Twice as many characters means double the trouble, but don't despair. We've included a complete map of the tri-level labyrinth along with a helpful hint sheet. Skill Level: Moderate

APPLE 2 PLUS 48K DOS 3.3	042-0162	$29.95	(£21.99 inc. VAT)
ATARI 48K DISK	052-0162	$29.95	(£21.99 inc. VAT)
COMMODORE 64 DISK	192-0162	$29.95	(£21.99 inc. VAT)

JYYM PEARSON'S ADVENTURES

GRAPHICS BY NORMAN SAILER

ADVENTURE PARAMETERS

Suggested Age Group . . . 12 to Adult
Game Save Feature . . . . . Yes
Graphics Oriented . . . . . On Apple
Number of Players 1/Unlimited

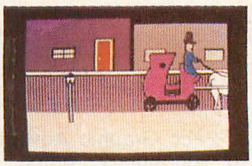
Apple Version

APPLE
ATARI
CoCo
TRS-80

ESCAPE FROM TRAAM

While on a routine patrol assignment, your small spacecraft's engine fails, forcing you to land on the most hostile planet in the galaxies. No one yet has yet lived to tell the story of Escape From Traam. You can only hope to be the first. Skill Level: Moderate-Advanced

TRS-80 16K TAPE Model 1 & 3 140-0109
$24.95 (£17.99 inc. VAT)
TRS-80 32K DISK Model 1 & 3 140-0109
$24.95 (£17.99 inc. VAT)
*APPLE 48K DOS 3.3 Applesoft ROM 042-0109
$34.95 (£25.49 inc. VAT)
ATARI 16K TAPE (Disk Version Below) 140-0109
$24.95 (£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE 140-0109
$24.95 (£17.99 inc. VAT)
*Apple with full color hi-res pictures!



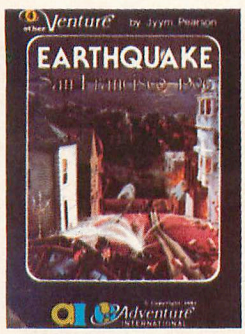
Apple Version

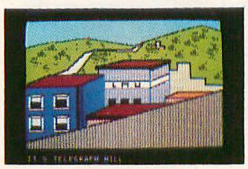
APPLE
ATARI
CoCo
TRS-80

THE CURSE OF CROWLEY MANOR

London 1913. You are Inspector Black of Scotland Yard, and though you *think* you've seen everything in the line of duty — **nothing** you've ever experienced has prepared you to solve the horrifying mystery of the Curse of Crowley Manor. Skill Level: Moderate-Advanced

TRS-80 16K TAPE Model 1 & 3 140-0108
$24.95 (£17.99 inc. VAT)
TRS-80 32K DISK Model 1 & 3 140-0108
$24.95 (£17.99 inc. VAT)
*APPLE 48K DOS 3.3 Applesoft ROM 042-0108
$34.95 (£25.49 inc. VAT)
ATARI 16K TAPE (Disk Version Below) 140-0108
$24.95 (£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE 140-0108
$24.95 (£17.99 inc. VAT)
*Apple with full color hi-res pictures!





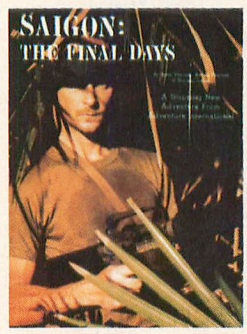
Apple Version

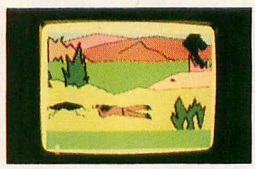
APPLE
ATARI
CoCo
TRS-80

EARTHQUAKE: SAN FRANCISCO 1906

As buildings crumble and the earth opens to swallow what remains, you stumble through the ruins of what was once beautiful San Francisco. Panic-stricken survivors flee around you, but you fear for more than your own life. When the quake hit, you were on your way to Oakland with the ransom for your kidnapped wife. Time is running out ... which way do you go? Skill Level: Moderate-Advanced

TRS-80 16K TAPE Model 1 & 3 140-0139
$24.95 (£17.99 inc. VAT)
TRS-80 32K DISK Model 1 & 3 012-0139
$24.95 (£17.99 inc. VAT)
ATARI 16K TAPE (Disk Version Below) 140-0139
$24.95 (£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE 140-0139
$24.95 (£17.99 inc. VAT)
*APPLE 48K DOS 3.3 Applesoft ROM 042-0139
$34.94 (£25.49 inc. VAT)
*Apple with full color hi-res pictures!





Atari Version

APPLE
ATARI
CoCo
TRS-80

Coauthored by Robyn Pearson

SAIGON: THE FINAL DAYS

Vietnam, 5/75. Crashing through the dense jungle foliage, you hear the distant fire of the NVA camp guards. You've escaped, but you have a long way to go before you reach Saigon — if you ever do. Uncle Sam is pulling out, and Saigon holds your only hope of ever going home. Gritty realism and historic fact blend to form a unique adventuring experience that plunges you into a controversial chapter of recent history.

TRS-80 16K TAPE Model 1 & 3 140-0177
$24.95 (£17.99 inc. VAT)
COLOR COMPUTER 16K TAPE 140-0177
$24.95 (£17.99 inc. VAT)
ATARI 400/800 16K TAPE 140-0177
$24.95 (£17.99 inc. VAT)
*APPLE 48K DISK 042-0177
$34.95 (£25.49 inc. VAT)
*Apple with full color hi-res pictures!

TRS-80

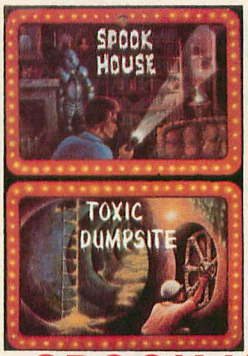
THE SLEDGE OF RAHMUL
by Roger Schrag

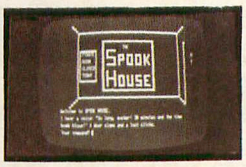
MERLIN'S TREASURE
by Michael D. Wile

Each Graphic Adventure features an extensive vocabulary, game save, and, with THE SLEDGE OF RAHMUL, real-time game action. During the journey, you will be treated to screen after screen of quality graphics — and THE SLEDGE OF RAHMUL and MERLIN'S TREASURE both feature the kind of game depth and detail that you've come to expect from Adventure International.

Make an investment in fun today — pick up a copy of our latest double feature, THE SLEDGE OF RAHMUL and MERLIN'S TREASURE! No joysticks necessary. **Skill Level: Moderate.**

TRS-80 48K DISK 012-0179
$39.95 (£28.99 inc. VAT)
(Contains Two Full Disks of Data!)





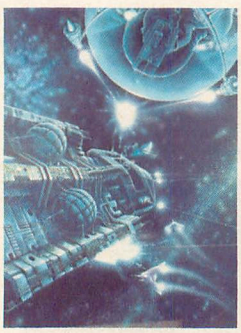
TRS-80 Version

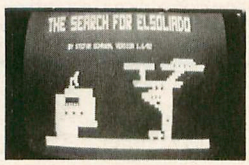
TRS-80

SPOOK HOUSE AND TOXIC DUMPSITE
by Roger Schrag

Now your TRS-80 can hobnob with the best of 'em. Over 50 full screens of sharp, quality graphics breathe a realism and vitality into Adventuring, the likes of which you've yet to see on the TRS-80. Both Graphic Adventures feature game save, extensive vocabulary, real-time action (Yes — we said real-time!) and accept FULL sentences! Includes two great Adventures: Spook House and Toxic Dumpsite. **Skill Level: Moderate.**

TRS-80 48K DISK Model 1 & 3 012-0164
$39.95 (£28.99 inc. VAT)
(Contains Two Full Disks of Data!)





TRS-80 Version

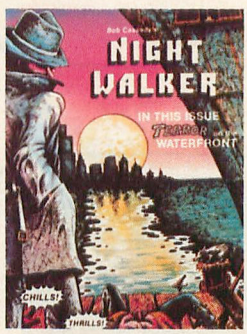
TRS-80

THE SEARCH FOR ELSOLIADO
by Stefan Schramm

THE SEARCH FOR ELSOLIADO is just that — an interstellar quest for an uncharted world. Since Elsoliado cannot be found by pure chance, information concerning its whereabouts must be purchased from deep-space Starbases — information which frequently sports an exorbitant price tag.

This real-time, strategy-action game features graphics, sound and game save. Average completion time: 6 hours. No joysticks required.

TRS-80 32K DISK 012-0178
$29.95 (£21.99 inc. VAT)



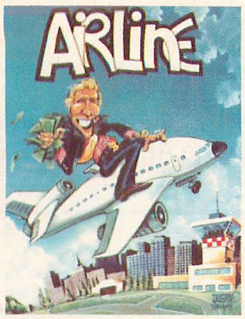
COM. 64
IBM
TRS-80

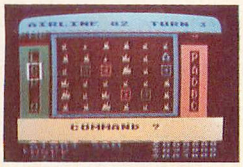
NIGHTWALKER
TRS-80 and COM-64 by Bob Cassady
IBM Version by Fran Green

Nightwalker! Beautiful women. Dangerous men. A weird gravedigger. They're all here in this interactive tale that challenges you to gather enough evidence to crack a dangerous underground heroin ring. You must successfully gather enough evidence to present to the police for a bust.

Nightwalker is a text-oriented program that is beefed-up with some sharp graphics routines, and has an extensive data base that assures you of many, many hours of varied excitement — if you survive! For one or more players; includes game save feature.

TRS-80 48K DISK Model 1 & 3 .	012-0149	$24.95	(£17.99 inc. VAT)
IBM 64K DISK	132-0149	$34.95	(£25.49 inc. VAT)
COMMODORE 64 TAPE	190-0149	$24.95	(£17.99 inc. VAT)
COMMODORE 64 DISK	192-0149	$24.95	(£17.99 inc. VAT)





Atari Version

AIRLINE

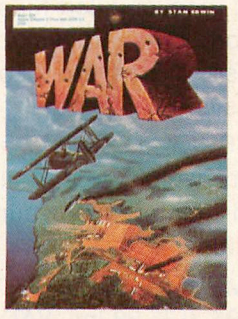
ATARI
CoCo
TRS-80

by George Schwenk
TRS-80 Version by Dave Simmons
Color Computer Version by Roger Schrag

Enter the intriguing world of high finance where even the sturdiest of corporate empires can dissolve as quickly as they're built. AIRLINE is a no-holds-barred strategy game for one to four players. The object is to construct a sizable empire while competing against human and/or computerized opponents. Players purchase landing rights from any one of 36 major U.S. cities, buy planes and then station them on routes that will maximize their revenue from fares. And unlike many strategy games, the outcome of AIRLINE is solely determined by your playing skills.

Atari version requires joysticks and a basic cartridge.

ATARI 400/800/1200 / COLOR COMPUTER / TRS-80 Model 1&3 16K TAPE
140-0169 $24.95 (£17.99 inc. VAT)



Atari Version

WAR

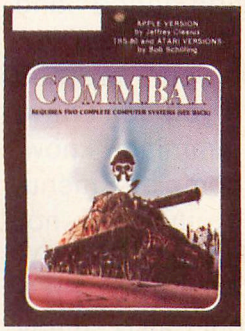
APPLE
ATARI
COM. 64

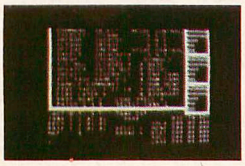
by Stan Erwin

Start a WAR on *your* computer — WAR is a detailed war game for one or two players. Your army consists of armored units, infantry units, engineer units (which can either build or destroy all-important bridges), and aircraft. Set against a backdrop of forests, cities and rivers, you must move your units into battle and eventually destroy your opponent.

WAR comes complete with an extensive instruction manual that outlines all of the strategies and tactics that you'll need to execute a winning game. WAR is certain to provide the avid war gamer with many hours of colorful excitement and action-packed fun. Average completion time 4 hours. Includes game save feature, too!

APPLE 2 48K DISK (DOS 3.3 Required)	**102-0150**	**$24.95**	**(£17.99 inc. VAT)**
ATARI 32K DISK	**102-0150**	**$24.95**	**(£17.99 inc. VAT)**
COMMODORE 64 TAPE	**190-0150**	**$24.95**	**(£17.99 inc. VAT)**
COMMODORE 64 DISK	**192-0150**	**$24.95**	**(£17.99 inc. VAT)**





COMMBAT

Requires 2 Complete Computers

APPLE
ATARI
TRS-80

by Bob Schilling

INCLUDED IN THIS PACKAGE — TAPE AND DISK VERSIONS FOR APPLE, ATARI AND TRS-80 SYSTEMS

Finally! A battle game that allows players on different computer systems to participate. You heard right, *different systems!* All you need is an APPLE, ATARI or TRS-80 microcomputer, a willing friend with one of the above systems, a full-duplex modem (or, a modem eliminator cable if the two computers are in the same room) and this package!

You and your opponent are located somewhere within a 4096-square-kilometer combat zone. The outcome of the game will be determined by two factors: the skills of the participants and a little luck. Your mission is to find and destroy the enemy's base before he can do the same. Look smart and remember — each enemy tank defeated in combat increases your survival odds.

COMMBAT requires two computer systems with RS-232 port and a 300 baud full duplex modem.

TRS-80 16K TAPE Model 1 & 3 ..... 164-0123 $49.95 (£35.99 inc. VAT)
TRS-80 32K DISK Model 1 & 3
ATARI 24K DISK
ATARI 24K TAPE
APPLE 48K DISK DOS 3.3
Package contains one each of the above!

Nominated by Electronic Games Magazine for "1984 Most Innovative Videogame Computer Game"

UTILITY

DISKEY

UNLOCK THE SECRETS OF YOUR DISK SYSTEM!

DISKEY is a disk utility that allows you to examine your disks sector by sector, edit and copy files or sectors, and repair crashed disks. DISKEY is now available for the APPLE, ATARI, COMMODORE 64, and TRS-80 COLOR COMPUTER.

ATARI

by Sparky Starks

DISKEY is a remarkable utility program that gives ATARI disk drive owners the flexibility to accomplish tasks that other utilities either ignore or only hint at. With DISKEY, you can actually examine a disk and its directory, and repair files that might otherwise have been lost. DISKEY also performs a multitude of other functions essential to the serious ATARI user.

As an ATARI owner, you have extraordinary power and versatility at your disposal. Tap those resources effectively with DISKEY.

ATARI 400/800/1200 32K DISK
052-0158 . . . . $49.95 (£35.99 inc. VAT)
(Note: Some features will require 40K)

TRS-80 Color Computer

by David D. McLeod

If you can only buy one program for your CoCo this year, DISKEY is the one to get! DISKEY is a powerful machine language utility which allows you to examine, modify, or copy almost any disk, sector by sector. DISKEY is designed to help you recover killed files and rescue data from crashed disks. Using DISKEY is also a great way to learn how your disk system operates.

Included with DISKEY is CCDIAG, a diagnostics program which tests all major functions and elements of your Color Computer system.

TRS-80 COLOR COMPUTER 32K DISK
062-0158 . . . . . $49.95 (£35.99 inc. VAT)

COMMODORE 64

by Ralph Jones

DISKEY gives your COMMODORE 64 the file-handling capabilities a serious user needs. Many users have complained about the inability of the C64 DOS to copy SEQ or PRG files, or USR files of similar form, from disk to disk. DISKEY gives you not only this, but also the ability to examine, copy, or modify any disk. You can now rescue data from a crashed disk, and recover killed files. DISKEY comes complete with its own DOS.

The user-friendly instructions allow even the novice to use DISKEY quickly and effeciently.

COMMODORE 64 64K DISK
192-0158 . . . . . $49.95 (£35.99 inc. VAT)

APPLE

by Scott Smith

Here's a maintenance and repair package that lets you examine and repair your crashed APPLE disks, even if you don't have any special programming knowledge. DISKEY is a complete, menu-driven package that includes not only CATALOG EDITOR, DISKEY-COPY, DISKEY-ZAP, and FILE RESURRECTION, but also many other functions that the serious APPLE user will find indispensible.

APPLE II/IIe 32K DISK
042-0158 . . $49.95 (£35.99 inc. VAT)

UTILITY

ATARI

S.A.G.E.

Scott Adams' Graphics Editor

At last — an excellent graphics editor for ATARI owners! The Scott Adams Graphics Editor allows the user to draw and edit highly compressed (Graphics Mode 7 ½) pictures using over 50 different colors & shades. This is the same editor developed and used by Scott Adams to create the vibrant graphics in his highly acclaimed S.A.G.A. Series. Here's why you need S.A.G.E.:

★ Drawing speed — pictures load & draw fast!

★ Picture Size — many of the pictures created with S.A.G.E. in the S.A.G.A. Series used only 300-400 bytes of memory — clearly an improvement over the "old way" which could eat up 4000-8000 bytes or more to store the same picture!

★ Pictures look identical on both the newer ATARIs (which use the GTIA chip) and the older models (which use the CTIA chip).

★ S.A.G.E. allows you to place graphics quickly and easily into your own programs.

★ S.A.G.E. package includes both tape and disk versions and an easy-to-use manual.

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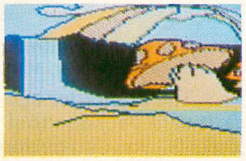

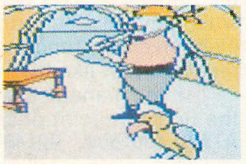

ULTRA DISASSEMBLER

by Ralph Jones

Ultra Disassembler is a superb new utility which enables the user to analyze and modify existing machine language programs. Ultra Disassembler not only directly translates machine language, but also formats the output into highly readable pseudo-source code, including standard system labels where appropriate. Additionally, Ultra Disassembler writes the source code to disk in a form suitable for editing and reassembly with all the major Atari assemblers. Anyone with a working knowledge of 6502 assembly language and the Atari operating system can put Ultra Disassembler to work quickly and effectively.

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APPLE SPICE

by Corey Kosak and David Fox

Apple Spice is a set of fast assembly language routines that alleviate the drudgery of writing programs in Applesoft BASIC. Apple Spice greatly expands Applesoft's capabilities by adding features found in many larger BASICs like, PRINT USING, STRING SEARCH (INSTR)., IF-THEN-ELSE, and LINE INPUT. A complete user-friendly manual includes explanations of the examples found on the disk and shows you how to use Apple Spice.

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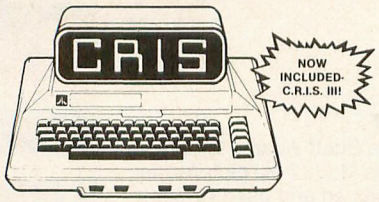

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by Dale Kubler

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- A notes option can be used to flag tax-deductible transactions.
- Handles up to 223 user-defined income and expense accounts. Many other systems only allow ONE income account. Compare!
- Assign transactions to a single account, or distribute over multiple accounts. Assign specific amounts, or pro-rate by fraction or percentage. Cash transactions can be recorded in any account without affecting check-book balance.
- Check Address data base stores up to 75 addresses and automatically prints them on your checks.
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APPLE 2
ATARI
COM. 64
CoCo

by Ed Hobbs
Color Computer Version by Jeff Francis

The imaginative game scenario centers around a master tic-tac-toe board. Score an "X" by selecting and successfully battling one of nine weird foes. Three X's in a row and Bingo! — you automatically advance to the next level! But the core of TRIAD is the colorful hi-resolution graphics and great sounds. They simply have to be experienced firsthand!

TRIAD excells in the "frills department," too — keyboard or joystick option, game freeze, running high score and more. And a succession of teeth-gritting skill levels is guaranteed to test the eye-to-hand coordination of the most valiant of armchair warriors. Joystick required on Commodore version.

APPLE 2 DOS 3.3 Required Flippy Disk 48K ATARI 400/800
102-0173 $34.95 (£25.49 inc. VAT)

COMMODORE 64 TAPE . . . . . AVAILABLE DIRECT FROM COMMODORE
COMMODORE 64 DISK . . . . . AVAILABLE DIRECT FROM COMMODORE
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APPLE 2

GNOME VALLEY

by Roger Maine

Technology meets geology in GNOME VALLEY, a colorful, graphics-oriented game for your APPLE that looks as though it could've popped right out of the arcade! You are challenged to enter a mysterious cave and defuse a deadly hydrogen bomb. And hordes of crafty gnomes are out in force to ensure that you don't!

Sharp, intricate graphics and sounds ensure that GNOME VALLEY will find a permanent place on your software library's shelf of favorites. Joystick not required, but recommended! For one or two players.

APPLE 2 48K DOS 3.3 . . . . . **042-0219 $34.95 (£25.49 inc. VAT)**

C'EST LA VIE

APPLE
ATARI
COM. 64

by Gordon Eastman

It's a dream come true! The streets are litered with $10, $20 and $50 bills, and you're challenged to collect as many bucks as you can. But there are flies in this financial ointment — thieves and tax men abound. A loan from your friendly neighborhood loan shark may tide you over, but you'd better repay him on time or else!

Great graphics and sounds. For one or two players. Joystick optional.

APPLE 2 48K DISK DOS 3.3	**042-0218**	**$34.95**	**(£25.49 inc. VAT)**
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from page 85

```
550 FOR C=LA TO A STEP 30
560 CLOAD*A,A$
565 FOR P=0 TO 29
566 IFA(P)=1000THEN590
570 POKE C+P,A(P)
575 NEXT P
580 NEXT C
590 RETURN
600 PRINT"EXECUTION ADDRESS";:GO
SUB800
605 IFM=1THENRETURN
610 EXEC A
620 RETURN
700 END
800 M=0:INPUTA$
805 IFA$="P"THENPP=1-PP:GOTO800
810 IFA$="M"THENM=1
820 IFA$=""THENA=0:RETURN
830 IFLEFT$(A$,1)<>"$"THENA=VAL(
A$):RETURN
840 A$=MID$(A$,2)
850 A=0:B=1
860 IFRIGHT$(A$,1)>="A"THENV=ASC
(RIGHT$(A$,1))-55:GOTO870
865 V=VAL(RIGHT$(A$,1))
870 A=A+V*B:B=B*16
880 A$=LEFT$(A$,LEN(A$)-1)
890 IFA$=""THENA$="$":RETURN
895 GOTO860
900 B=4096:C=A/B:D=INT(C)
910 E=D*B:F=A-E:G=256:H=F/G:I=IN
T(H)
920 J=I*G:K=F-J:L=16:M=K/L:N=INT
(M)
930 O=N*L:P=K-O:Q=INT(P)
940 PRINTMID$(H$,D+1,1);MID$(H$,
I+1,1);MID$(H$,N+1,1);MID$(H$,Q+
1,1);" ";
945 IFPP=1THENLPRINTMID$(H$,D+1,
1);MID$(H$,I+1,1);MID$(H$,N+1,1)
;MID$(H$,Q+1,1);" ";
950 RETURN
1000 CLEAR200,20430
1010 FORC=20443TO20478
1020 READA$:GOSUB850
1030 POKEC,A
1040 ENDC
1050 GOTO15
1060 DATA CE,40,00,FF,4F,D7,CE,0
0,00,FF,4F,D9,FE,4F,D9,A6,00,08,
FF,4F,D9,FE,4F,D7,A7,00,08,FF,4F
,D7,8C,42,00,26,E9,39
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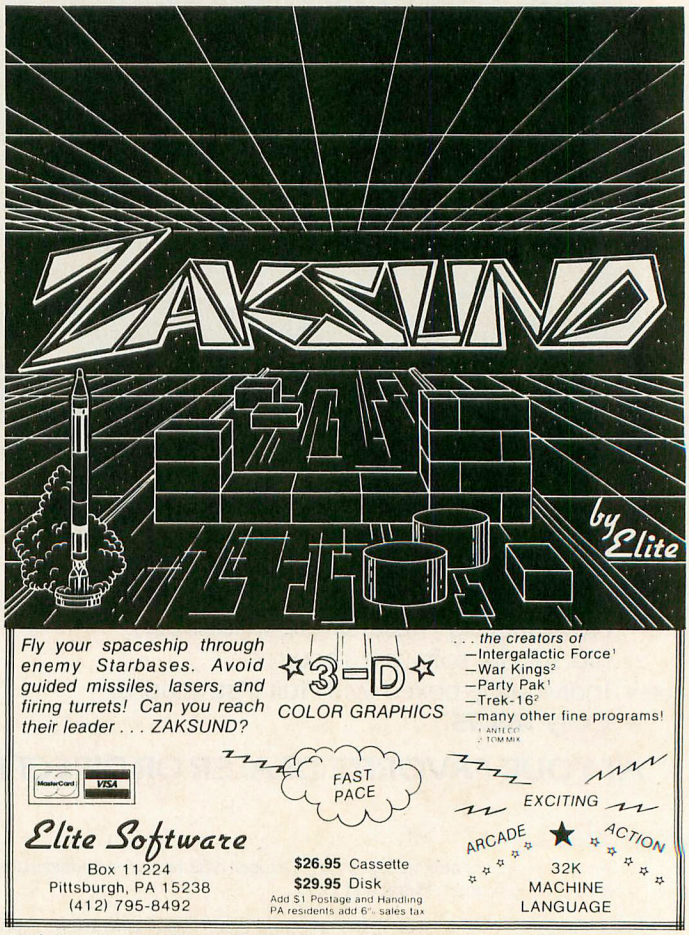

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32K Extended Basic

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By Ken Kalish

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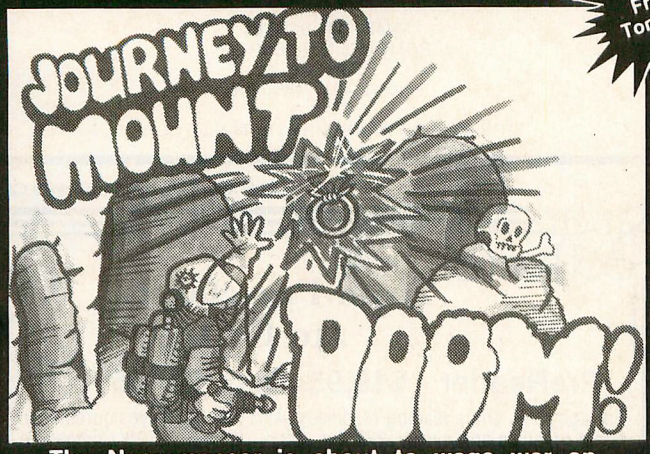

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ARCADE ACTION GAMES

```
130 GOTO 20
200 PRINT"START ADDRESS OF BLOCK
";:GOSUB800
205 IFM=1THENRETURN
210 POKE20450,INT(A/256)
220 POKE20451,A-INT(A/256)*256
230 EXEC 20443
240 A$=INKEY$:IFA$=""THEN240
250 IFA$="W"THENA=A-512
260 IFA$="Z"THENA=A+512
270 IFA$="M"THENRETURN
280 GOTO210
300 PRINT"START ADDRESS";:GOSUB8
00:IFM=1THENRETURN
310 CC=A
320 A=CC:GOSUB900:A=PEEK(CC):GOS
UB900:PRINTCHR$(PEEK(CC));" ";:G
OSUB800
325 IFPP=1THENLPRINTCHR$(PEEK(CC
))
330 IFM=1THENRETURN
340 IFA$=""THEN360
350 POKECC,A
360 CC=CC+1:GOTO320
400 PRINT"START ADDRESS";:GOSUB8
00:SA=A
405 IFM=1THENRETURN
410 PRINT"END ADDRESS";:GOSUB800
:EA=A
415 IFM=1THENRETURN
420 PRINT"READY TAPE RECORDER AN
D PRESS   <ENTER>"
430 INPUT A$
435 IFA$="M"THENRETURN
440 FOR C=SA TO EA STEP 30
445 FOR P=0 TO 29
450 A(P)=PEEK(C+P)
455 NEXT P
460 CSAVE*A,A$
470 NEXT C
475 A(0)=1000
476 CSAVE*A,A$
480 RETURN
500 PRINT"LOAD ADDRESS";:GOSUB80
0:LA=A
505 IFM=1THENRETURN
510 PRINT"END ADDRESS";:GOSUB800

515 IFA$=""THENA=65535
520 IFM=1THENRETURN
530 PRINT"READY TAPE RECORDER AN
D PRESS   <ENTER>"
540 INPUTA$
545 IFA$="M"THENRETURN
```

to page 87

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Circle No. 58 on Reader Service Card

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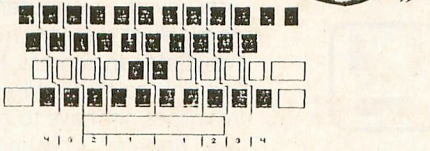
KEYBOARD



KEYBOARD HELPS FAMILIARIZE CHILDREN WITH THE LOCATION OF COMPUTER KEYS. THE GRAPHIC KEYBOARD ENABLES THE USER TO FIND KEYS QUICKLY. HOME KEYS ARE IDENTIFIED AND PROPER FINGERING MAY BE TAUGHT TO OLDER CHILDREN. LESSONS ARE BUILT AROUND ALPHABET PRESENTATIONS AND LETTER DRILLS WITH A GRAPHIC REWARD COMPLETING EACH LESSON. WHILE YOUNG CHILDREN ENJOY KEYBOARD'S LETTER RECOGNITION ACTIVITIES, ADULTS MAY BRUSH UP ON RUSTY TYPING SKILLS. THE 32K VERSION HAS LENGTHIER TIMED DRILLS. DATA TAPE USE IS OPTIONAL WITH BOTH 16K AND 32K VERSIONS. ANY DATA TAPE MADE FOR B5'S SPELLING OR HANGWORD/SCRAMBLE PROGRAMS MAY BE USED WITH KEYBOARD, OR USE KEYBOARD PHONIC DRILL DATA TAPE. (SEE BELOW)

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KEYBOARD Phonic Drill Data Tape - $8.95

INTEGRATE LEARNING WITH USE OF THIS DATA TAPE AND KEYBOARD PROGRAM. STUDENTS TYPE LETTER, WORD, AND SENTENCE DRILLS USING COMMON VOWEL AND CONSONANT COMBINATIONS. REINFORCE PHONIC STRUCTURES WHILE LEARNING THE KEYBOARD. MUST BE USED WITH KEYBOARD PROGRAM (ABOVE). MAY NOT BE USED ALONE.

For use with TRS-80 Color Computer & TDP-100* with Extended Basic*

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Brochure describing other fine B5 programs available upon request.

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B5 Software DEPT. M
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Table 1. Memory Locations and ROM Routines

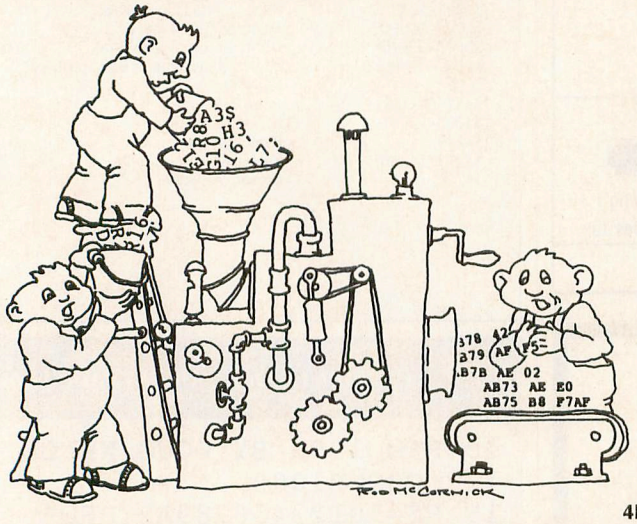
$F83F	FLSCUR	Flash the cursor at the current cursor position.
$F883	POLCAT	Pole the keyboard and return the key being pressed to the A accumulator.
$F9C6	CHROUT	Output a character from the A accumulator to the device pointed to by DEVNUM.
$F9D0	LPTOUT	Output the A accumulator to the printer.
$FA1B	SCNOUT	Output the A accumulator to the screen.
$FAAF	INPLIN	Input a line of text from the keyboard.
$FBD4	CLS	Clear the text screen.
$FBD6	CLSB	Clear the screen with the contents of the B accumulator.
$0003		Bit 0 is serial out, bit 2 is serial in.
$00E8	DEVNUM	Device number.
$4224	BAUD	Baud: $F0 = 300 bps $76 = 600 bps $3C = 1200 bps $19 = 2400 bps $0A = 4800 bps
$0093–$0094		Points to start of Basic.
$0095–$0096		Points to start of variables.
$009B–$009C		Points to top of stack.
$00A1–$00A2		Points to top of user RAM.
$00AD–$00AE		Points to next line of Basic program.
$00EA		Reset flag.
$421F–$4220		Jump for EXEC.
$4280–$4281		Position of cursor.
$4229		Printer width.
$4231–$4236		Keyboard look-up table.
$4282		Cursor character.

Program Listing 1. MC-10 Basic Monitor

```
10 REM 1983 BY DOUG KELLEY
12 'GOSUB1000
15 H$="0123456789ABCDEF"
17 DIMA(30)
20 CLS:PRINT@7,"MICRO MONITOR 1.
0";
30 PRINT@131,"1)  EXAMINE/CHANGE
 MEMORY";
40 PRINT@163,"2)  DISPLAY A MEMO
RY BLOCK";
50 PRINT@195,"3)  SAVE A BLOCK O
F MEMORY";
60 PRINT@227,"4)  LOAD A BLOCK O
F MEMORY";
70 PRINT@259,"5)  EXECUTE A PROG
RAM";
80 PRINT@291,"6)  END PROGRAM";
90 PRINT@360,"ENTER SELECTION";
100 A$=INKEY$:IF A$=""THEN100
110 IF A$<"1"OR A$>"6"THEN SOUND
 1,1:GOSUB100
115 CLS
120 ON VAL(A$)GOSUB300,200,400,5
00,600,700
```

My MC-10 Speaks ML!

Machine language on the MC-10? What won't this little machine do?



4K MC-10

by Tim McFadden and Doug Kelley

IN OUR LAST ARTICLE on the MC-10 we described its features and performance; this time we want to show you how to program in machine language, using a simple Basic monitor program (Program Listing 1). To run the program, type it into the MC-10, save it to tape, then Run it.

When the program is Run, a main menu will appear at the top of the screen. To select any one of the options, press the number corresponding to your choice. When you want to finish the program, press number six to return to the Basic command mode.

If you press number one you will enter the Memory Examine and Modify section. The computer will respond with the prompt START ADDRESS?, to which you respond by entering the number, either in hex or decimal, you wish to start examining. (For a decimal number, simply enter that number, for a hex number, use the prefix $.)

If at any time during the program you wish to return to the main menu, press M followed by pressing Enter. After you have entered your start address the computer will respond with the hex address; the contents of the location in hex; the ASCII symbol for the number in memory (if there is one); and will then prompt you for a response. You may either press Enter to indicate no change, or the number to which you wish to change the contents. As always, entering an M will return you to the menu, and a P will toggle the printer on/off switch.

Pressing number two, while in the main menu, will put the program into a Memory Block Display mode. The computer will ask you what memory location you want to examine, and you may respond with the decimal or the hex value. Again, as always, you may press M or P. The screen will immediately fill, starting with your location on the top left of the screen. The display will continue to update until the letter M is pressed.

To advance to the next page of memory, press the Z key, and to go to the previous page of memory, press W. Notice the Up and Down Arrows on the W and Z keys, to help you remember which key pages in which direction.

Memory Blocks

Since the MC-10 has no built-in CSAVEM command, the monitor lets you save a block of memory to cassette tape. To enter this mode, press the numeral three key, and the computer will ask you the start address of your data. Respond with the hex or decimal location, or the P or M keys. Do the same for the END ADDRESS? prompt. The computer will next tell you to ready the cassette recorder and press Enter. If you wish to name your file, do so before you press the Enter key. The computer will save the block of memory, then return you to the main menu.

Loading a block of memory is done by pressing the numeral four key. The computer will respond with: LOAD ADDRESS?; you should answer as you did for the START ADDRESS? prompt in the Save mode. The computer will then ask for the ending address of the data. If you hit the Enter key, the computer will load the entire block of memory from cassette, but if you Enter an address, the computer will load only to that address. The Load address does not have to correspond to the Save address, creating an additional block move feature. The computer will once again ask you to set up the tape recorder and press Enter. If you do not specify a file name, the computer will load the next section of data on the cassette.

Executing a program in memory is done by pressing the numeral five key. The computer will present a prompt: EXECUTION ADDRESS?, to which you should respond with the address of the memory location to which you wish to transfer control.

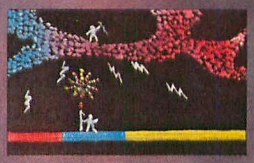
To aid in your programming efforts, here are some useful undocumented ROM routines found in the Micro Color Basic Interpreter. Also included in Table 1 are some memory locations you may find useful. ■ ■ ■

Programs

Circle No. 56 on Reader Service Card

AARDVARK *Action Software*

PRESENTS. . .



ZEUS

WITHOUT QUESTION, ABSOLUTELY —

The Fastest

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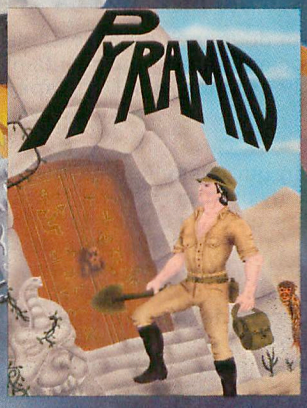
AVAILABLE, THAT WE KNOW OF.

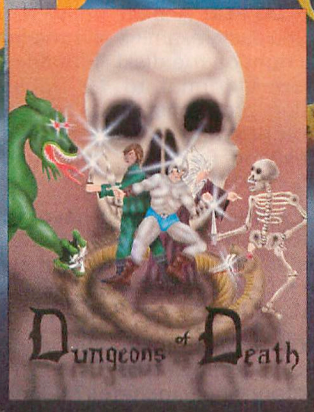
FAST AND FURIOUS. You become the wizard fighting off the thunderbolts of an angry Zeus. Multiple action. Are you good enough to keep up as the difficulty increases wave after wave. Hours of challenging fun. This is one game you may never completely master.

AVAILABLE ON: TRS-80C(16K), CMD 64, VIC 20(13K)
STOCK #1007 TAPE:$24.95 DISK: $29.95



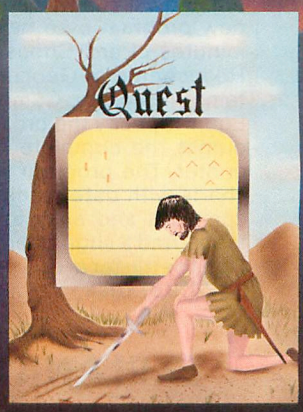
PYRAMID... Our toughest and most intrigueing adventure. Average time though the pyramid is 50-70 hours. Clues everywhere and some very ingenious problems. This one is popular around the world.

AVAILABLE ON: TRS-80C (16K) CMD 64 VIC 20 (13K) TIMEX/SINCLAIR TI/99-4A
STOCK #5002 TAPE: $19.95 DISK $24.95



DUNGEONS OF DEATH. . .A serious D & D type game for you up to 6 players at a time. You get a choice of race and character, on screen mapping of the maze, a chance to grow from game to game, and a 15 page manual. Requires extended basic on TRS-80C.

AVAILABLE ON: TRS-80C(16K), CMD 64, VIC 20(13K), TRS-80C 32K DISC
STOCK #7001 TAPE: $19.95 DISK: $24.95



QUEST. . . A different kind of adventure. Played on a computer generated map of Alesia. You lead a small band of exployers on a mission to conquer the Citadel of Moorlock. Takes 2-5 hours to play and is completely different each time.

AVAILABLE ON: TRS-80C(16K) CMD 64
VIC 20(13K) TIMEX/SINCLAIR TI99/4A, EXTENDED BASIC REQUIRED ON TI
STOCK # 7007 TAPE: $19.95 DISK: $24.95

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

STOCK #7006 TAPE: $24.95 DISK: $29.95

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IS AVAILABLE AT SOFTWARE RETAILERS EVERYWHERE. IF YOUR LOCAL COMPUTER OR SOFTWARE STORE DOES NOT CARRY IT — ASK THEM WHY NOT. SEND ONE DOLLAR FOR ILLUSTRATED CATALOG. DEALER INQUIRES INVITED.

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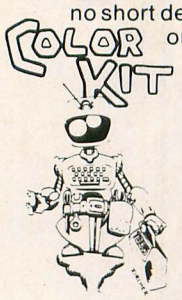
UTILITIES

COLORKIT: What can we say about the absolute best state-of-the-art programmer's utility. This program adds 35 commands to BASIC that should have been there all along and no short description will do it justice. Summary - light or dark screen, keyclick, screen editor, programable keys, a super memory tool, variable listing, echo to printer, BREAK disable, convert machine language to DATA, global search, single step thru program run, double space printouts of program listings - that's less than half of what it will do. It takes about 6K of space, and if you have 64K you can put it up high and lose no BASIC space at all. 100% ML. Fully relocatable. **Tape - $34.95, Disk - $39.95**



APPLICATIONS

PRICKLY-PEAR MAILING LIST: This mailing list program will handle up to 1500 records per file and will sort by name or zip code. It searches on any field and all display is in a hi-res upper and lower case format. There is no better mail list program. Needs 32K and 1 disk drive. B & ML. **$49.95**

MUSIC BOX: Compose your music in 4 voices and let the harmony flow. You can assign any of 4 instruments to each voice, and the program is truly easy to use. 100% ML. **Tape - $24.95**

EIGHT-BIT BARTENDER: Over 100 drink recipes, and you can call them up by name, category, or main liquor. The author's liver risked death to bring you this program. Needs 32K. B & ML. **Tape - $19.95, Disk - $24.95**

HOUSEHOLD HELPER: This gem does recipe conversions, metric conversions, gasoline computations, and maintains a bills due file. A very friendly program. B & ML. **Tape - $19.95, Disk - $24.95**

NEW **SUPER ASTROLOGY:** Everything our customers have written and asked for in an astrology program is here! This all new program by a new author gives accuracy to a few minutes of arc. Choose from tropical or sideral zodiacs, Heliocentric or Geocentric, and five different house systems - Placidus, Campanus, Regiomontanus, Koch, and Equal. Specify the orb for aspects, find any harmonic, and output the complete natal horoscope to the screen or printer. The program will handle progressed and transit charts with date manipulation. This program comes with complete and easy to follow instructions, sample chart forms, and a suggested reading list to aid in interpretation. Don't settle for a lesser program! Needs 32K. B & ML. **Tape - $24.95, Disk - $29.95**

EXPLANATION OF CODES

BASIC: This program is 100% BASIC. That means it is easy to examine and easy to modify. BASIC is the best language for some applications.

B & ML This program is written mostly in BASIC, but some routines are in machine language for more speed. May be harder to examine or modify than an all BASIC program.

100% ML This program is all machine language for fastest possible execution. Examination or modification will require a high skill level.

EDUCATIONAL PROGRAMS

PREREAD I, II, & III: This program uses graphics and voice from the tape to teach the alphabet three ways - by name, by sound, and by shape. B & ML. **Tape - $24.95, Disk (with voice tapes) - $29.95**

PHONICS I: Teaches all the consonant blends phonetically, using graphics and sound from the tape. B & ML. **Tape - $24.95**

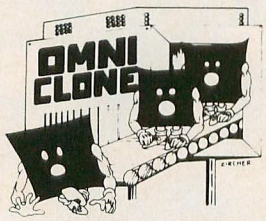
PHONICS II: Like Phonics I, but teaches the consonant digraphs. B & ML. **Tape - $24.95**

PHONICS I & II ON DISK: A package that includes both of the above in a disk format. Still has voice on tape. B & ML. **Disk only (with voice tapes) - $44.95**

NEW **SPELLING:** Six tapes provide voice testing and practice modes for the entire 220 word Dolch list which makes up 75% of all elementary written material. Eleven lessons, and the testing is by VOICE, just like in class. The disk version can be easily modified to include new words. B & ML. **Tape -$49.95, Disk (with voice tapes) - $54.95**

MATHPAC: Provides drill and positive reinforcement of addition, subtraction, multiplication, or division. Lots of extras for repeating, setting levels, and classroom use. **Tape - $19.95, Disk - $24.95**

DISK UTILITIES



OMNI CLONE: This program even amazes us. It backs up every color computer disk we have seen, and has even backed up disks for the Model 3 and IBM PC. Protect your valuable collection against loss with this super power backup utility. Easy to use. Needs 32K and at least one disk drive, but works with two drives if you have them. 100% ML. **$39.95**

DISK ZAPPER: A neat utility that lets you easily examine and change data right on the disk! Rebuild directories, format to 40 tracks, change programs, store backup directories, and more. Needs two drives and 64K for some functions. B & ML. **$34.95**

DISK MANAGER: If you have an extensive software collection, this program will create an alphabetical listing so you can find what you want. It also prints a super directory with ML addresses and gives you three ways to recover a crashed disk! Needs 32K and 1 disk drive. B & ML. **$29.95**

DISK MASTER: Eight functions, including drive speed check and adjust, moving DATA files to and from disk and tape, a directory which includes ML addresses, two different disk maps, and an easy mass copy utility. Needs one disk drive and 32K. B & ML. **$24.95**

PUBLICATIONS

SONGBOOK: The PLAY statements and lyrics for over 200 songs. Type them in and just listen, or use them in your own programs. Hymns, popular songs, fold songs, college marches, holiday songs, and lots more. About 100 pages, soft cover, plastic ring binder. **$9.95 - quantities limited.**

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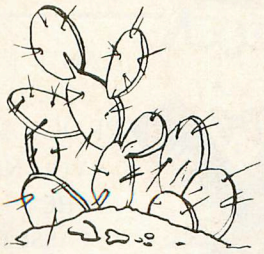
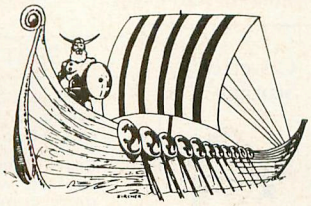


PRICKLY-PEAR SOFTWARE

QUALITY PROGRAMS FOR YOUR COCO & TDP-100

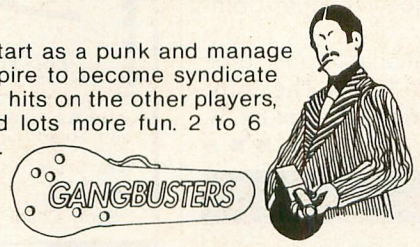
PROGRAMS REQUIRE 16K EXTENDED BASIC FOR TAPE, AND 32K DISK UNLESS OTHERWISE NOTED.

SIMULATION GAMES



VIKING: Run your country well and become king or queen. This is the most complex simulation we've seen. Takes 2 or more hours, has 9 levels, and is for 1 to 4 players. B & ML. **Tape - $19.95, Disk - $24.95**

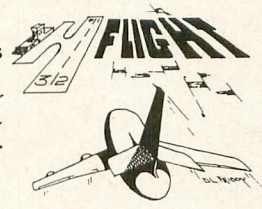
GANGBUSTERS: Start as a punk and manage your criminal empire to become syndicate boss. Steal, make hits on the other players, go to prison, and lots more fun. 2 to 6 players. B & ML. **Tape - $19.95, Disk - $24.95**



FOOTBALL: A strategy approach. Offense and defense choose their plays, and the results are calculated by past averages and some chance. Truly a football lovers simulation. B & ML. **Tape - $19.95, Disk - $24.95**

SIMULATIONS

FLIGHT: Not a game, but a hi-res graphic landing simulator. Choose 4 levels of instrument or regular landings, with or without cross-winds. Needs 32K. B & ML. **Tape - $19.95, Disk - $24.95**



FANTASY GAMING APPLICATIONS

(These are not games)

FANTASY GAMER'S PACKAGE: All versions have a 20 page manual and display hi-res rooms and roll complete stats for characters and monsters. 32K version also has a dice-bag for instant dice simulations in 36 ranges. Disk version has dicebag and complete dragon and ring rollers. B & ML. **Tape - 16K $19.95, 32K $24.95; Disk - $29.95**

FANTASY MASTER'S SECRETARY: For use during play, this will easily keep track of characters, monsters, time, treasure, magic, and more. B & ML. **Tape - $19.95, Disk - $24.95**

ADVENTURE

ADVENTURE IN WONDERLAND: Simply the best adventure ever written for the color computer. A full Eliza intelligence so you can enter whole sentences. At least three ways out of any trap. A vocabulary of HUNDREDS of words. Needs 32K. 100% ML. **Tape - $24.95, Disk - $29.95**

WORD GAMES

THE GREAT WORD GAME: 2 to 4 players compete using words they have chosen. Each player tries to guess the opponents' words while the opponents do the same. B & ML. **Tape - $19.95, Disk - $24.95**

TOPSY TURVY: Race against the clock to form as many words as possible from the letters you are given. Lots of bonus scoring for longer words. BASIC. **Tape - $19.95, Disk - $24.95**

NEW! **DECIPHER:** For 1 or more players. Multiple players choose their words, while single players let the computer choose from hundreds stored in memory. You must unscramble the word or phase while the clock runs. This is the best available word game! 100% ML. **Tape $24.95, Disk - $29.95**

JOYSTICK GAMES

TEEEOFFF: The only really outstanding golf game for the color computer. All in hi-res, and you move your golfer (a little person) up to the ball and then control his backswing with the fire button. Very challenging, with water and sand - even giant cactuses. 1 to 4 players. 100% ML. **Tape - $24.95, Disk - $29.95**

SHAFT: The ultimate in "dodge the moving object" games. Really tough, with 15 screen patterns to learn and ascending difficulty. 100% ML. **Tape - $24.95, Disk - $29.95**

MISCELLANEOUS GAMES

MONSTERS & MAGIC: Fight your way thru up to 50 different monsters using a realistic fantasy combat system (initiative - damage by weapon type - levels - etc.), and then try to defeat the dungeon lord. 1000+ place description combinations. For 1 player, needs 32K. BASIC. **Tape - $19.95, Disk - $24.95**

JUNGLE: Take a journey into trouble. This game gives Murphy's law new meaning, and in this magical jungle, many things are only illusions. A very nice game, and easy enough for the younger set. BASIC. **Tape - $19.95, Disk - $24.95**

ADULT GAMES

THE NAKED GAMER: Nothing obscene - just two great games in which the losers are told to remove items of clothing. One game is a fast moving joystick type, while the other is a logic game. These games are terrific even if you keep your clothes on! B & ML. **Tape - $21.95, Disk - $26.95**

from page 77

any of you used the MC-10 for this purpose? Let us know!

Books

If catching up on practically everything there is to know about computers is your goal, a book from McGraw-Hill is "must" reading. Before you head to the nearest bookstore be sure to check your expendable funds. The book carries a hefty $79.50 price tag! While that is not a small price for a book, the amount of information contained in its 30 chapters is almost exhaustive.

The *McGraw-Hill Computer Handbook* assumes the reader has no prior knowledge of computer science. However, there are portions of the book that only those who are more familiar with the technical aspects of computers will understand.

The contents include computer theory, history, computer structures, peripherals, databases, networks, computer graphics, artificial intelligence, and computer communications, among many other topics. There are also chapters on languages, including Basic, Cobol, Fortran, Pascal, and PL/1.

This book would be helpful to someone who wants to become familiar with computers in a more sophisticated manner. The price tag should send you to the library first to determine whether this book belongs in your personal library.

Another month has passed and before long Thanksgiving will be here. Your ideas on Color Logo have been conveyed to Bill Gattis, Radio Shack's Education Director. Mr. Gattis has indicated sincere interest in your ideas, and I am certain they will be considered.

Next month some new ideas, including a feature on a computer lab furnished by the Gusdorf Furniture Company.

This is your educational forum, so be sure to write us: Goto School, **The Color Computer Magazine,** P.O. Box 8276, Akron, Ohio 44320. ■ ■ ■

Vector Addition

AFTER A LONGER than anticipated wait, Radio Shack has finally produced software that can be used in a high school curriculum. This new effort will provide an added dimension to the educational use of the Color Computer. "Vector Addition" is only one of several programs that can be used at the secondary level.

"Vector Addition" is a math and physics program that incorporates vector concepts. It was written to help students master the concepts without overemphasizing the mathematics involved. Before using this program, be certain you are familiar with vectors, including addition by the tip-to-tail method and addition by the parallelogram method.

The Vector Addition manual is divided into three sections — User's Guide, Selected Investigations, and the Answer key.

The User's Guide lets the student work through sample problems in order to become familiar with the program. The first sample problem is as follows: "Imagine that you take a walk in a city with square blocks. You walk two blocks south, three blocks east, five blocks north, four blocks west, two blocks north, two blocks west, and nine blocks south. If a crow were to fly from your starting point directly to your finishing point, how far would it need to fly and in what direction?" Helpful hints follow to help the user solve the problem.

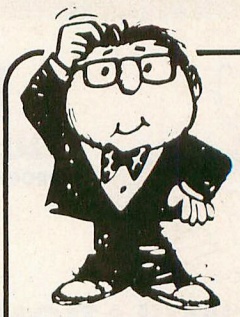
The second section contains selected investigations. This section groups problems according to topic. The topics include: fundamentals of vectors, displacement, velocity and acceleration, force, gravitation, conservation of momentum, electric forces and fields.

The final section is the answer key, which includes the correct responses to the problems in selected investigations.

Vector Addition is available on disk or tape. On tape it requires 16K Extended Basic, on disk a 32K Color Computer.

The manual is comprehensive and contains an expanded Appendix which includes "Appropriate Applications." The appropriate applications material describes how schools can best use this program. Some suggestions include: a learning lab with several computers staffed with someone to help students load and run programs and record scores; placement of computers in a regular classroom for use with individual students; checking computers out to students as a library book is checked out; and school library computer use by schedule.

Vector Addition can be used with a network system, allowing from one to sixteen computers to be used at once. Note that this is a preliminary description of the program; I suggest that one of our talented math readers review the program from a technical perspective. ■ ■ ■



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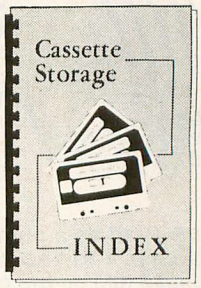

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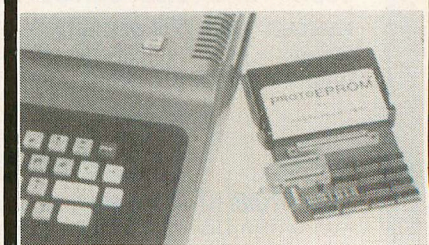

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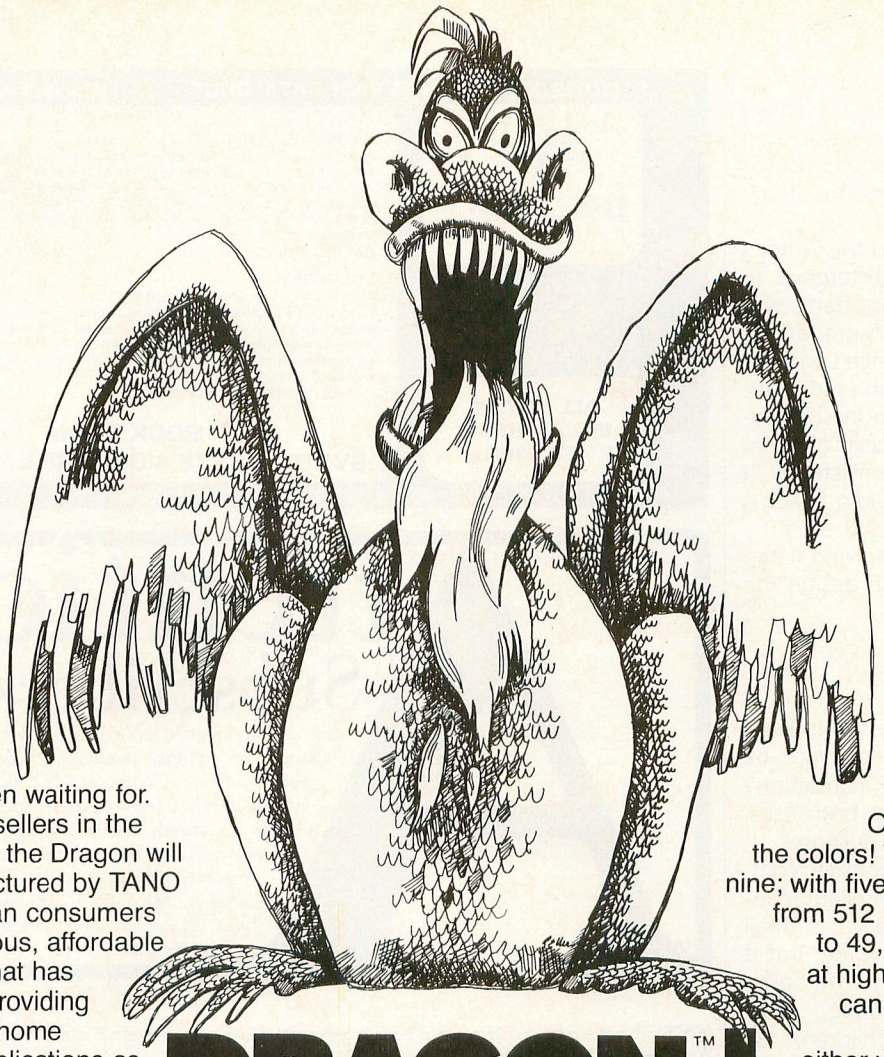

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cosine, and square root functions. These are beautiful Logo applications, which are most unfortunately unavailable in Color Logo. After some serious use of Color Logo I see this as a serious shortcoming."

I do not take exception to the writer's comments (although my reference to floating decimal as unimportant was only for the lower elementary grades). As a matter of fact, I agree. Once Logo has been introduced in the schools older students will need to perform more sophisticated operations. This criticism of Color Logo is one I have heard consistently. It is my understanding that Radio Shack is working on an enhanced Logo.

Finally, a Happy Thanksgiving Logo idea. Why not see who can design the most creative turkey?

MC-10

Should the computer be used to learn programming, or should software be used for computer assisted instruction? There is plenty of room for both uses, and for educationally sound purposes.

The MC-10 is an inexpensive computer that comes with an excellent manual. Admittedly, the keyboard is small and doesn't lend itself to typing, but it can be used most effectively with "one-finger" typists (for example, most elementary school-aged children). By using the MC-10 in higher elementary grades, it can be an excellent programming tool.

You can purchase 15 MC-10's for approximately $1200, the approved school discount price. While not the "best" use of the MC-10, 15 black and white television sets can be purchased for approximately $750. Thus, for less than $2000, you can install a computer lab of 15 computers. By limiting the use of the MC-10's to programming only, black and white televisions will be adequate.

Consider using the MC-10 in Grades 4 and 5 or maybe even just Grade 5. Your computer curriculum could list Grade 5 with programming as the highest priority. The 4K memory should not prove inadequate at this grade level. Your other Color Computers can then be used with available software, and with 15 MC-10's you should have an adequate supply of computers to work with one class at a time.

By combining Logo instruction in the lower grades, available software to supplement instruction on the Color Computer, and more sophisticated uses of Logo in the intermediate grades with programming on the MC-10, you have developed a substantial foundation for computer literacy in grades K – 5. Have

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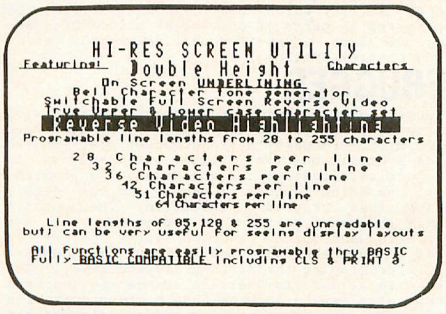

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American," published by Grolier Inc. "Academic American" consists of 21 volumes and nearly 28,000 articles. This is not the equivalent of a large encyclopedia, but it is a large data bank which will be continuously expanded and updated. The updating feature is especially attractive; it will provide the most recent information on the topic being researched.

Research is conducted easily. Each research topic has a menu which helps the user find the necessary information without having to read through impertinent material. Cross references assist in finding related information.

"Academic American" is *not* a substitute for thorough research. CompuServe has made an excellent resource available, but it does not provide all the ingredients necessary for a complete report. One problem is the lack of illustrations; also, the depth to which each topic is covered may not be as thorough as the printed material in an encyclopedia or resource book.

The electronic data bank is going to become an important ingredient in home and school education. My primary concern is whether the cost will prevent schools from making this service available to students.

Logo

Color Logo has been a welcome addition to the software available for the Color Computer. This language is essential for young learners. When evaluating Color Logo, remember that it is one of the lowest-priced versions available, and therefore some features contained in more expensive Logo versions do not appear in Radio Shack's Color Logo. This should not present a major problem during the first year of Color Logo use because it will be new to everyone. The future will necessitate an updated version which will include (at the very least) a floating decimal point. This will be essential for Logo use in intermediate to upper grades.

Here are some comments on Color Logo from an interested educator in Davis, California. "I think, as you do, that Logo is an invaluable aid for teaching what computers can do; for an excellent introduction to programming; and to simply have fun. However, I strongly disagree with you when you state that the floating decimal is unimportant. True, in the elementary grades, say K – 4, it is unimportant. Thereafter decimals become important in the math curriculum and should be implemented in Logo. Later on they become even more essential to the full use which can be made of Logo. I refer to simple programs to create sine,

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COLOUR SOFTWARE WORKBENCH

The Colour Software Workbench is a complete software development system for those who wish to do comprehensive program development on their TRS-80 Color Computer. The Colour Software Workbench transforms the TRS-80 Color Computer from a "BASIC Machine" into a "Real Computer System" by providing Color Computer users with the same tools and facilities used by professional programmers in the field. For those who want to program in an English-like language but don't want to pay the price of slow program execution, the Colour Software Workbench is ideal. The Colour Software Workbench allows Color Computer users to write their programs in the familiar English-like expressions of PASCAL while achieving the execution speeds of machine language with the Colour PASCAL Compiler.

TEXT EDITOR

The Colour Text Editor is a screen mode, in-memory, text editor which provides its users with a selectively moveable "window" into a text file. The Colour Text Editor was designed primarily for the development of program source code, but it can also be used in conjunction with some text formatting capabilities (which you "install" as a learning exercise) for the production of software documentation. As an example, this text and the CSW User's Guide were both developed with and produced by the Colour Text Editor and the "Text Formatter".

The Colour Text Editor is an excellent tool for developing PASCAL and ASSEMBLER source programs. The Colour Text Editor manipulates blocks of text efficiently and minimizes delays imposed by the speeds of I/O devices such as the Color Computer's floppy disk drive(s) or cassette tape recorder. The Colour Text Editor provides automatic left-right/right-left and up-down/down-up scrolling in conjunction with powerful FIND and CHANGE commands. Additional commands facilitate the replication of text blocks as well as their bulk movement within a text file. Text files created with BASIC are compatible with the Colour Text Editor. With the Colour Text Editor text files can be read and optionally merged from either cassette and/or disk and may then be written to either cassette, disk, or the printer. It should be mentioned that all of the keys have an auto-repeat capability.

PASCAL COMPILER

The Colour PASCAL Compiler is a fully recursive PASCAL language compiler which processes PASCAL program statements into machine executable binary for the TRS-80 Color Computer's 6809 micro-processor. The Colour PASCAL Compiler provides Color Computer programmers with PASCAL as an ideal "Systems Programming" language or the ability to write programs in the English-like "High Level" expressions of PASCAL without any sacrifice of program execution speeds. The Colour Text Editor, 6809 Macro Assembler, and Colour Linker were all written in PASCAL and produced by the Colour PASCAL Compiler and they, like the ROM Monitor software of the TRS-80 Color Computer, are machine executable programs.

The Colour PASCAL Compiler is a device-independent software package designed to economically translate PASCAL source programs into efficient 6809 micro-processor machine programs in one pass. Program source files may be read from either cassette or disk with the resulting machine program object files written to either cassette, disk, or the serial I/O port. The Colour PASCAL Compiler parses and evaluates PASCAL language statements and declarations and generates the corresponding 6809 micro-processor machine programs in accordance with "Standard PASCAL" language syntactical rules and conventions. The Colour PASCAL Compiler supports all "Standard PASCAL" features with the major exceptions being real or floating point arithmetic and pointers. Many University of California at San Diego (UCSD) PASCAL features are also supported in conjunction with some additional comprehensive extensions which enhance both the PASCAL language and its TRS-80 Color Computer implementation. The Colour PASCAL Compiler is also equipped with powerful compiler directives and comprehensive source listing aides, such as meaningful error messages and optional corresponding assembler language representations of all PASCAL statements.

OBJECT LINKER

The Colour Linker is a program which reads the program object files produced by both the Colour PASCAL Compiler and 6809 Macro Assembler and converts them into machine executable binary image files, "Load Modules", suitable for loading with the Color Computer's LOADM command. The Colour Linker can also read multiple program object files and combine them into one larger machine executable binary "Load Module" so as to allow Color Computer users to develop very large programs one piece at a time. The Colour Text Editor, Colour PASCAL Compiler, 6809 Macro Assembler and Symbolic On-Line Debugger, were all developed with the Colour Linker.

The Colour Linker is an excellent tool for the development of "Load Modules" from either or both PASCAL and ASSEMBLER object files. The Colour Linker is a device independent software package, comparable to linkage editors found on industry computers. It is capable of linking up to thirty program object files into one machine executable load module. Up to three hundred public symbols can be defined for all object files to be linked by the Colour Linker. The Colour Linker supports object code relocation, automatic Colour Software Run Time Library module inclusion, and a built in Symbolic On-Line Debugger interface. All machine executable binary load modules produced by the Colour Linker are compatible with the Color Computer's BASIC monitor, and, during their production, the Colour Linker generates load maps and error messages so as to report the status of any linking operation.

The Colour Software Workbench requires a TRS-80 Color Computer to be configured with at least 32K of memory, Extended Disk BASIC, and one floppy disk drive.

The Colour Software Workbench is a complete set of software development tools designed to support a programmer through the process of creating computer programs; from the entering of source code through the execution of the resulting machine program. The Colour Software Workbench is comprised of the following software packages:

MACRO ASSEMBLER

The 6809 Macro Assembler is a Motorola compatible macro assembler which processes Motorola 6809 Assembler language program statements into machine executable binary for the TRS-80 Color Computer's 6809 micro-processor. The 6809 Macro Assembler makes it easy to write Motorola assembler language programs which are compatible with PASCAL programs developed with the Colour PASCAL Compiler. The 6809 Macro Assembler is a powerful tool which enables Color Computer users to develop programs which are best suited for assembler language implementation. The Colour PASCAL Compiler and Symbolic On-Line Debugger were both written in Motorola 6809 Assembler language and produced by the 6809 Macro Assembler. The 6809 Macro Assembler fills any software development gaps not closed by the capabilities of the Colour PASCAL Compiler so that in its entirety, the Colour Software Workbench will support any program development effort that a Color Computer user may wish to attempt.

The 6809 Macro Assembler is a device-independent software package designed to economically translate Motorola 6809 Assembler source programs into 6809 micro-processor machine programs in two passes. Program source files may be read from either cassette or disk with the resulting machine program object files written to either cassette, disk, or the serial I/O port. The 6809 Macro Assembler parses and evaluates Motorola 6809 Assembler language statements and declarations, and generates the corresponding 6809 micro-processor machine programs in accordance with Motorola 6809 Assembler language syntactical rules and conventions. The 6809 Macro Assembler's powerful macro facility allows Color Computer users to define their own "Macro" instructions; the ability to write an assembler language subroutine using only one macro instruction to identify it in the source program. Each Macro instruction defined to the 6809 Macro Assembler may have up to nine parameters for argument passing between macro subroutines. The 6809 Macro Assembler's object code format provides for program relocation, separate assembly, and easy interfacing to PASCAL via the Colour Linker. The 6809 Macro Assembler supports all Motorola 6809 Assembler mnemonics as well as several declaration extensions which simplify the interfacing of 6809 Assembler programs to PASCAL programs at the source code level. The 6809 Macro Assembler is also equipped with powerful assembler directives such as the COPY facility which provides the ability to include other source programs as parts of one larger source program. Source listing aides include such essentials as meaningful error mesages and source listing control options.

SYMBOLIC DEBUGGER

The Symbolic On-Line Debugger, when linked to a program developed with the Colour Software Workbench, provides its users with a "window" into the Color Computer's 6809 micro-processor's execution of that program at the machine level. The Symbolic On-Line Debugger was designed to allow a programer to selectively control the execution of a program, see the actual contents of the Color Computer's memory and the 6809's internal registers during that program's execution. The Symbolic On-Line Debugger's user may reference sections of a program with the same symbolic names that were used in the programs source code rather than with memory addresses so that the user need not be a computer wizard in order to debug a program at the micro-processor level. The Symbolic On-Line Debugger also allows its users to change the contents of both the Color Computer's memory and the 6809 micro-processor's internal registers so that temporary program fixes and experiments can be performed as the program is being executed.

The Symbolic On-Line Debugger is an excellent tool for debugging machine programs developed in either PASCAL or ASSEMBLER. The Symbolic On-Line Debugger allows a user to stop and start a program under test at almost any point. Once the program under test has been stopped, the Symbolic On-Line Debugger allows the user to select any memory location or micro-processor register for the display of its contents. The Symbolic On-Line Debugger user may then select any memory location or micro-processor register and enter a new value for replacement of the previous value. For example, when entering a number for a contents replacement, an expression may be entered which is converted and stored by the Symbolic On-Line Debugger. The Symbolic On-Line Debugger provides a "Trace" facility which lists all of the active procedures within a program, by name, in order of their activation by the 6809 micro-processor, thus providing a "procedure call" history. The Symbolic On-Line Debugger automatically preserves the screen of the program under test whenever that program is stopped, and automatically restores the screen of the program under test whenever that program is restarted. This makes the Symbolic On-Line Debugger very handy for use with applications using graphics.

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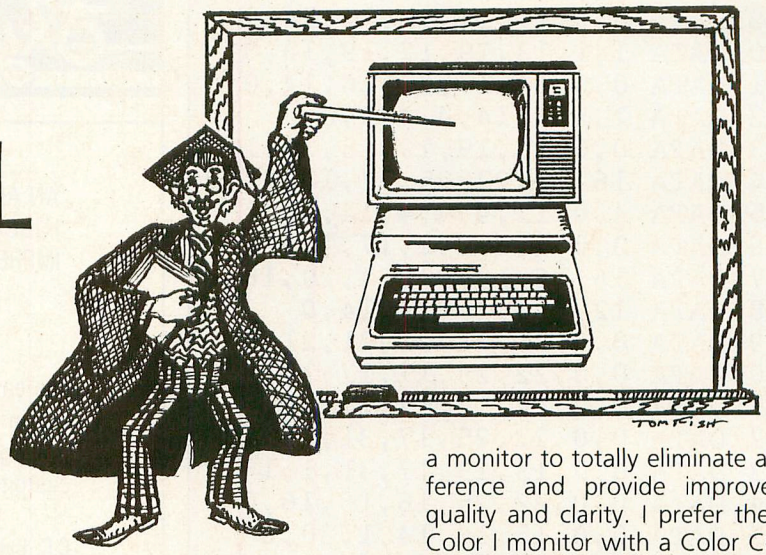

by Dr. Paul Kimmelman

MANY PEOPLE SEEM TO view the computer as a cure for all the educational ills that befall us. Not so! We really don't know whether there will be long-term effects on the learning process through the use of computers.

There is evidence that learning with a computer is rapid, i.e., students "catch on" more quickly than with conventional teaching methods. The question is whether the material will be *retained* by the student. I am always amazed at how quickly younger children grasp the concept of a complicated video game. Caution is needed, however, when introducing new material; even if students have shown evidence they understand the material, be sure to use follow-up activities that reinforce learning over an extended period of time.

Good math programs serve as examples of what I am saying. For example, when introducing math through the Bertamax programs, the teacher can offer beginning level math material and build with more complex problems. An outstanding feature of the Bertamax materials is the review capability offered with the series.

A second concern I have is the *impact* of the computer configuration on learning. St. John's University has been involved for many years in learning styles research, in a project directed by Dr. Rita Dunn. Briefly, this research has demonstrated that some children learn best alone, some in pairs, some in small groups, some with adults teaching them, and some in a variety of ways. There are other factors that also affect learning. There is a distinct possibility that placing a child in a computer-oriented learning environment, that is not articulated with his learning style, may be detrimental or at least an obstacle to his learning successfully.

I believe learning style research on computers is an area that needs to be explored in controlled experimental situations. Next month I will provide a detailed explanation of the learning styles concept.

Television or Monitor?

A frequently asked question is: What kind of TV or monitor should I use with my Color Computer? I hear this question most often from school administrators who are operating under limited budgets. In my opinion there are two different responses to this question, one offering better results but costing more money.

The school district where I work purchases off-brand 13-inch color televisions for approximately $190 each. The televisions normally carry a one-year warranty, and are purchased from reputable appliance dealers. After one school year of use we have found these televisions remain dependable and adequate. It must be emphasized, however, that the color, clarity, and interference are sometimes bothersome, but when balancing cost versus results we had to place cost as our highest priority. These $190 televisions could not be compared to the Radio Shack or Sony 13-inch models that sell for almost double the price, or to the Amdek Color I monitor.

The preferred method would be to use a monitor to totally eliminate any interference and provide improved color quality and clarity. I prefer the Amdek Color I monitor with a Color Computer Audio/Video Interface from Cheshire Cat Computer Creations. If cost is not a major factor this should be the preferred alternative, especially if character resolution is essential for your computer use. The Cheshire Cat cable is unique because you can not only use a color monitor, but also a monochrome monitor alongside it. The cable has three output ports, one for color, one for monochrome, and one for audio.

Monochrome monitors are ideal for word processing. They produce crisp, clear letters without "bleeding."

The Cheshire Cat cable is easy to install and sells for approximately $30. The Amdek Color I sells for approximately $350.

A monitor is *not* a television receiver: you cannot use it to view different stations unless it is connected to a tuner.

CompuServe

The computer is rapidly changing the way information is retrieved. It has been traditional to have a set of encyclopedias in the home to help children with school assignments. School libraries usually purchase several sets of encyclopedias for their resource sections. The encyclopedia is still a common means of educational research, but the computer is beginning to enter this field.

Picture your child coming home for dinner and announcing he has a report on weather due the next morning. The library is closed and you have no books on weather in your house. However, you do have a Color Computer, modem, and a membership in CompuServe: you can resolve the problem with relative ease.

CompuServe offers the "Academic

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```
10096 DATA 0,0,0,0,0,0,0,0
10097 DATA 0,0,14,1,15,17,15,0
10098 DATA 16,16,22,25,17,25,22,0
10099 DATA 0,0,14,17,16,17,14,0
10100 DATA 1,1,13,19,17,19,13,0
10101 DATA 0,0,14,17,31,16,14,0
10102 DATA 2,5,4,14,4,4,4,0
10103 DATA 0,0,13,19,19,13,17,14
10104 DATA 16,16,22,25,17,17,17,0
10105 DATA 4,0,12,4,4,4,14,0
10106 DATA 0,0,1,0,1,1,17,14
10107 DATA 16,16,18,20,24,20,18,0
10108 DATA 12,4,4,4,4,4,14,0
10109 DATA 0,0,26,21,21,21,21,0
10110 DATA 0,0,22,25,17,17,17,0
10111 DATA 0,0,14,17,17,17,14,0
10112 DATA 0,0,22,25,17,31,16,16
10113 DATA 0,0,13,19,17,31,1,1
10114 DATA 0,0,22,25,16,16,16,0
10115 DATA 0,0,15,16,14,1,30,0
10116 DATA 4,4,31,4,4,5,2,0
10117 DATA 0,0,17,17,17,19,13,0
10118 DATA 0,0,17,17,17,10,4,0
10119 DATA 0,0,17,17,21,21,10,0
10120 DATA 0,0,17,10,4,10,17,0
10121 DATA 0,0,17,17,31,1,17,14
10122 DATA 0,0,31,2,4,8,31,0
```

Program Listing 2. Eight by Nine Character Generator

```
100 '8 BY 9 TEST GENERATOR
110 PMODE 4,1
120 SCREEN 1,0
130 PCLS
140 VV=0
150 FOR YY=0 TO 20
160 FOR XX=0 TO 31
170 TS=&H3800:GP=&HE00
180 GOSUB 230
190 VV=VV+1:IF VV=123 THEN VV=0
200 NEXT XX
210 NEXT YY
220 GOTO 220
230 '8 BY 9 CHARACTER GENERATOR
240 ' VV=CHARACTER, 0-255
250 ' XX=CHAR. POSITION, 0-31
260 ' YY=ROW POSITION, 0-20
270 ' TS=START OF CHAR. TABLE
280 ' GP=START OF GRAPHICS PAGE
290 GP=XX+YY*288+GP 'CHANGE TO G
P=XX+YY*256+GP FOR 8X8
300 FOR RW=0 TO 7
310 VL=PEEK(TS+VV*8+RW)
320 POKE GP,VL
330 GP=GP+32
340 NEXT RW
350 RETURN
```


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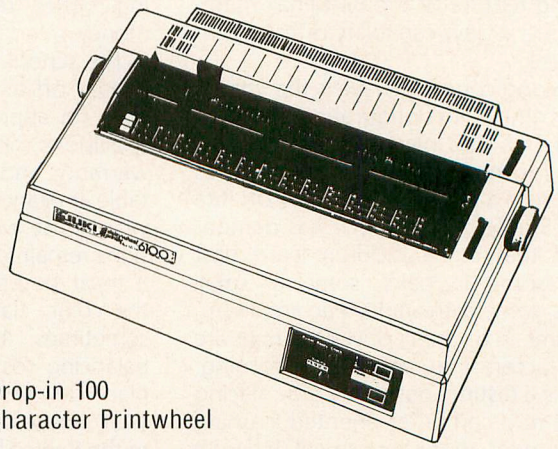

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```
10043 DATA 0,4,4,31,4,4,0,0
10044 DATA 0,0,0,12,12,8,16,0
10045 DATA 0,0,0,31,0,0,0,0
10046 DATA 0,0,0,0,0,12,12,0
10047 DATA 0,1,2,4,8,16,0,0
10048 DATA 14,17,19,21,25,17,14,0
10049 DATA 4,12,4,4,4,4,14,0
10050 DATA 14,17,1,14,16,16,31,0
10051 DATA 14,17,1,6,1,17,14,0
10052 DATA 2,6,10,18,31,2,2,0
10053 DATA 31,16,30,1,1,17,14,0
10054 DATA 6,8,16,30,17,17,14,0
10055 DATA 31,1,2,4,8,16,16,0
10056 DATA 14,17,17,14,17,17,14,0
10057 DATA 14,17,17,15,1,2,12,0
10058 DATA 0,12,12,0,12,12,0,0
10059 DATA 12,12,0,12,12,8,16,0
10060 DATA 2,4,8,16,8,4,2,0
10061 DATA 0,0,31,0,31,0,0,0
10062 DATA 8,4,2,1,2,4,8,0
10063 DATA 14,17,1,2,4,0,4,0
10064 DATA 14,17,1,13,21,21,14,0
10065 DATA 4,10,17,17,31,17,17,0
10066 DATA 30,9,9,14,9,9,30,0
10067 DATA 14,17,16,16,16,17,14,0
10068 DATA 30,9,9,9,9,9,30,0
10069 DATA 31,16,16,30,16,16,31,0
10070 DATA 31,16,16,28,16,16,16,0
10071 DATA 15,16,16,19,17,17,15,0
10072 DATA 17,17,17,31,17,17,17,0
10073 DATA 14,4,4,4,4,4,14,0
10074 DATA 1,1,1,1,1,17,14,0
10075 DATA 17,18,20,24,20,18,17,0
10076 DATA 16,16,16,16,16,16,31,0
10077 DATA 17,27,21,21,17,17,17,0
10078 DATA 17,25,21,19,17,17,17,0
10079 DATA 14,17,17,17,17,17,14,0
10080 DATA 30,17,17,30,16,16,16,0
10081 DATA 14,17,17,17,21,18,13,0
10082 DATA 30,17,17,30,20,18,17,0
10083 DATA 14,17,16,14,1,17,14,0
10084 DATA 31,4,4,4,4,4,4,0
10085 DATA 17,17,17,17,17,17,14,0
10086 DATA 17,17,17,10,10,4,4,0
10087 DATA 17,17,17,17,21,27,17,0
10088 DATA 17,17,10,4,10,17,17,0
10089 DATA 17,17,10,4,4,4,4,0
10090 DATA 31,1,2,4,8,16,31,0
10091 DATA 4,14,21,4,4,0,0,0
10092 DATA 0,0,0,0,0,0,0,0
10093 DATA 0,0,0,0,0,0,0,0
10094 DATA 0,0,0,0,0,0,0,0
10095 DATA 0,0,0,0,0,0,0,0
```

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'COCOCASSETTE' SUBSCRIPTION SOFTWARE
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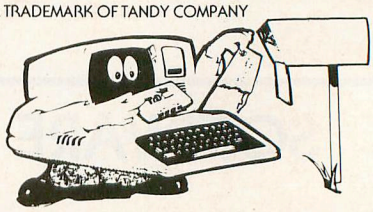

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SPEECH SYNTHESIS SYSTEM

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Program Listing 1. Character Store Program

```
50 'CHAR TABLE STORED AT &H3800
51 FOR I=&H3800 TO &H3800+983
52 READ A: POKE I,A
53 NEXT I
54 STOP
10000 DATA 0,0,0,0,0,0,0,0
10001 DATA 0,0,0,0,0,0,0,0
10002 DATA 0,0,0,0,0,0,0,0
10003 DATA 0,0,0,0,0,0,0,0
10004 DATA 0,0,0,0,0,0,0,0
10005 DATA 0,0,0,0,0,0,0,0
10006 DATA 0,0,0,0,0,0,0,0
10007 DATA 0,0,0,0,0,0,0,0
10008 DATA 0,4,8,31,8,4,0,0
10009 DATA 0,4,2,31,2,4,0,0
10010 DATA 0,4,4,21,14,4,0,0
10011 DATA 0,0,0,0,0,0,0,0
10012 DATA 0,0,0,0,0,0,0,0
10013 DATA 0,0,0,0,0,0,0,0
10014 DATA 0,0,0,0,0,0,0,0
10015 DATA 0,0,0,0,0,0,0,0
10016 DATA 0,0,0,0,0,0,0,0
10017 DATA 0,0,0,0,0,0,0,0
10018 DATA 0,0,0,0,0,0,0,0
10019 DATA 0,0,0,0,0,0,0,0
10020 DATA 0,0,0,0,0,0,0,0
10021 DATA 0,0,0,0,0,0,0,0
10022 DATA 0,0,0,0,0,0,0,0
10023 DATA 0,0,0,0,0,0,0,0
10024 DATA 0,0,0,0,0,0,0,0
10025 DATA 0,0,0,0,0,0,0,0
10026 DATA 0,0,0,0,0,0,0,0
10027 DATA 0,0,0,0,0,0,0,0
10028 DATA 0,0,0,0,0,0,0,0
10029 DATA 0,0,0,0,0,0,0,0
10030 DATA 0,0,0,0,0,0,0,0
10031 DATA 0,0,0,0,0,0,0,0
10032 DATA 0,0,0,0,0,0,0,0
10033 DATA 4,4,4,4,4,0,4,0
10034 DATA 17,17,17,0,0,0,0,0
10035 DATA 10,10,31,10,31,10,10,0
10036 DATA 4,15,20,14,5,30,4,0
10037 DATA 12,13,2,4,8,19,3,0
10038 DATA 8,20,20,8,21,18,13,0
10039 DATA 12,12,8,16,0,0,0,0
10040 DATA 2,4,8,8,8,4,2,0
10041 DATA 8,4,2,2,2,4,8,0
10042 DATA 4,21,14,31,14,21,4,0
```

from page 67

other Basic code. Variable VV is the character code, from Table 1. The character code is a value from 0 through 255. XX is the character position number and YY is the line number for display. Character positions are numbered from 0 through 31, while line positions are numbered from 0 through 20.

Variable TS is the starting location of the graphics table, in this case &H3E00. Variable GP is the starting location of the graphics page, in this case &HE00 (or &H600 for a non-disk system).

The expression: XX + YY × 288 + GP locates the byte location of the top row of the character position within the graphics page. One byte of data from the graphics table is then stored in each of eight rows of graphics data to make up the character.

The driver program before the subroutine constructs a screen full of characters from the graphics table over 32 characters by 21 lines. If you run it, don't forget to protect memory and relocate the graphics data using Program Listing 1 first.

Next month – the end of the story!

■ ■ ■

Program on page 70

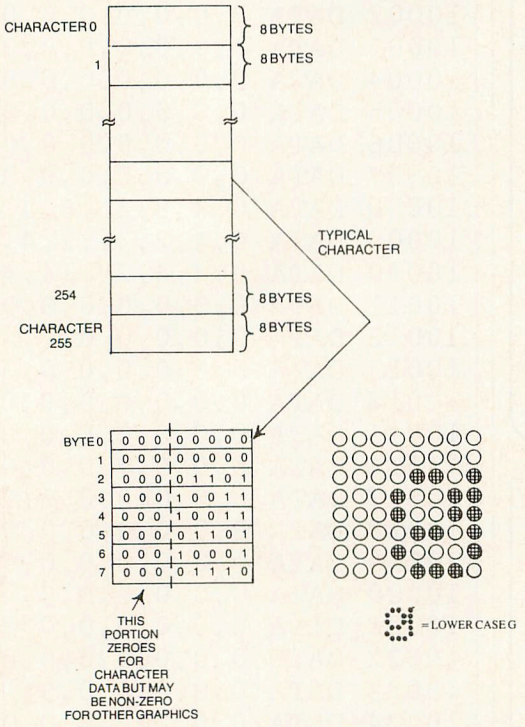

Figure 3. Graphics Table Format

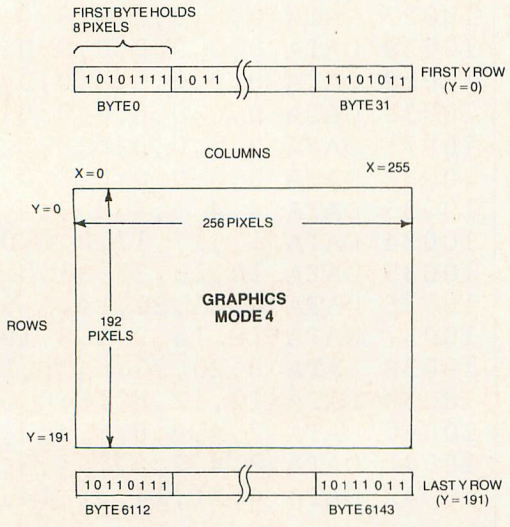

Figure 4. Graphics Mode 4 Memory Mapping

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Circle No. 41 on Reader Service Card

Figure 2. 5x7 Dot Matrix Characters

CHARACTER 0

CHARACTER 1

CHARACTER 2

CHARACTER 3

CHARACTER 4

CHARACTER 5

CHARACTER 6

CHARACTER 7

CHARACTER 8

CHARACTER 9

CHARACTER 10

CHARACTER 11

CHARACTER 12

CHARACTER 13

CHARACTER 14

CHARACTER 15

CHARACTER 16

CHARACTER 17

CHARACTER 18

CHARACTER 19

CHARACTER 20

CHARACTER 21

CHARACTER 22

CHARACTER 23

CHARACTER 24

CHARACTER 25

CHARACTER 26

CHARACTER 27

CHARACTER 28

CHARACTER 29

CHARACTER 30

CHARACTER 31

CHARACTER 32

CHARACTER 33

CHARACTER 34

CHARACTER 35

CHARACTER 36

CHARACTER 37

CHARACTER 38

CHARACTER 39

CHARACTER 40

CHARACTER 41

CHARACTER 42

CHARACTER 43

CHARACTER 44

CHARACTER 45

CHARACTER 46

CHARACTER 47

CHARACTER 48

CHARACTER 49

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CHARACTER 53

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CHARACTER 94

CHARACTER 95

CHARACTER 96

CHARACTER 97

CHARACTER 98

CHARACTER 99

CHARACTER 100

CHARACTER 101

CHARACTER 102

CHARACTER 103

CHARACTER 104

CHARACTER 105

CHARACTER 106

CHARACTER 107

CHARACTER 108

CHARACTER 109

CHARACTER 110

CHARACTER 111

CHARACTER 112

CHARACTER 113

CHARACTER 114

CHARACTER 115

CHARACTER 116

CHARACTER 117

CHARACTER 118

CHARACTER 119

CHARACTER 120

CHARACTER 121

CHARACTER 122

CHARACTER 123

Listing 1 is a Basic program that holds 123 separate characters, arranged in the order shown in Table 1.

If you look at the ASCII representation in your Color Computer manual, you'll find that the decimal values for the characters in the Table are almost identical to the values in the manual. This will be helpful when converting between strings and the equivalent graphics table character. The "unused" slots in the table still take up eight bytes of space; they are available for any new graphics characters, including any 8 by 8 shapes we'd care to define.

Listing 1 relocates the first 123 characters to user RAM, starting from &H37FF (14335 decimal). Note that the last three digits of the line number correspond to the decimal code for the character in the Table. Before running this program to store the graphics data, Enter CLEAR 100,&H37FF.

Using the Graphics Data

Now I had the data; how hard would it be to use? I set out some ground rules:

- The graphics data was to be used in the graphics pages only
- The graphics mode would be PMODE 4, the 256 by 192 resolution mode

The graphics pages are located just after the text area in a non-disk system, or a little further on in a disk system. The actual location for non-disk is &H600 (1536 decimal) and for disk is &HE00 (3584 decimal). A word of warning: be sure to use the &HE00 area in a disk system. If you store data in the &H600 area in a disk system, catastrophic things may happen to your disk. *Listings all use the &HE00 area — change &HE00 to &H600 in a non-disk Color Computer.*

The graphics mode would have to be the highest resolution mode, because this is the only mode that supports 256 dots horizontally. In this mode, the graphics page is "mapped," as shown in Figure 4. The top row (Y=O) is located in the first 32 bytes of the page, the next row is located in the next 32 bytes, and so forth.

I tried the simplest case first, generating an 8 by 9 character over the entire screen. Program Listing 2 is the result.

The software "character generator" for this program is indeed fairly simple. It's in the form of a subroutine, called by

to page 69

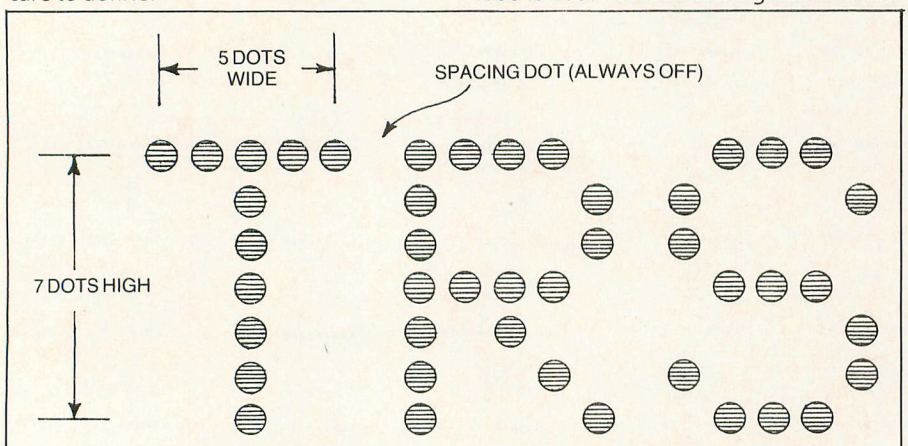
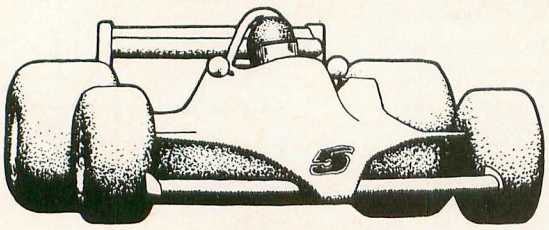


Figure 1. 5x7 Dot Matrix Representation

SOFTWARE FOR THE TRS-80* COLOR COMPUTER!



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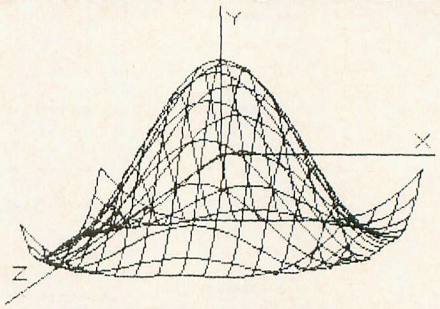

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Never one to admit defeat, I wondered next what kind of resolution *was* possible. I thought I'd do some experimenting to find out.

Upper- and Lowercase

My first chore was to construct a table of dot matrix character representations. This wasn't too hard, as I had some descriptions of character-generating ROMs in my semiconductor manuals. Leafing through a manual from Retarded Micro Logic (RML), I came across the designs shown in Figure 2. In fact, Figure 2 is a modification of the RML designs. I wanted "descenders" on the lowercase characters. Descenders are the portion of the character that goes below the base line, if you remember advanced printing from P.S. 49.

You can see from the figure that each character is made up of five horizontal dot positions by eight vertical dot positions. The lowest dot row is blank, except in the case of descenders.

I now had the character "font" designed. Although it was a far cry from illuminated manuscripts and Baskerville, it was adequate. Now, how could I implement it?

A Graphics Table

I was attempting to define my own character set in software. The perfect place to use such a character set was in graphics pages rather than the text page that's used in the Color Computer for normal display. One of the nicer benefits from this scheme is that it would be easy to overlay graphics designs with text, something that can't be easily done in the Color Computer. Not only that, but why not use the same scheme to define unique graphics shapes defined by the dot matrix? Perfectly possible...

Table 1. Graphics Table Code

Code	Character	Code	Character
0–7	unused	44	,
8	Left Arrow	45	–
9	Right Arrow	46	.
10	Down Arrow	47	/
11–31	unused	48–57	0–9
32	blank	58	:
33	!	59	;
34	"	60	<
35	#	61	=
36	$	62	>
37	%	63	?
38	&	64	@
39	'	65–90	A–Z (uppercase)
40	(	91	Up Arrow
41	)	92–96	unused
42	*	97–122	a–z (lowercase)
43	+	123–255	unused

I decided on the following approach: all the character combinations would be held in a graphics table of 256 characters. Each character in the table would consist of eight bytes, as shown in Figure 3, representing the eight rows of the character from top to bottom. The eight bytes would hold the 64 bits of an 8 by 8 dot matrix. The 5 by 7 dot matrix would fit inside the 8 by 8 matrix — a little bit of a space waster, but on the other hand, an easy format from which to access character data.

If the table held 256 characters at eight bytes per character, we'd have 256 by 8, or 2048 bytes. The table could be stored in "protected RAM" by using the Clear command after turning on the Color Computer. CLEAR 100,&H37FF, for example, clears 100 bytes for strings and protects the user RAM from &H3800 (14336 decimal) on, preventing Basic from overwriting it.

All right so far. But how do we get the matrix data from Figure 2 into "encoded" form? I'd like to tell you that I got out my laser scanner and whipped off the values in 20 milliseconds, but I wound up going down each of the characters and translating them manually into decimal values.(What wouldn't I do for computing in the country?) The result is Program Listing 1.

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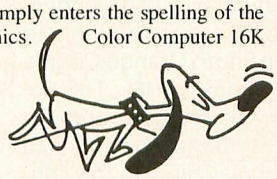

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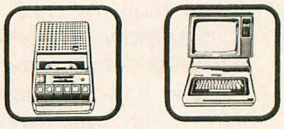
Bill has found a way to put user-definable graphics characters into your favorite machine.

illustration by Rod McCormick



16K Extended Color Basic

by William Barden, Jr.

I WAS WORKING ON PORKBELLY, my Color Computer commodities analysis program, when I heard a knock on the door of my computer room. Opening the door, I saw my neighbor Engineer John holding a new Timex Sinclair TS2000. "Gotcha, Barden!" he grinned. "You're always bragging about your Color Computer. This baby will run rings around it!"

"Is that a computer or a new electronic watch?" I quipped, flipping off PORKBELLY in the middle of Soviet grain estimates for 1984. I sighed inwardly. I knew a long discussion was coming. We had once spent two days arguing over the relative merits of the 6809E and 6502 microprocessors.

"No, I'm not kidding, Bill," he continued. "The TS2000 has user-definable character sets that are switchable from software. You can define any character you want! Can you do that on the Color Computer?"

I hemmed and hawed. "Yeah, sure you can — it's simply a matter of using a DRAW string to generate new characters..."

"Yeah, but I don't have to fool around with that on the TS2000," he went on. "I can define any 8 by 8 matrix of characters with one command. Furthermore, the TS2000 has lowercase, 24 lines per screen, and a 64 character per line capability when used with a monitor," he concluded with a smug grin.

"Listen. I'll bet you a weekend in computer camp that I can do the same thing on the Color Computer," I challenged. The computer camp I was referring to had just opened in South Orange County and specializes in Timex/Sinclair, TRS-80, counterinsurgency techniques, and automatic weapons handling; it had proved to be a popular camp in this conservative pocket of California.

After my neighbor left, I started thinking about the problem. Why do I get myself into these things? Still, the idea of a weekend in the smog was appealing...

Dot's a Nice Display

First I had to refresh my memory on how the Color Computer actually displays characters and data.

The Color Computer uses a Motorola 6847 Video Display Generator (VDG) chip to display text and graphics. The VDG chip contains a built-in "character ROM" which defines text characters as a matrix of dots. It also lets each of the 256 (horizontal) by 192 (vertical) screen dots be individually programmed. A good description is found in *Color Computer Graphics* (Radio Shack 62-2076).

Dot matrix representation of text characters has been used for a long time. The first standard representation was a 5 by 7 dot matrix, shown in Figure 1. Later versions went to larger matrices for better resolution.

My first thought was this: Why not use a 5 by 7 dot matrix representation of characters and divide the screen into character positions of six pixels (dots) wide by eight pixels high? This would give 256/6, or 42, characters per line by 192/8, or 21, lines per screen — quite an improvement over the current specs.

When I tried a test case, I found that the resolution on a color television was simply not good enough to resolve a line that was only one pixel (1/256 of the screen) away from another. The characters had to be at least two pixels apart. I should have realized this from the beginning of course; you'd have to go to a monitor (see Dennis Kitsz's article in the March, 1983 issue of **The Color Computer Magazine**) to get that type of resolution. (You might keep the 42 characters per line by 21 lines scheme in mind, though, if you're using a monitor or thinking of upgrading to one...)

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by Dennis Kitsz

FRANKLIN D. ROOSEVELT once told a story about campaign criticism. He recalled how he was attacked, his family was attacked, and those attacks extended as far as "even my little dog Fala." F.D.R. then explained that neither he nor his family minded criticism, but Fala did mind. Most days I agree with F.D.R.'s attitude, so when a recent letter to **The Color Computer Magazine** called me (in order) an egotistical maniac, biased, unfair, ridiculous, assinine (sic), and mentally disturbed, I might have felt rather complimented. This time, though, my reaction was like Fala's, because the letter took me to task for criticizing Speech Systems' music synthesis program "The Composer" in a recent review.

Well, G.B. in San Jose, this month's for you. Stuff this program in your computer and listen to how the Color Computer is really capable of sounding. Then write me again — and include your name and address!

Why Fala?

I reacted strongly to G.B.'s letter because I am first and foremost a composer, and my involvement with computers arose from and continues with music. So his letter, instead of remaining merely a provocative tirade, became a challenge. In the past I have published several sound routines for the TRS-80 Model I, but all have been monophonic (single-line) software; my polyphonic (multiple-line) software has always required an external synthesizer interface or some *hardware appendage*. But the Color Computer has a more powerful microprocessor, and four-voice harmony and polyphony is at last possible. Limited, but possible.

This month's program, Color Quaver, can produce full four-part harmony and polyphony over seven octaves; has independently controllable timbre and envelope for each voice, and is in accurate, tempered tuning over its full range. The driver portion of Quaver is in Basic, and includes a music editor, waveform and envelope design system, Fourier transform waveform creation, tape save and load facilities, and a music compiler. The machine language execution routine ocupies only 580 bytes.

Some brief definitions are first in order; more details are given in the glossary. I use *pitch*, *tone*, and *note* interchangeably to mean a perceived musical frequency — a C-sharp or B-flat or D-natural, for example. A *voice* is a musical line, that is, a solo tune; *harmony* is the simultaneous playing of several notes; *polyphony* (also called *counterpoint*) is the simultaneous performance of several tunes. Polyphony is different from harmony in that the voices may have different rhythms, may start and stop at different times, and are generally unique and independent. *High* and *low* refer to pitch, *loud* and *soft* to volume. By *timbre* or *quality*, I mean the character of any note that identifies what produced it — such as an oboe, a guitar, or an electric bass. Pitch differs from timbre in that pitch refers to the fundamental frequency, whereas timbre includes the fundamental plus all the related *harmonics* or *partials* which, when combined, give an instrument its "sound."

A *waveform* graphs the pattern of air or eardrum compressions and decompressions made during the course of a specific time period. Look closely at a record groove; it is a perfect example of a waveform preserved in plastic. For the most part, this article refers to the waveform of a single fundamental note's cycle. A *spectrum* is an intensity graph of all the fundamentals which, when combined, make up some audible event such as a car horn, bird song, rock band, symphony orchestra, or explosion.

Electronic music synthesis has added a few terms of its own to this discussion. The most important of these is *envelope*, which describes how a note starts, proceeds, and ends. A piano envelope has a sharp attack, quick initial decay, long sustain (if the pedal is pressed down), and slow release. A cello has a gentle attack, no initial decay, long sustain, and quick release. Most microcomputer music programs don't bother with envelope. The notes just start and stop, giving them a beeping quality.

Music and Computers

A desire to use computers for music has been around as long as computers have existed. Computers interest composers because they offer great control over the resulting music, without the need to explain the music to performers; they don't make mistakes; and they are flexible enough to produce a wide range of sounds — especially those for which no acoustic instruments yet exist.

Digital computers, however, don't find music to be native territory. Sound is a continuously changing phenomenon, with infinitesimally small gradations in volume, pitch, and timbre. No sense is as capable as hearing; hi-fi manufacturers produce equipment with distortion almost unmeasurably low — yet no sophisticated listener is ever fooled into believing that a recording is a live performance. Thus, digital musical hardware and software are among the greatest challenges.

To discover how to produce sound from a digital computer, it's important to explore both the process and the pitfalls of digital techniques. I'll start with the simplest of all waveforms, shown in Figure 1. This is a sine wave, a pure tone with no harmonics. There is no way a digital computer can store this precise, continually changing waveform. Instead, the waveform is "sampled" at regular intervals, and the discrete values (voltage, intensity, or whatever) are stored in the computer as a series of numbers. Figure 2 shows the wave and sampling points; in this case, a full cycle consists of only ten samples.

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Now look at Figure 3. Each stairstep represents the fixed digital value stored to represent the sound. A higher sampling rate (say 20 or 30 samples per cycle) would provide a more detailed picture; a lower sampling rate would decrease the accuracy of representation. The note can then be re-created by sending the computer's binary information to a digital-to-analog converter (D/A converter or DAC), which puts out a voltage proportional to the binary input. Figure 4 shows digital information changed to a sine wave output through a six-bit D/A converter — the size used in the Color Computer. The resulting waveform is made up of stairsteps, exactly like the numerical representation. The audible effect of the stairsteps can be filtered out with a tone control or an equalizer if the sampling rate is fast enough.

Therein lies the problem. A fast sampling rate is critical to good synthesized sound. Imagine you're traveling along the highway trying to keep track of your mileage, but the only dashboard gauge that works is the tenths of a mile counter on your odometer. You assume that if you check often enough — once each half mile or so — you can mark down the tenths on a piece of paper. When you arrive, you merely take the difference between each tenth value and the previous tenth value, and add them up. But maybe it's been a hard day, and your time sense isn't as keen as it should be. You're actually checking each mile or so. When you get to your destination, you add up the mileage and you're way off — by half!

Now imagine instead that, as you travel, your previous tenth marking is always the same as the new one. Was it one mile or two? Or three? Or fifty? Or is your odometer completely broken now? It turns out that your sampling rate was exactly the same as the odometer's frequency of repetition, so your information is useless. Look at Figure 5. Since sine waves are symmetrical, a sampling rate of one-half the tone's frequency results in the same complete lack of useful data. It looks like a straight line — no sound at all.

Having no sound is almost preferable to what happens when the sampling rate rises to more than half the frequency being digitized. Not only is the sound you want to store lost, but a new frequency — an *alias* frequency — is produced by the digitizing process! Figure 6 shows how this looks. By keeping the sampling rate high enough, and by filtering out all frequencies of more than half that rate, excellent sound is produced. Since the aliasing process works in reverse, it's im-

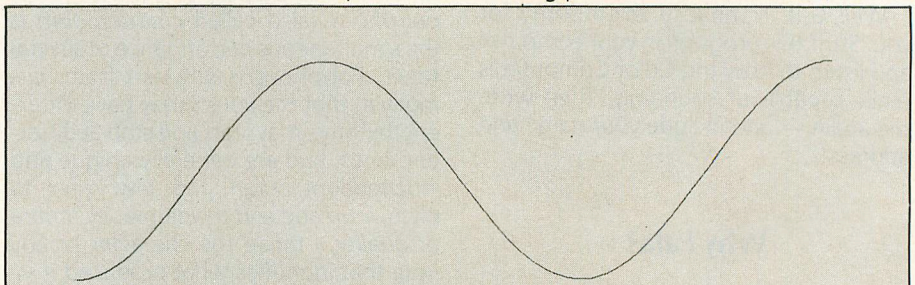

Figure 1. A sine waveform, representing a single frequency.

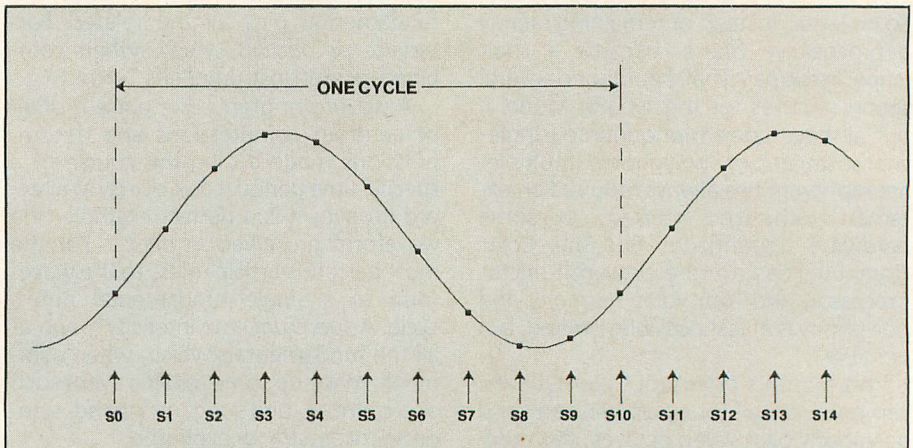

Figure 2. The process of sampling the sine waveform shown in Figure 1. One cycle is sampled ten times in this example.

portant not to put out any frequencies of greater than half the output sampling rate. In fact, the recently introduced digital Compact Disc players perform 44,100 samples per second, giving a full hi-fi frequency range of 20 to 20,000 Hz.

Microcomputers can keep up with this rate on a strictly "through-put" basis, but don't have enough memory to store the music. At 44,100 samples per second, 5.3 megabytes of storage would be required for each minute of music! In fact, even to sample and play a single waveform repeatedly can only be done at about a 20,000 Hz sampling rate on the Color Computer.

The main dilemma: economy of programming to optimize sampling speed.

Tuning Up

The whole process of outputting a series of voltages that produce an audible pitch (when taken as a fast, continuous stream through an amplifier) is straightforward. The problem, then, is developing computer software which, given descriptive information (note name, octave, length, etc.) can *create* sound smoothly and quickly enough. Without smoothness — irregularities in timing, processor interruptions, etc. — the pitch will waver or an unpleasant "gargle" will be heard.

Quickness is an even more severe requirement. First, I'll describe how a pitch is produced that is consistent, and then deal with the restrictions that speed imposes.

There are two possible ways of achieving different pitches: through varying the speed of the waveform table output to the D/A converter, or through varying the samples selected from a waveform table. The first solution presents several difficulties, including the difficulty of creating in-tune software, and the need to "pre-compile" each pitch, chord, dissonance, etc., into a unique waveform table. The second solution also presents problems, but the software can be reduced to a minimum configuration. In fact, the result shown in Listing 1 (excluding the set-up and return to Basic and presented in Part 2) is only 264 bytes.

It's time for the odometer analogy again. When do you change your car's oil, for example? Every five thousand miles, perhaps. How often is that? The answer depends on how much you drive. If you drive a great deal, then, if you are conscientious, you change your oil quite frequently. Here's another example. If you have guests — meaning higher coffee and tea consumption, more dish washing, more baths or showers — the

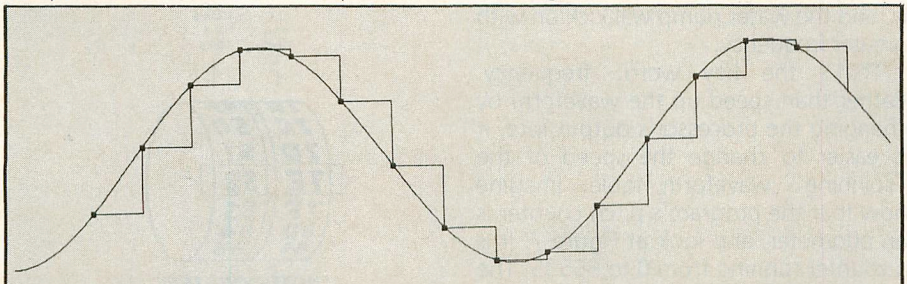

Figure 3. Discrete sampling voltages stored in memory actually describe a stair- step waveform rather than the continuous, sine-wave original.

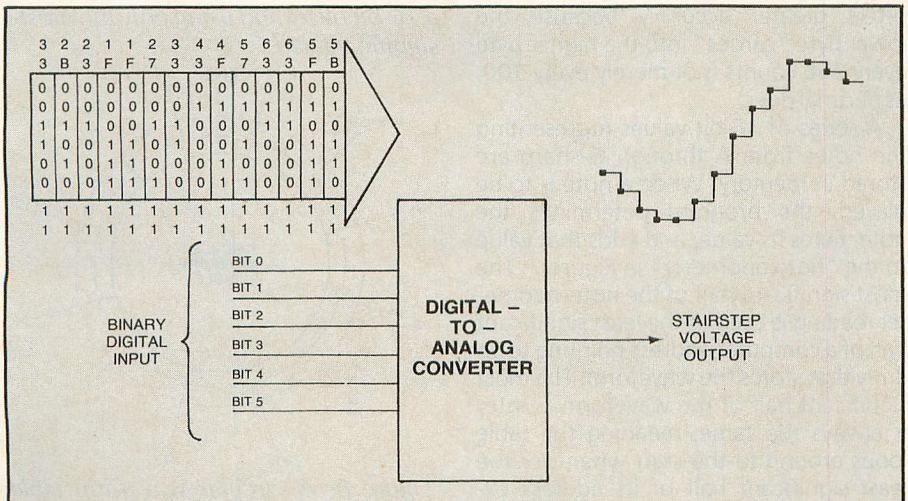

Figure 4. Binary data entering a digital-to-analog converter is transformed back into a stairstep version of the original sine wave.

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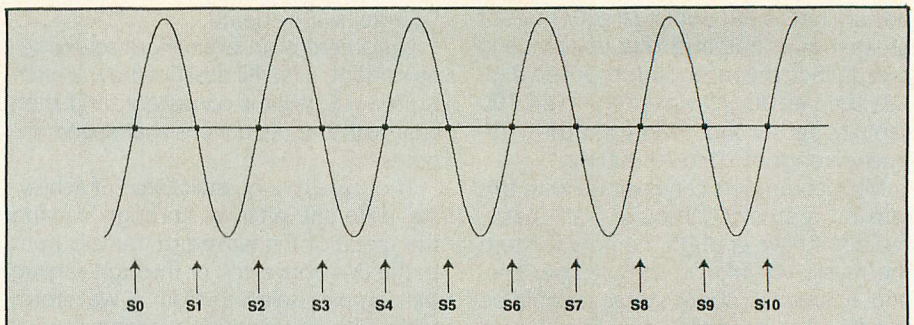


Figure 5. A sine wave sampled at exactly half its frequency appears to the computer as a straight line, and is therefore useless.

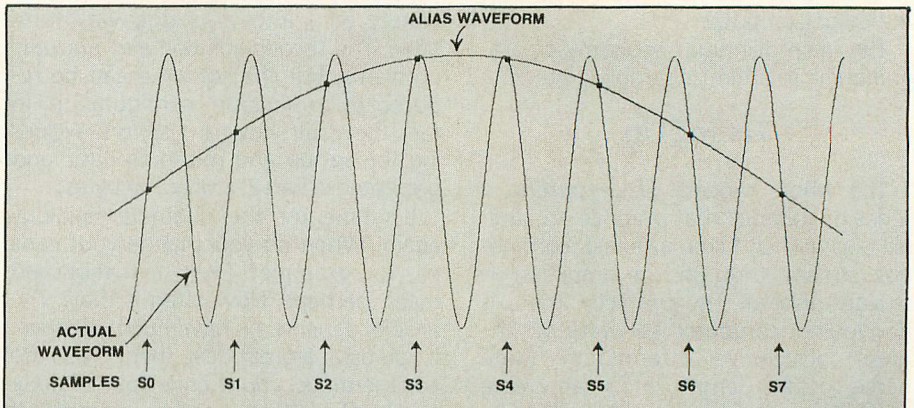


Figure 6. A waveform sampled at a frequency of less than half its frequency produces an alias waveform that is artificial, audible, and unpleasant.

water pressure will decrease more quickly, and the water pump will kick on with greater frequency.

That's the key word: frequency. Rather than speed up the waveform by changing the processor's output rate, it is easier to change the speed of the "spinning" waveform table. Imagine now that the program's pitch counter is an odometer, and look at Figure 7. It is a counter running from 0 to 65535. The counter is maintained in binary for two reasons: first, that is the natural domain of the digital computer; and second, it offers greater accuracy because the lower byte "carries" into the higher byte every 256 counts (not merely every 100, as decimal does).

A series of 16-bit values representing the notes from A through G-sharp are stored in memory. When a note is to be played, the program determines the note, takes its value, and adds that value to the "note odometer" in Figure 7. The most significant half of the note-odometer reading is used as the least significant half of a computer address pointing to an array that stores the waveform. The most significant half of the waveform pointer is always the same, meaning the table loops around to the start whenever the least significant half of its address exceeds hex FF. It looks like Figure 8, which shows samples taken from a circular waveform table.

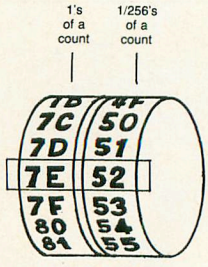


Figure 7. A high accuracy note counter can be created by advancing a 16-bit offset and using only the most-significant half.

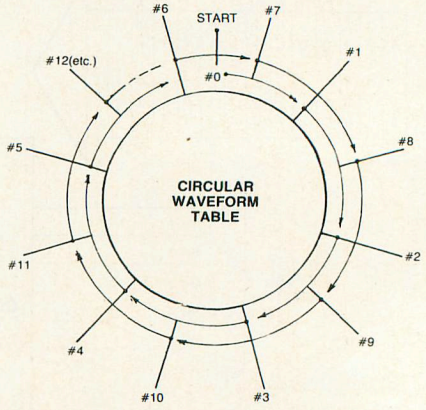


Figure 8. A circular waveform table permits the program to loop through at any speed, picking out the wave table samples it needs.

The table starts at zero, and the note's pitch value is added to the counter. A sample is taken at number 1, the pitch value added again, and another sample taken at number 2. Figure 9 is a sine wave with 53 sample points. Now follow me carefully here. Let's say the waveform table is gone through one step at a time during the sampling period. That means the full waveform is output, as expected. What happens when the pitch counter is increased by two instead of one? Remember that we're dealing with a circular table, and look at Figure 10. Every *other* sample is output. The table is gone through twice in the same sampling period. The apparent frequency of the waveform is twice the original — an octave!

By using a fractional counter (counting in one's and 1/256's), the integer part of the counter plucks a real sample from the waveform table. The fractional amount keeps it honest, preventing the frequency from "creeping" flat in upper octaves.

Toot, Whistle, Plunk and Boom

Several music programs produce convincing pitches. Most are in tune. But still, they lack two important musical qualities: timbre and envelope. Timbre is easiest; I'll cover that first.

Timbre, or quality, can actually be analyzed as a series of sine-wave harmonics added to a sine-wave fundamental. It can be achieved precisely by mathematical calculation, or very roughly by drawing the waveform. Both can be musically satisfactory, and both are available using the Quaver Basic driver.

The mathematical calculations (called a Fourier transform) involve applying sine and cosine functions to a frequency spectrum. These functions form the link between the spectrum (a frequency representation) and the waveform (a time representation). It is possible, by knowing an instrument's frequency spectrum, to define very precisely what that particular timbre will sound like on the computer.

Envelope is a simple concept, but tricky to implement. It's easy to imagine how a note might start and gradually fade away, or follow any other pattern of volume changes. But what if one note begins to fade as another one starts? In acoustic music, this happens more often than not.

The computer must keep track of not only a note's pitch, timbre and duration, but also its instantaneous intensity. And it must do this for *four* notes, each changing at its own rate. The process is one of summing and averaging, but all the math has to be done at a high speed. Before explaining the machine language program in detail, I'll describe how to use Quaver. Tune in next month. ■ ■ ■

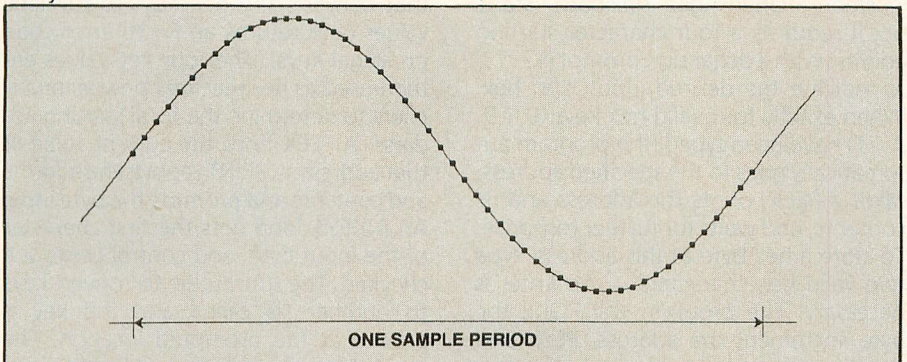


Figure 9. A sine wave with 53 samples. The samples are used to create a waveform table.

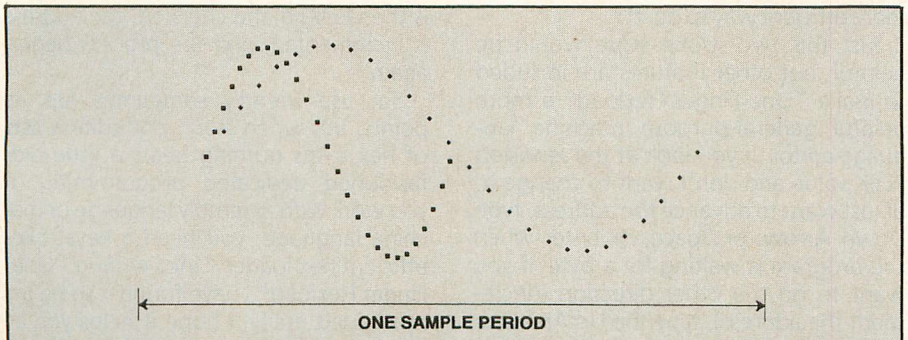
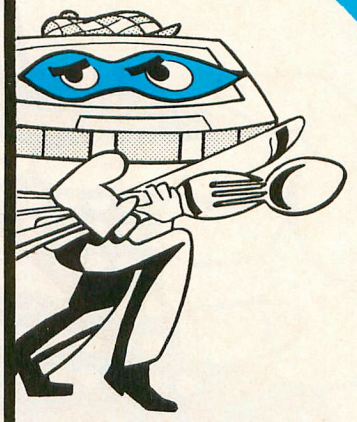


Figure 10. Passing through the sine wave table using a two-sample offset produces an octave with the same waveshape. As the pitches get higher, the waveshape gradually deteriorates, containing less and less of the original wave shape.

TRS-80 COLOR COMPUTER



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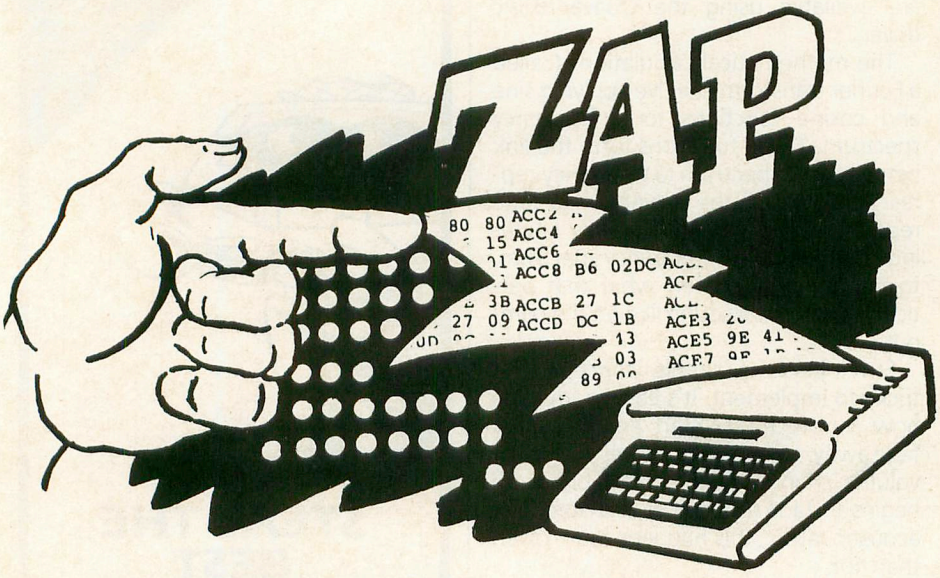
One-Finger Hexload



by Jim Norman

IN AN EFFORT to be user-friendly, some monitor programs force you to respond to questions and type &H each time you want to enter a hexadecimal value. This is especially annoying when you want to enter the hexadecimal machine code of a relatively short program like Steve Odneal's "Reformat Your Video," (see the April 1983 issue). the INPUT command is at fault. You see, INPUT is so powerful it's hard to turn down the temptation to use it. When a command such as INPUT "WHAT IS THE NUMBER";N is executed, it prints the request and supplies the question mark.

Then the Basic itself helps you enter the number. It can be in decimal (normally) or it can be in hex if you preface the number with "&H". Basic then lets you type, backspace, and correct until you get the number you want and hit the Enter key. If you typed in a hex value Basic understands it without need for conversion. And, it does all these wonderful things automatically. Not using the INPUT command means having to program all these functions yourself. But doing so also lets you enter hex bytes in two single keystrokes — quite an improvement from before! It would sure make short work (or shorter anyway) of the video reformat program. With all of this in mind, I wrote "One-Finger Hexload."

User Instructions

When "One-Finger Hexload" starts up, it requests a four character starting address with a dollar sign prompt ($????) to indicate the desired input is in hex. When exactly four valid hex keys (0 – 9, A – F) have been typed, the program automatically goes to the specified address, takes a PEEK, prints the address and its contents, and waits for further response. To store a hex byte at this address, type two valid hex characters — no Enter is necessary. The program will POKE the byte, increment the address, PEEK and display, and wait again. Thus, you can continuously store a list of bytes with only two keystrokes each. There is no more efficient way to do it!

Just this two-stroke store would be helpful, but other features are included to make "One-Finger Hexload" a more helpful general-purpose machine language editor. If you look at the reported PEEK value and don't want to change it, or just want to advance the address, type Down Arrow, or Space, or Enter when the program is waiting for a byte. If you want to go the other direction (decrement the address), type the Up Arrow or slash mark. If you see that you have typed the first of the two hex characters wrong, then the Left Arrow or comma lets you backspace-delete and try again.

If you inadvertently type a non-hex key during address input, instead of ignoring it (you might not notice!) the program reinitializes the address request. If you strike a non-hex key during byte input you get a "!!" error display, and the program goes again to the same address giving you another chance. Also, after POKEing the given byte, the program quickly PEEKs to see if the byte made it. It won't have if you are POKEing defective RAM, any ROM, and some types of I/O (or if you are trying to get a new piece of hardware up that hasn't made it yet). If the POKE didn't work you'll get an error message (??), the address will increment, and the program will go on. Finally, at any time while entering bytes the @ key will call up the new address prompt and let you easily go to a new address with just four keystrokes. I find this particularly useful for checking my work and otherwise tooling around memory.

Program Description

"One-Finger Hexload" is extensively documented so you can follow the details if you want, but here is a brief description of how it gets around using the INPUT command. PRINT is used to prompt a four-key starting address. A subroutine that uses INKEY$ loops is called four times to get the keystrokes, and prints them at the prompted spot. This subroutine calls another subroutine that converts the hex keys to numeric values (and returns an F=16 error code on illegal keys). The four key values are then used as hexadecimal powers multipliers to determine the total starting address. A PEEK finds the current value at that address. A PRINT reports the address and contents and prompts the byte input. An INKEY$ loop gets the first character of the input byte, and control codes are checked. The subroutine to convert keys to numbers is called and the key is printed at the prompted location. The second key is handled much like the first, and the byte value is then computed from the two-key information. The byte is then POKEd and checked, the address is incremented, and the process begun again.

So, user-friendly sometimes has its points, but when storing or editing lists of hex bytes nothing beats a little old-fashioned dedicated programming. If you work with assembly language or machine language, you need a keystroke-efficient hex loader. Since writing "One-Finger Hexload" I have found it to be my most used utility. I hope it helps you as much as it has helped me. Now, if you skipped it in April, go back and type in "Reformat Your Video" in hex. It will be worth it! ■ ■ ■

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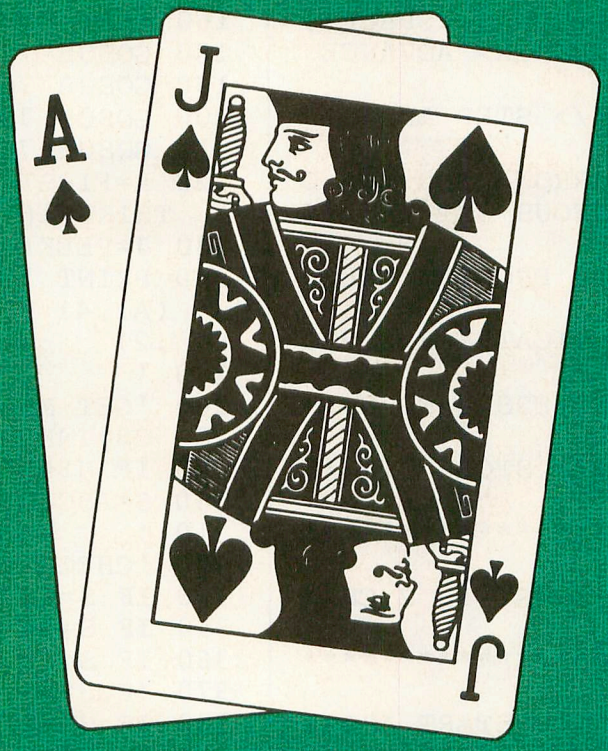

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Program Listing. One-Finger Hexload

```
20 PRINT "<@> CALLS NEW ADDR-4 C
HAR ONLY."
30 PRINT "<DOWN ARROW>, <SPACE>,
 AND             <ENTER> ADVANCE
ADDRESS."
40 PRINT "<^>AND</> STEP ADDR. B
ACK ONE."
50 PRINT "<LEFT ARROW> AND <,> D
ELETE       ERRONEOUS 1ST KEY IF
 NEEDED."
60 PRINT "<!> ENDS PROGRAM EXECU
TION."
70 PRINT "'!!' INDICATES ERRONEO
US ENTRY"
80 PRINT "    -ADDRESS DOES NOT
ADVANCE."
90 PRINT "'??' SAYS STORE DIDN'T
 WORK."
100 PRINT "**********************
**********"
110 PRINT "VALID ENTRY IS 2 CHAR
. HEX BYTE"
120 PRINT "**********************
**********"
130 CLEAR 50: PRINT "START ADDR:
 $????"
140 COUNT=0 'INIT: WILL BE 4.
150 '
160 'GET FOUR ADDR. KEYS.
180 GOSUB 760: FIRST=F
190 GOSUB 760: SECOND=F
200 GOSUB 760: THIRD=F
210 GOSUB 760: FOURTH=F
220 A=FIRST*4096 + SECOND*256 +
   THIRD*16 + FOURTH 'MAKE ADDR
230 J=PEEK(A) 'PEEK AT ADDRESS.
240 PRINT "$" RIGHT$("000"+HEX$
   (A),4) " " RIGHT$("0"+HEX$(J)
   ,2)
250 '
260 'GET MSB HEX KEY.
280 U$=INKEY$
290 IF U$="" THEN 280 'KEY YET?
300 S=ASC(U$) 'ASCII VALUE?
310 '
320 'CHECK FOR CONTROL CODES
340 IF S=13 THEN 670 '<ENTER>?
350 IF S=94 THEN 680 'UP ARROW?
360 IF S=10 THEN 670 'DOWN ARW?
370 IF U$=" " THEN 670 'SPACE?
380 IF U$="/" THEN 680
390 IF U$="!" THEN END
```


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```
400 IF U$="@" THEN 130
440 F$=U$: GOSUB 860: IF F=16
   THEN 690 ELSE U=F
450 PRINT @458,U$ 'PRINT OK KEY
470 'GET LSB HEX KEY.
490 L$=INKEY$
500 IF L$="" THEN 490
510 S=ASC(L$) 'ASCII VALUE?
520 IF S=8 THEN 710 'LEFT ARROW
530 IF L$="," THEN 710 'BKSP
550 'CHECK FOR PROPER HEX KEY.
570 F$=L$: GOSUB 860: IF F=16
   THEN 690 ELSE L=F
580 PRINT @459,L$ 'PRINT OK KEY
590 H=U*16+L 'CALCULATE VALUE.
600 POKE A,H 'DO THE STORE!
610 '
620 'CHECK TO SEE IF GOT THERE.
640 CHK = PEEK(A)
650 IF CHK<>H THEN 660 ELSE 670
660 PRINT @460," ??" 'DIDN'T
670 A=A+1: IF A>65535 THEN A=0:
   GOTO 230 ELSE 230 'INCR, GO
680 A=A-1: IF A<0 THEN A=65535:
   GOTO 230 ELSE 230 'DECR, GO
690 PRINT @458,"!!" 'ERROR MSG.
700 GOTO 230 'TRY OVER, NO INC.
710 PRINT @458," " 'DO BKSPACE.
720 GOTO 280 'TRY SAME AGAIN.
730 '************************
740 'SUB:GET,PRINT,ADDR.CHAR.
750 '************************
760 F$=INKEY$
770 IF F$="" THEN 760 'GET KEY.
780 GOSUB 860 'CONVERT TO HEX.
790 IF F=16 THEN 130 'NG:DO OVR
800 PRINT @(461+COUNT),HEX$(F)
   'PLACE CHAR IN CORRECT SPOT
810 COUNT=COUNT+1 'RDY FOR NEXT
820 RETURN
830 '************************
840 'SUB:CONVERT KEY TO VALUE
850 '************************
860 F=16 'DEFAULT: NOT HEX KEY.
870 H=ASC(F$) 'CONV KEY TO NUM.
880 IF ((48<=H) AND (H<=57))
   THEN 900 'IS A NUMBER?
890 IF ((65<=H) AND (H<=70))
   THEN 920 ELSE RETURN 'A LTR?
900 F=H-48 'VALUE OF NUMBR KEY.
910 RETURN
920 F=H-55 'VALUE OF LETTR KEY.
930 RETURN
```


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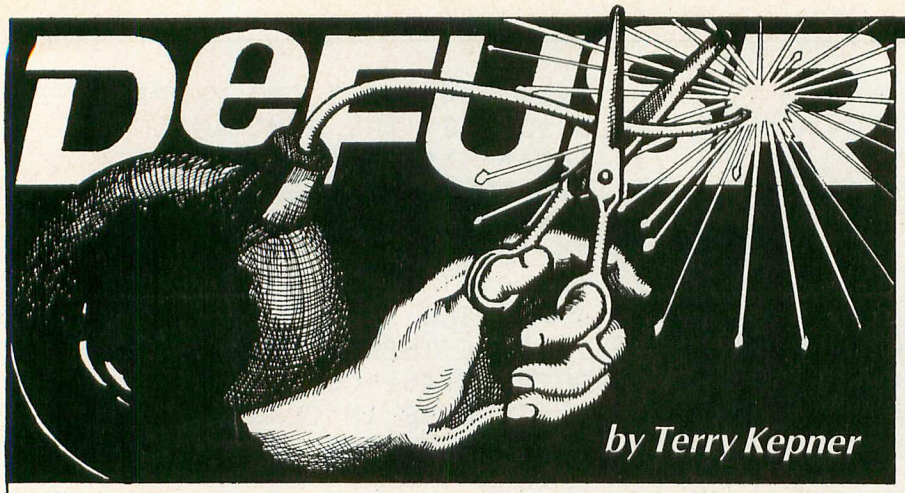

illustration by Rod McCormick

I'm thinking of buying a Mannsmann Tally MT160L printer for my Color Computer. Can I connect it to my computer with no additional interface? Should I expect a problem finding or making a cable? Will I be able to use the full potential of both printer and computer? Can I use and print information with my CompuServe ROMpak?

—W.B., Everett, WA

Yes. A little. Sort of. I don't think so.

Silliness aside, I used an MT160L with my Color Computer for several months. The only additional hardware you'll need, since the MT160L comes with RS-232 and parallel interfaces, is the cable from the Color Computer to the printer. The cable supplied for RS-232 by Radio Shack for the Color Computer is wired incorrectly for use as an RS-232 printer cable. It can be easily fixed, or you can build one yourself just as quickly and cheaper too!

To make the cable you need the Radio Shack Color Computer printer cable (four-pin DIN to four-pin DIN, number 26 – 3020, $4.95), a D-subminiature male connector (276 – 1547, $2.99), the D-subminiature hood (276 – 1549, $2.19), a soldering iron, a little solder, wire cutters, and a screwdriver.

Cut one DIN plug off the printer cable, and remove the covering from the four exposed wires, then strip about 1/4 inch of insulation from each wire. Solder the DIN pin 2 wire (green) to pin 20 of the D-connector. Solder DIN pin 3 wire (red) to pin 7 of the connector. Solder DIN pin 4 wire (white) to pin 3 of the connector. Check your soldering for accidental bridges to adjacent pin connections and make sure the solder joints are solid and clean. Put the hood in place and screw it together. You're finished with your cable. Plug it in and try it out. If you have problems, use a volt/ohmmeter to make sure that pins 2 and 20, 3 and 7, and 4 and 3 are connected, and no others (it's possible that the colors are connected to different pins than I've indicated, but all the cables I've seen so far used the colors I specified).

If you would rather alter the Radio Shack cable (26 – 3014, $19.95), you'll need a screwdriver and a pair of pliers. Take apart the hood of the RS-232 connector and use the pliers to pull the wires from the connector (make sure you grip the metal pin and not just the bare wire). Now push the white wire's pin into the connector hole labeled 3, push the red wire's pin into hole 7, and push the green wire's pin into slot 20. Re-assemble the unit and test it out. If it still doesn't work, test it for correct wiring.

For either of these methods to work, make sure the printer is set to the default settings of your computer. If you have Color Basic version 1.0, they are seven bit words, two stop bits, no parity. Color Basic 1.1 uses eight bit words, one stop bit, and no parity.

The printer is much faster than the computer, but you can set the printer to higher baud, and use POKE from Basic to speed up the computer's baud. The other printer features can easily be accessed with the proper software.

The CompuServe ROMpak sold by Radio Shack doesn't provide for printer output of data received. For that you'll need a smart terminal program.

I have a 64K Color Computer with one Tandon drive and a Radio Shack disk controller. The problem is that the computer seems to turn itself off. The screen goes to regular TV snow and I lose all keyboard communication. Sometimes it happens after several hours of use, sometimes right after power-up. Turning the computer on and off will eventually get it to work, but once it blinks off it usually happens several times before the computer will work properly for any length of time.

—E.K., Baltimore, MD

Your power supply sounds like the culprit to me. The Radio Shack controller draws its power from the Color Computer power supply. I think the power supply's performance may be marginal. Adding the disk controller pushed it too far and a component gave out. Now the component works only when it wants. My suggestion is to take it to a Computer Service Center and ask the technician to take a look and give you an estimate on repair cost.

I've read several articles about 64K modifications and they all seem to hinge on the use of a DOS. I plan to purchase disk drives in the future. How can I use 64K without disks? Is there a way, either software or hardware, to transfer the contents of ROM to RAM, and possibly compress the amount of memory ROM uses? How can I use the memory addresses assigned to the ROMpaks after I've upgraded to 64K?

—L.O., Vancouver, WA

You don't need a DOS to use 64K in a Color Computer. Page Plus (Skyline Software, 442 Sunnyside, Wheaton, IL 60187, (312)260-0929, $27.95), lets you use 56K of RAM with Basic via memory banking techniques. The same company sells 64K Boot/Pager ($19.95), which lets you manually page between two banks of 32K RAM, and will copy ROM to RAM so you can modify it. Micro Technical Products (123 N. Sirrine, Suite 106B, Mesa AZ, 85201 (602)834-0283), sells PLUS32 ($15) which moves Basic from ROM to RAM for your modifications.

When you're in 64K RAM mode, without Basic, address the memory the same way you do anything else in machine language. If you're using Basic in 64K mode you have to use the PEEK and POKE commands, or machine language jumps (EXEC) to address those locations above Basic. Basic itself can't use anything above 32767.

to page 102

Setting The Standards

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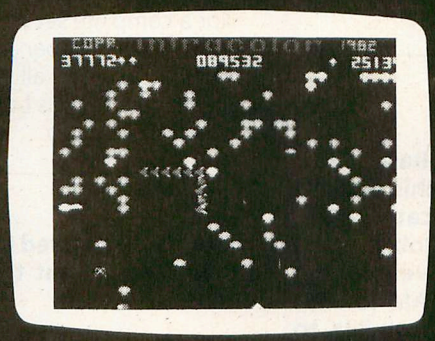

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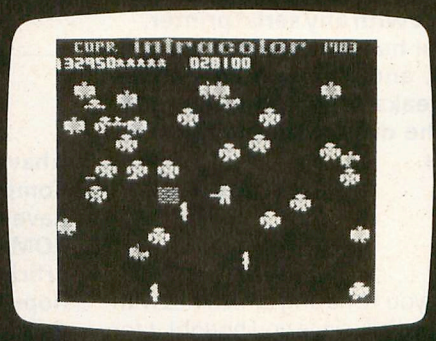

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Circle No. 72 on Reader Service Card

from page 100

I purchased Radio Shack's Scripsit based on your March word processor review, and I want to tell you that Scripsit won't print properly from the disk to the printer (the spooler function) with non-Radio Shack printers (I bought it for the spooler function). It generates miscellaneous characters in the printed copy. I checked with the local Radio Shack Computer Center and found that they know of the problem, but they don't intend to correct it since there isn't a problem with Radio Shack printers. Yet, the advertisements say it will work with any serial printer.

The error has something to do with bit errors, and it only occurs at the buffer breaks when the computer goes to the disk spool file for more characters.

—R.C., Winter Park, FL

I'm sorry you're having difficulties with Scripsit, especially since you bought it for the spooler function. You don't mention the brand of printer you're using, but is it possible there might be a switch setting to eliminate the problem? After looking at your sample print-out, it looks like the printer is losing the characters when Scripsit slows down for disk I/O. Have you contacted the printer manufacturer for advice? I don't know if Scripsit is entirely to blame, since it works with my non-Radio Shack printer.

Radio Shack should add a disclaimer to their advertisement that not all serial printers will work with Scripsit. If you can't solve the problem, you can return Scripsit to Radio Shack and ask for a refund since it won't work properly with your system.

I have a 32K Extended Basic Color Computer. I understand this means I have 64K chips that allocate 32K to ROM and 32K to RAM. Bob Rosen's article (March 1983) gave me the hope of upgrading my RAM to 64K. Can I upgrade my RAM from 32K to 64K? Or is 32K ROM and 32K RAM all I can get from my computer?

—J.C., Ruston, LA

Your computer may already have 64K RAM, you just can't access it. If you have the latest board, all you need is software (such as Telewriter-64 and Super Color Writer 3.0) to access the full 64K capability. If you have an earlier board, you must have a Color Basic 1.1 ROM (type: EXEC 41175, or PRINT PEEK(41301): a response of 49 means you have version 1.1). You'll also have to make sure the SAM chip is properly wired to address the extra RAM (if you have Color Basic 1.0, then it isn't). If it isn't, you have to cut traces and solder wires for the modification. You may also have "half bad" 64K chips instead of good ones.

For a complete set of instructions, see Dennis Kitsz' October "Custom Color," in which he gives all the changes required by the various boards for upgrading to 64K capability.

I have 16K Extended Basic with a "D" board, and I want to upgrade it to 64K.

—J.R., Munford, TX

See previous letter.

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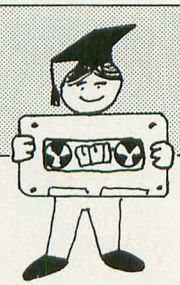

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I want to upgrade my DMP-100 printer to a DMP-200. Is it possible? I've tried selling it, and using it as a trade-in to my dealer without success. Can you help?

—W.M., Freeport, IL

You can't upgrade the printer to a DMP-200, at least as far as I know. Have you tried advertising in the want ad booklets as well as newspapers? If your dealer will let you, post a For Sale note at his store.

I do a lot of direct access file work and I'm constantly plagued by crashing programs when I enter a non-existent record address. Can I make an "on error, do something" (other than crash) routine that could be incorporated into the program or the operating system?

The Radio Shack manuals give poor explanations on how to use PEEK and POKE. I understand they can look into memory and put things in selected locations, but when and why would I want to do this? What are such operations good for? How can they be used?

Finally, I have a revision C (1.0) board, how do I upgrade to 64K?

—L.G., Columbus, OH

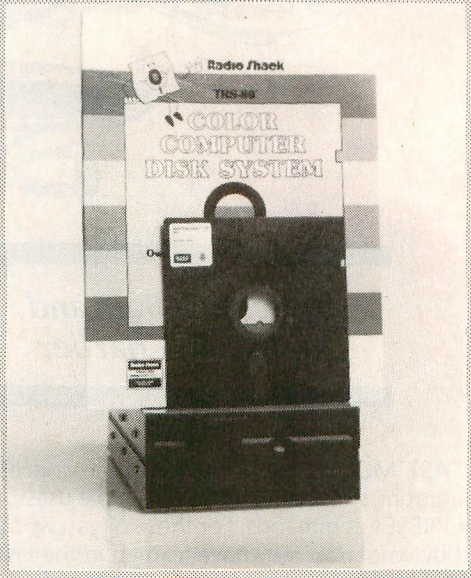
First, why are you entering non-existent record numbers? In direct access files, a non-existent record number must be either less than one or greater than the number of records in the file. All other numbers are valid. You need to use standard error checking methods on your record numbers before you try to use them in a Get statement. Checking for less than one is easy, but how do you know if the record number is too large for the file? This is accomplished with the LOF (buffer number) command. Every time this command is issued, the operating system calculates the highest record number in the disk file. A simple statement of: IF LOF(x)<N THEN PRINT "N is too large":GOTO (repeat input) will solve the problem. It might be a good idea to put your error checker in a subroutine and call it before you execute a Get statement. That should eliminate the problem of crashing on a BR error. *Hope that* helps.

See previous letter for info on upgrading to 64K.

I will be going to China for a year and would like to bring my Color Computer, CGP-115 printer, and CTR-80 with me. Is this possible? The electrical current over there is 220 volts, 50 cycles.

A.L., Eugene, OR

Before you leave the states, buy a 220 volt, 50 cycle to 110 volt, 60 cycle converter. You can purchase this unit from Gerber Electronics Co., but it will be expensive. Before buying a particular unit, make sure it can handle the power rating of your system (the computer pulls about one amp, the monitor takes about the same, and your tape recorder takes only a few hundred milliamps). *Is there someone out there who's already done this and can help A.L.?* ■ ■ ■



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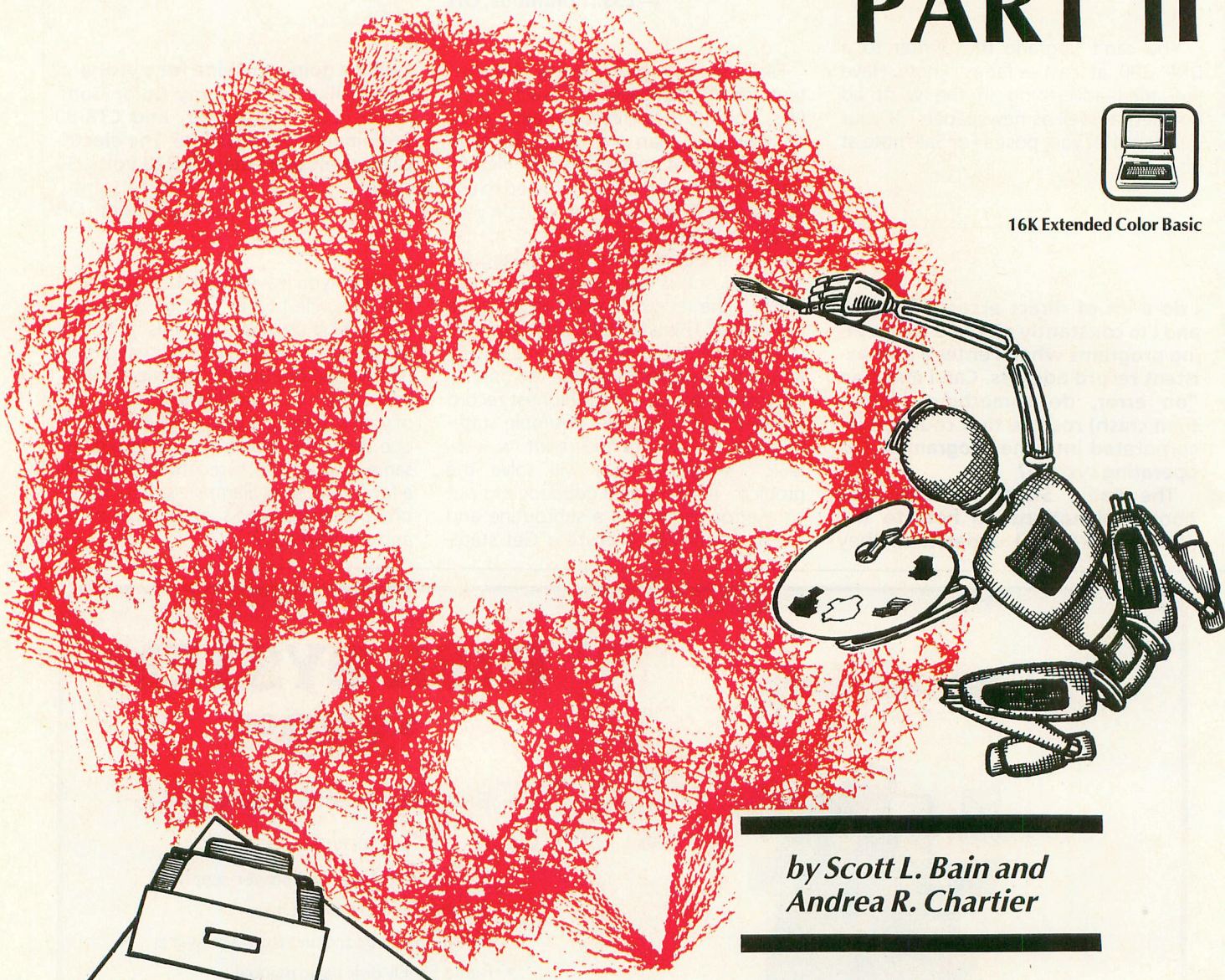
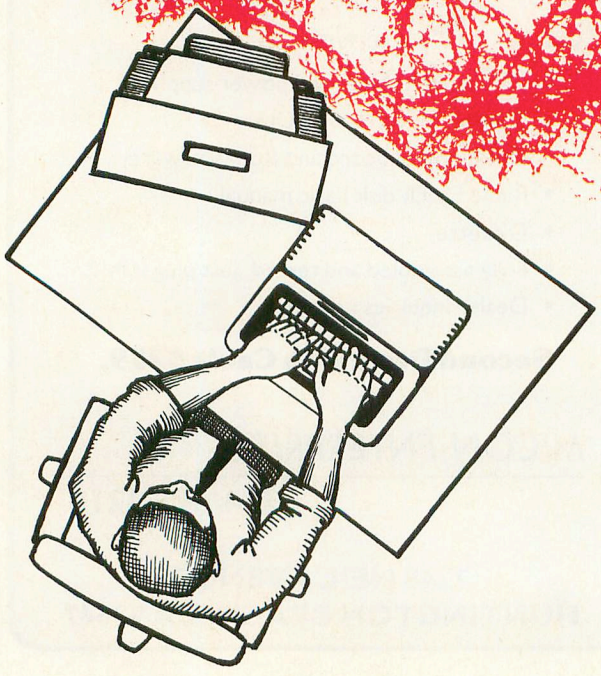


16K Extended Color Basic

by Scott L. Bain and Andrea R. Chartier



LAST MONTH WE EXAMINED the concepts behind the graphics display, and some simple uses of the PSET and PRESET commands. For those of you who are a little confused by what you may have learned in the last article, here's a short refresher:

PCLEAR — should be the first statement in your program, followed by a number that corresponds to the PMODE you will be using.

PMODE — establishes the graphics mode and number of colors available.

SCREEN — determines whether you are in text or graphics mode, and selects the colors available in graphics mode.

PCLS — clears the graphics screen to the background color — either the default color under the current SCREEN set, or any available color set by COLOR.

PSET — turns a single pixel to a specified color.

Now we're going to teach you about some rather snazzy commands that will let you create complex graphics quickly and easily. As before, all these functions require that your machine be equipped with Extended Color Basic. Assuming this, onward.

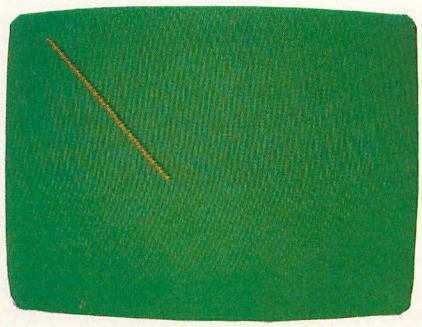


Photo 1. Line Program

Drawing Lines

The LINE command lets you draw a straight line between any two points on the screen. The syntax is:

LINE (x,y)–(a,b),PSET.

X and y are the coordinates of one point, and a and b are the coordinates of the other. PSET, a familiar term, tells the computer to plot the line in the foreground color. Substituting PRESET here will plot the line in the background color, thereby erasing an existing line if the coordinates match.

This is fairly obvious, right? The LINE command has two other options, however, that you will find most useful — B and BF. Adding a comma and B to the end of a LINE command will cause it to draw a box using the coordinates as opposing corners, rather than a line. BF here would make this a filled box in the foreground color.

Let's try one. Type:

```
NEW
10 PCLEAR 4
20 PMODE 3,1
30 SCREEN 1,0
40 PCLS
50 LINE (10,10)–(100,100),PSET
70 GOTO 70
RUN
```

You should see a red line on a green background in medium resolution. The line's upper left corner is at point (10,10) and its lower right corner is at point (100,100).

Push the Break key, then type:

```
35 COLOR 2,3
RUN
```

more

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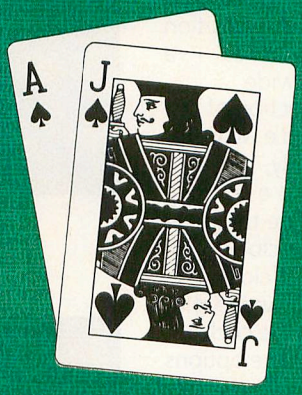

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S K I L L W A R E

Now you should have a yellow line on a blue background. Add ,B to the end of Line 50, then after looking at that, change it to ,BF — isn't this fun?

Circle

Plotting a circle or ellipse is not much more difficult than plotting a line. The basic syntax is this:

```
CIRCLE(x,y),w
```

where x and y are the coordinates of the center of the circle, and w is the width (in pixels). The command: CIRCLE(128,96),95 would plot a circle with a center of 128,96 (the center of the screen) and a width of 95.

Other options include color variation, height variation (for ellipses), and partial or arc plotting.

The complete syntax, with options, would be:

```
CIRCLE(x,y),w,c,h,s,e
```

The color of the outline of the circle is specified by c. Normally the foreground color would be used, as when c is omitted. Using the c option lets you vary this.

The height multiplier is specified by h. Normally the height is the same as the width (a perfect circle), and therefore the multiplier would be 1, which is the default value. Specifying an h of less than one, let's say .5, would cause the circle to be less tall than it is wide, generating a fat ellipse. Putting 1.5 in the h position would create just the opposite — a skinny ellipse, taller than it is wide.

The "arc segment," or a section of the circle, is plotted through s and e, which is a little tricky to use. Basically, use s to mark the start of the arc and e to mark the end, where (if you imagine the circle as a clock face), 0 is the 3 o'clock position, .25 is 6 o'clock, .50 is 9 o'clock, etc. An s of .50 and an e of .75 would plot only the left lower quarter of the circle.

If you want to use some of the options but not others, the syntax requires only that you keep the number of commas in the statement consistent with the format. For example, to vary the height, but not the color, the statement would be CIRCLE(128,96),95,,.8. The extra comma tells the Color Computer that .8 is a height specifier and not a color (which is fortunate, since a color of .8 would be quite illegal). Note that the commas for s and e are not included, since they come *after* the height command and therefore would not confuse the issue.

Let's Break and try an example:

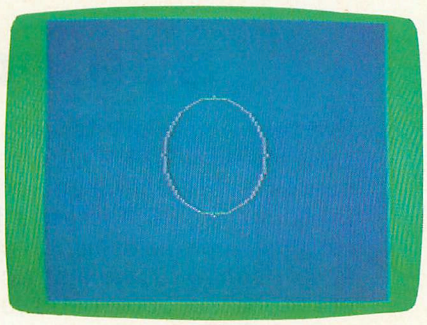

Photo 2. Circle Program

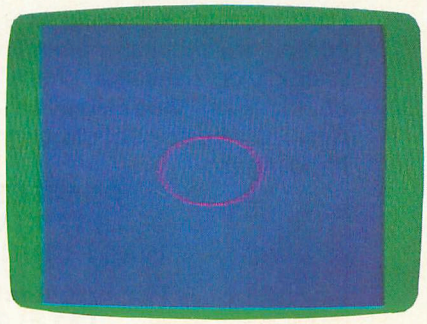

Photo 3. Alternate Circle

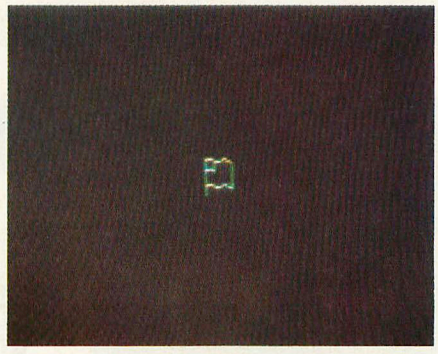

Photo 4. Draw String

Photo 5. Alternate Draw String

```
50 CIRCLE(128,96),40,1
RUN
```

This generates a perfectly round, complete, green circle of radius 40 using (128,96) as the center. Change the command to CIRCLE(128,96),40,4,.6 and look at the difference.

Paint

The Paint command fills any closed polygon on the screen with any available color. It can be very useful, to generate images for games, etc., and is easy to use.

```
PAINT(x,y),c,b
```

As you may have guessed, x and y are the coordinates for the point at which the painting should begin. The color of the paint to be used is shown by c, and b is the border color, or the color which the paint will not cross. Our circle of color 4 could be filled up with red paint (color 4) like this:

```
<BREAK>
60 PAINT(128,96),4,4
RUN
```

The (x,y) coordinates could be any point that falls inside the circle. Change the command to PAINT (1,1),4,4 and see what happens.

Paint can be used to fill any polygon regardless of the size or shape, but *be careful*. If you try to paint an object that is not finished (that is, one with a gap somewhere in its border), the paint will leak out and flood the entire screen.

Get and Put

The Get and Put commands are not plotting commands, but utilities that let you make copies of or move graphics around the screen without replotting them over and over. They're fairly advanced tools, and since you don't really need them for simple graphics, you might want to skip this section if you get confused. If you feel confident, however, try it. Used carefully, they result in greater speed and shorter programs, and take less time to code than other, more conventional means.

Let's say you've got an object on the screen — a space ship or a political candidate — and you want to create a duplicate of it elsewhere. First you GET, then you PUT.

The syntax for Get is GET(x,y)–(a,b),m,G. The x, y, a, and b are the corners of a rec-

to page 108

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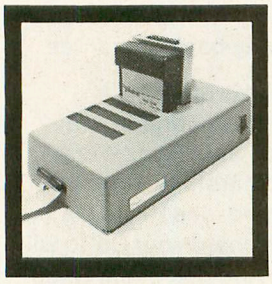

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Circle No. 78 on Reader Service Card

from page 106

tangle that should completely contain the object to be copied. The m is an array dimensioned earlier in the program, using the following formula to determine its size:

```
SIZE=((abs(x-a)*ABS(y-b))-1)/n
```

where n is 40 for PMODEs 3 and 4, 80 for PMODEs 1 and 2, and 160 for PMODE 0. Array m must be dimensioned to at least this size, and, despite what the Radio Shack manuals say, need only be one-dimensional. (Review the material on arrays in the Radio Shack manual if you are unfamiliar with them.)

The G in the Get command tells the computer that this is to be used for graphics, and is not optional.

The m array now contains the information necessary to replicate whatever was in the rectangle you specified. To make the copy, Put it somewhere, like this: PUT (x,y)-(a,b),m,PSET. The coordinates here should indicate a *new* rectangle for the object to be copied into, m should be that same array, and PSET indicates that the new object should be in the same colors as the old object.

PSET can be replaced with any one of four options: PRESET, which works to create the object in the background color; OR, which places the object into the rectangle without erasing anything that may have already been there (merely lays it on top); AND , which only plots the pixels that are on in the m array and the destination area. This is rarely useful; and NOT, which reverses the status of every pixel in the destination rectangle, irregardless of what is in the m array, creating very strange results.

To move an object rather than duplicate it, Get the object, then blank it off the screen using LINE(x,y)-(a,b)PRESET,BF. Now Put the array next to where it used to be. Repeating this process gives the illusion of motion.

Draw

The Draw command is the simplest *and* most complex way to create an image on the graphics screen. It is a sister to the Play command used in sound generation, in that it uses a string or string variable to store its parameters: DRAW "string" *or* DRAW A$.

The Draw command uses a graphics "turtle," which is a cursor on the graphics screen that leaves a trail of pixels turned on as it moves. Basically, the string in the Draw command controls where the turtle moves, what color it uses to draw, etc..

The string or string variable contains a series of commands that the turtle follows, in order. For example, DRAW"U10;R10" tells the turtle to move up 10 pixels and right 10, leaving a trail behind, and assuming the foreground color since none is indicated. The commands the string may contain are listed below:

U,D,R,L — Move up, down, right, or left the number of pixels that follow the command. The default number (the number the computer will use if none is specified) is 1.

E,F,G,H — Move diagonally — E is to the right and up, F is to the right and down, G is to the left and down, and H is to the left and up. As with the above commands, 1 is the default number.

Cn — Change the drawing color to n. The drawing color will remain n until it is changed again.

An — Changes the turtle's orientation. An n of 1 makes the right of the screen act as the top of the screen, so all future U commands will actually move the turtle toward the right. All direction commands are turned to compensate until a new A command is encountered. The n can be 1 for the right side, 2 for the bottom (totally inverts everything), 3 for the left side, or 0 (default) for the top.

Sn — Injects a scaling factor into all future movements. The default is 4, so S8 would double the size of all commands that follow it. If you put an S command at the beginning of the Draw string, the entire image being drawn will be scaled accordingly. The n can be any number from 1 to 62, with numbers less than four shrinking the drawing and numbers greater than four enlarging it.

N — No update; basically, this command applies to the command which follows it, causing the turtle to execute the next command, then return to where you are now. The combined command NR20 would tell the turtle to move 20 pixels to the right (leaving a trail), then return to the position it held before the move.

M — Causes the turtle to move to a new position on the screen. For instance, M20,20 would move the turtle to position 20,20, leaving a trail behind. M can also be followed by relative numbers; M+2,−5 would mean move to a position that has an X coordinate that is two greater than your current one, and a Y coordinate that is five less, leaving a trail behind.

B — Blank applies to the motion command that follows it. BR5 would move the turtle five pixels to the right, *without* leaving a trail behind it.

X — Means execute the following substring and return. XB$; would cause the turtle to look for the variable B$ in memory, execute the draw commands contained there, then return to the current string and continue on.

To give you an example of the Draw function, we're going to write a program that will display the draw strings on the hi-res screen. Then, we'll give a few sample strings to draw.

```
NEW
10 PCLEAR4
20 PMODE 4,1
30 SCREEN 1,1
40 COLOR 5,0
50 PCLS
60 DRAW "BM128,96;U5;R5;D5;L5"
70 GOTO 70
```

Here are a few other draw strings you can put in Line 60:

```
"BM128,96RER7F1R2E1R1BM−5,+10U10L4D10"
"BM128,96D14U4R3FR3ERFRFU10HLHLGL3D4HL3
U4R3"
"BM128,96F7R2EHL2BM+3,+1R3FR2EHL2BM+1,
−1H4"
"BM128,96FDGHURD4R2ERFGLEL6HLGFRHR4D4
RL2"
"BM128,96HE2F2G2D2R2E2F2G2H2L4H2G2F2E2
R2D2F2G2H2EHEG8"
```

Those are the Extended Basic commands that give you so much freedom on the Color Computer. Remember them the next time you play a high resolution game program you've paid lots for, and realize you could have done it yourself, and better.

Now, a few notes follow to help you get started. Next month we'll look at a "drawing board" program that will demonstrate the use of all these commands while turning your machine into a scratch pad for your creative urges.

Notes

Line does not necessarily need the first set of coordinates. LINE−(a,b),PSET makes perfect sense to the Color Computer. It means "plot a line from wherever you are now (wherever the last Line or Draw command ended) to the a,b coordinates, PSETing the pixels."

PRESET in a Line command can be used to make "holes" in closed polygons. Just plot a PRESETing line through one side of the object, and you've created a gap. Why create a gap? See the explanation of Paint if you're not sure.

The commands in a Draw string can be separated by semicolons for your own debugging ease, but the computer ignores them. You should remove them when the program is in its finished state, since they *do* consume memory. ■ ■ ■

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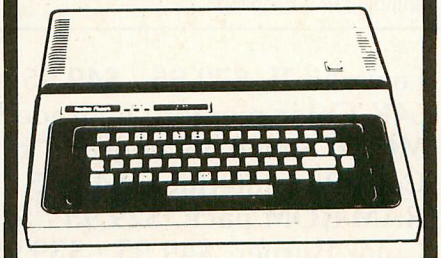

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FORX=1TO66:PRINT#-2,STRING$(64,45):NEXT

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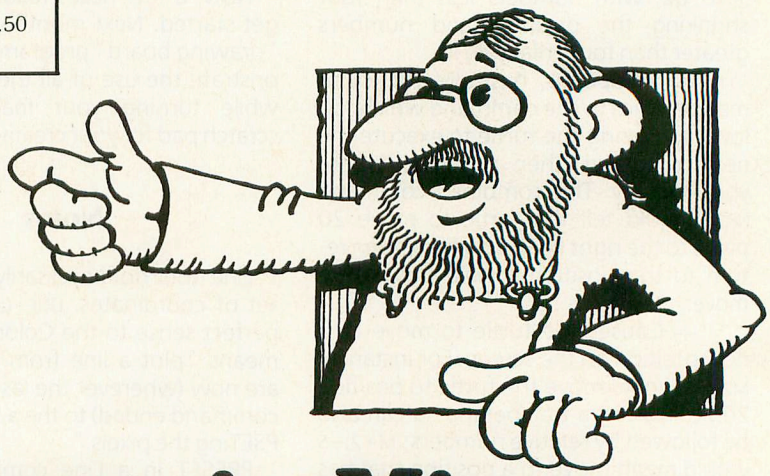
(Comparisons made using a Microline 82A serial/parallel printer. CoCoPort $49.95 ($39.95 kit). Cable and connectors additional. Parallel connector, $10. Assembled cable, $20 complete. Add $2.50 shipping and handling.)



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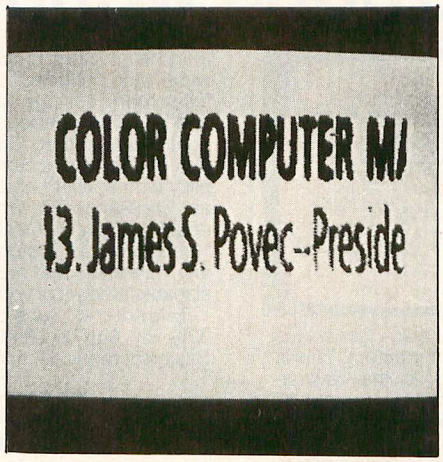
IF COMPUTER VISION interests you, the MicronEye will interest you. It provides a complete digital imaging system for a 16K Color Computer. I am interested in character recognition (see the Photo, taken from the fine print in the table of contents of this magazine) and have found the resolution of tiny print to be outstanding. Possible uses of character recognition systems include graphic input, security, pattern analysis, automated process control and robot vision.

The heart of the MicronEye is the OpticRAM, developed by Micron Technology (not the Japanese). This OpticRAM is composed of 65,536 individual image-sensing elements arranged in two arrays of 128 by 256 elements. The technological advance represented by this device results in a 1000 times reduction in price over previous generation sensing chips, such as the CCD chip.

Ordering the eye was simple enough. A simple telephone call and a credit card were all that was needed. Shipping is via Federal Express second day service, resulting in fast hand delivery of the well cushioned box. I was pleased to see that the shipment included everything necessary to operate the eye. Among the packed items were the lens, OpticRAM and tube (bullet), tripod, interface electronics, cable, software cassette, and manual. Everything comes assembled; just read the instructions, plug the card into the ROM slot, load the software and you're in business.



MicronEye: A Digitized Image

The 45-page manual is well written and includes software listings and a schematic diagram. Sections on programming, advanced technique, and troubleshooting indicate that this company is selling a product and the technical information necessary to take that product to its limits.

The lens has adjustable focus and an adjustable aperture. Shutter speed is a function controlled through electronics rather than mechanics, resulting in fully software-controllable exposures. The supplied lens and close-up ring enable focusing from five inches to infinity, but the standard C-mount permits easy lens changes, if desired.

Ordinary room light is more than sufficient to obtain good images if a proper shutter speed is used. In bright light it is possible to obtain about fifteen images per second; one per second is more appropriate inside my house. I have not obtained good images of my basement (it isn't photogenic) because it does not translate nicely into pixels, which are jet black or snow white. Shades of gray may be detected by using multiple scans at different exposure times — using these shades is an exercise left to the purchaser.

My only problem arose when I tried to connect the interface card to the ROMport. The instructions say: "When inserting the interface, always be certain that the component side of the board is down." The components are sealed in a plastic black box with nothing more than a double-sided card connector protruding. The end of this rectangular black box should rest alongside the keys; no part of the box should extend behind the computer. The card connector which goes into the ROMport is not "idiot resistant" like the Radio Shack game cartridges; I had to open the port door with my finger and watch lest I cram the card above, below, or off to the side of the socket.

MicronEye is a sophisticated piece of equipment; I would strongly recommend it for anyone working with computer vision. *— by Mike Rigsby*

Astro Blast

Mark Data Products
24001 Alicia Pkwy, #226
Mission Viejo, CA 92691
$24.95 cassette, $27.95 disk

FIRST OF ALL, I never even *saw* the Command Ship — much less got a shaky-handed shot at it. Whether this was due to a slight bias in Astro Blast towards the nasties, my eye-hand coordination not being sound, or the unfortunate state of the Radio Shack joystick (a truly slack-action device) — I never got past the type number 3 aliens.

Astro Blast is an Invaders-inspired game. Three different series of aliens descend on your ship/launcher/station. Your blaster moves and shoots slowly, making it quite a feat to get through the waves of aliens. You have to get through each unit or wave and wipe them all out before you can go on to another. But, not only do you have to plaster the blasters — you have to avoid comets as well.

An easy-to-read fuel and blast shield gauge keeps you well informed concerning your status. Going to higher skill levels is probably a wonderful sport. You have to be confident — and good — to be able to work your way through the various levels.

Astro Blast can accommodate more than one player; unfortunately, not simultaneously. The game lets you get hit three times before the game unceremoniously ends. The graphics used to represent alien or defender hits are adequate but not spectacular.

The instructions on the back of the package cover the game well. The only addition I would like to see is an extra set, printed on the cassette case insert or just as a piece of paper that could be stuffed into the cassette case.

Astro Blast is good for beginners to game playing and, most likely, better for children than adults.

— by Leslie Venable

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Telewriter-64 also generates true lower case characters. This is much preferable to the reverse characters that merely "represent" lower case letters in other co-co word processors.

Telewriter-64 is feature packed. Besides the standard features found in any word processor, Telewriter also includes: user-friendly full-screen editing, rapid cursor and scrolling control, page jump, right justification, menu-driven disk or cassette access, compatability with spelling checkers (such as Spell-and-Fix), and a clever double check that asks the user "Are you sure?" before executing any operation that would kill any sizeable amount of your text.

Telewriter-64 runs on any 16K, 32K, or 64K system (extended Basic not required) and works with any printer. It has all of the control codes necessary to take full advantage of all of the features in any printer. There is even a "typewriter" mode which sends typed lines directly to your printer.

With advanced word processing software such as this, your color computer becomes a truly powerful word processing system, with a price that makes sense for the personal user.

Beyond impressive capability, Telewriter-64 simply makes any kind of writing a pleasure. It is a truly sophisticated system that is marvelously easy to learn and enjoyable to use.

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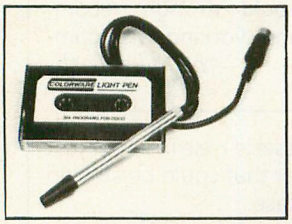

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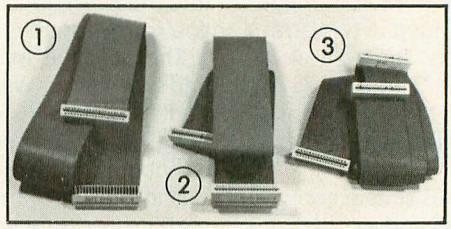

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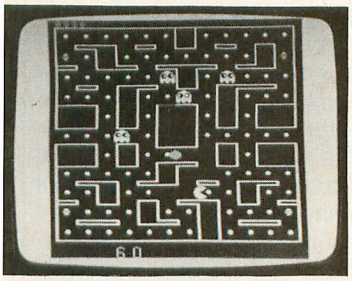
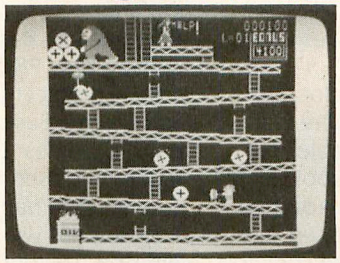


GHOST GOBBLER

From Spectral Associates, this "Pac" theme game is the best of it's type. Brilliant color, action and sound, just like an arcade gobble your way to glory, but watch for those ghosts! Get in on the wild fun of this game craze now. Requires 16K. Tape: $21.95, Disk: $25.95

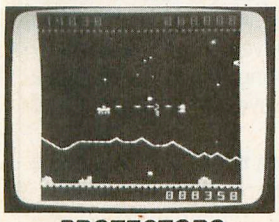
DONKEY KING



DONKEY KING

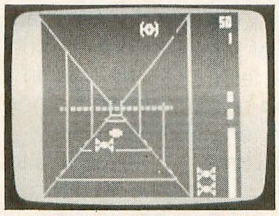
You simply can not buy a more impressive game for your color computer than this new wonder from Tom Mix. The graphics, sound, and animation are all just astonishing! There are four different graphic screens and each is endless fun. Requires 32K. Tape: $24.95, Disk: $27.95

GHOST GOBBLER



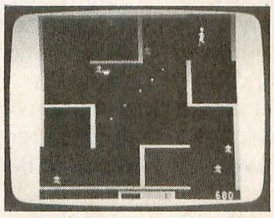
PROTECTORS

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



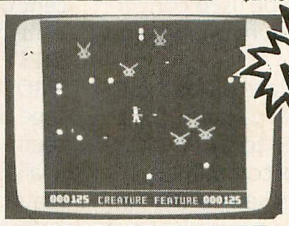
INTERGALACTIC FORCE

Your space fighter roars into the Death Corridor. Lock-on and blast the enemy fighter from the sky. Now try dropping one into Death Star's narrow exhaust vent. It takes skill and guts. Good luck! With "Star Wars" theme song. From Anteco. Requires 16K. Tape: $24.95



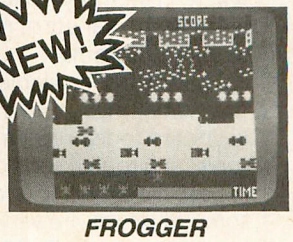
ANDROID ATTACK

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



CREATURE FEATURE

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



FROGGER

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

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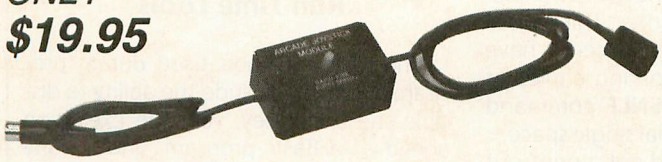

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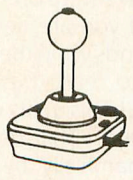

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the powerful set of utilities available on most mainframes. Micro owners must acquire utilities one by one until they collect a good set of them. The problem then is to load all those separate programs so they can be used at will. Arizin has taken a step in the right direction with a superb package of utilities called "COLORKIT."

"COLORKIT" is a 5.2K fully relocatable machine language program (there is also a smaller, 1.5K version available). The program uses the Basic ROM hooks and can be turned on and off as desired. Since the program can be loaded anywhere in memory, it can be used concurrently with a variety of machine language or Basic programs.

The utilities available are divided into five categories: Basic program tools; keyboard tools; run time tools; memory tools; and toolkit control commands.

Each category includes several utilities, some of which are very powerful. I have been using "COLORKIT" about six months, and I still haven't been able to use all the tools in actual application, although I have tested them all. The tools included significantly enhance the Color Computer's power, and all commands are easily entered by typing a period followed by the command.

Basic Program Tools

Basic program tools include a number of utilities designed to make Basic programming easier:

.DATA translates a resident machine language program into Basic data statements and appends them to a resident Basic program. This lets the user append machine language programs with data statements and POKEs without having to key in the actual machine language.

.DELR deletes all remarks from a Basic program, cutting down the amount of memory required. The **.DELS** command deletes spaces in the same program. Both commands can appreciably reduce the size of a Basic program.

.GBL is one of the handiest commands. It lets you search globally for any string. You can even tokenize a Basic statement and search the program for it. The search can easily be continued to look for multiple occurences of the same string or Basic token.

.MMRG merges the resident Basic program with a resident machine language program. The merged machine code cannot be listed (it is invisible), but can be saved and loaded as any ordinary Basic program. The code can be purged from the Basic program with the **.MPRG** command.

.OLD is a great command for those who type NEW and later regret it. This command lets you recover the old program as long as you haven't entered the new one.

To protect a Basic program currently in memory, the **.PROT** command is issued. This will protect that program and let you load another Basic program. The old program becomes transparent while the new one is used, worked on, or saved. The New command will not affect the old program, but will get rid of the most recent one. The old program, still invisible in memory, can then be accessed via the **.REST** command. A manipulation of the .PROT and .REST commands will let a tape user merge two programs and save them as one, a feature currently only available with the Merge Disk Basic command.

One of the handiest tools is the **.VAR** command, which will create a list of all variables used in the program. I have found this feature invaluable at documentation time.

A number of Basic tools are designed to enhance the print and display features of the Color Computer. These tools are especially handy if you have a printer:

.DARK reverses the video on the screen and creates light letters on a dark background. The command **.LITE** will return the screen to its normal display.

For more readable printed output, the **.DFLF** command will send an extra linefeed character to the printer. This causes all output to be double spaced. I have used this often with working copies of program listings. The **.SNLF** command returns the print to normal single space.

Ever wished you could get a print-out of a text screen? The **.ECON** command causes all screen output to be echoed to the printer. The **.ECOF** command turns this feature off.

If you are tired of watching List commands whip the listings by you too quickly to read, the **.PDLY** command is for you! This utility will let you vary the listing speed. The delay can be overridden dynamically by holding the space bar down. You can also use a "single step mode" which will only print while a key is held down. For debugging (especially if you don't have a printer), this feature is particularly useful.

Keyboard Tools

The keyboard tools set enhances your keyboard entry by making features available which are usually found only on much more expensive computers.

The **.FN** command lets you use the number keys (0 – 9) as programmed function keys. Each function key can be programmed (the programming is quite simple) to store and print any sequence of up to 256 screen characters. I have found this tool to be particularly useful when entering Basic programs where I have a lot of repetitive phrases. An outstanding feature of this tool is the fact that you can save the key values and create your own defaults, which are ready each time you use the "COLORKIT." For example, I get tired of keying PRINT # –2, so I have programmed a key to do that. In a long program, that one function alone saves me hundreds of keystrokes.

If you're a touch typist, you might like the **.KLON** command. It creates an audible keyclick (user definable) to let you know when you have entered a character **.KLOF** turns the click off.

A useful tool for Basic programming is the **.SCON** command, which gives you a full screen edit feature. This editor will let you merge program lines, or renumber copy, or move program lines, simply by entering a new line number. This feature is excellent for setting up menu screens or editing a screen of output and making a data statement out of it. The possibilities are unlimited.

Run Time Tools

The run time tools used during program execution include the ability to disable the Break key, vary the execution speed of a Basic program, and modify the trace (TRON) function. These tools are particularly helpful for Basic debugging sessions.

Memory Tools

These tools make modification or examination of memory possible. One of the most useful is the **.DUMP** command. It will print any portion of memory to screen or printer (or both, if the **.ECON** command has been invoked) in ASCII or hex. If you want to do more than just look at memory, the **.MEM** command will allow examination and modification of memory.

Other memory tools let you modify machine language execution addresses and move blocks of memory. This latter

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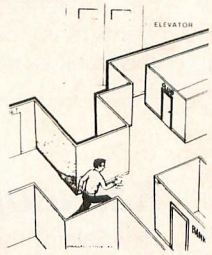

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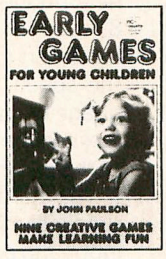

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TRS-80 EXTENDED COLOR BASIC

by Richard Haskell from Prentice-Hall, Inc.

If you want to perfect programming techniques this comprehensive guidebook is what you need. It offers the beginning and advanced programmer a hands-on approach. Video screen illustrations enhance chapters on keyboard usage, BASIC programming, low and high-resolution color graphics and tape data-file handling. Learn concepts of structure used by professionals. Enjoy the easy, readable style plus an excellent set of appendices for reference!

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by Thomas Czarnecki from Spectral Associates

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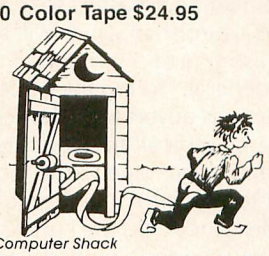

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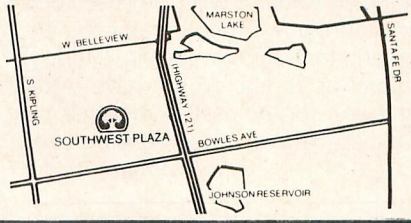

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feature is handy for moving relocatable machine language programs without reloading them.

Toolkit Controls

The toolkit is turned on with an **EXEC** command and turned off with a **.BYE** command. It can be toggled on and off at will. There are many tool commands to remember and master, so a **.HELP** command is furnished which will present you with a screen of command summaries.

In general, I found the "COLORKIT" to perform as advertised. The screen editor was a bit difficult to use at first, but that may have been due to the fact that I am used to powerful mainframe full screen editors. Once I got the hang of it, I found it easy to use and a powerful tool.

The "COLORKIT" provides an abundance of excellent utilities for a low price. I have purchased other utilities that only perform one or two of the features of the toolkit and have paid almost as much as I did for the entire "COLORKIT." the utilities are all user-friendly, although some are inherently easier to master than others.

Documentation is excellent. A comprehensive 19-page manual is provided which includes a one-page summary of commands. The summary is very handy to have by your side as a reference as you learn to use the tools.

Color Computer users looking to improve their programming productivity, or just wanting to enhance their Color Computer with a full-fledged set of utilities, will find the "COLORKIT" to be an outstanding value. It will give your computer a more powerful programming environment that micros costing (literally) four times as much do not have. After using the kit for the past six months, it is hard to believe I ever got along without it.

— by Norman Garrett

Top Down BASIC For The Color Computer

by Ken Skier
BYTE Books
Peterborough, NH 03458
$14.95

TOP DOWN BASIC has nothing to do with Volkswagen convertibles; top-down programming is an approach to writing well-structured, readable, and user-friendly programs in Basic.

In a chatty style, similar to that of the Radio Shack Color Computer manuals, Skier presents eleven programs in Extended Color Basic to illustrate the top-down concepts. He goes slowly, with lots of examples and explanations for illustration. Bear in mind, though, that this book is not intended to teach you how to use Basic: it is a book about program design.

The first aspect of top-down design is structure. Most beginners write *linear* programs — we start at the cover and go from there as inspiration or desperation dictates. This is not good programming. Since any project (be it a house or a book review or a computer program) is constructed for a particular purpose, it must begin with a plan, a plan that clarifies its purpose and provides a broad outline of its parts. A good program is structured to allow extension and revision without creating new problems.

How readable a listing is comes from a kind of "internal documentation" using Remark statements, meaningful variable names, modular line numbering, and indentations. Remark statements are used as program titles, headings for blocks of code, comments and blank lines to separate code blocks. Modular numbering means starting each block of code with a multiple of 100 or 1000 to create easy-to-find subroutines, and using regular number intervals of five or ten within blocks. Indentation is achieved by starting a line with a colon. Everything in a loop between a For and its Next is indented; nested loops get stepped indentations. This really is helpful, because you don't have to hunt to find the end of a loop.

The third aspect of top-down programming, friendliness, will probably be familiar. A "friendly" program is easy to use, even if you have never seen a computer before. It is achieved in a variety of ways, including a title screen that explains the purpose of the program; frequent menus; clear directions for input procedures ("Type the number of your choice and press Enter") and meaningful output statements; error trapping with explanations ("That number is too big. Type a number between 1 and 10") and chances to confirm user intention ("Are you sure?") to avoid accidentally overwriting or clearing files.

Another facet of top-down is that it is memory hungry. You may want to save the top-down version for reference, then strip the Remarks statements and spaces for a working copy. However, 16K will be plenty of room for the demonstration programs.

By the time you finish this book, you will have typed in several good programs, including a lovely grandfather clock with high-res graphics and reasonable accuracy. You will have become a better programmer, able to flowchart and construct programs that are elegant and readable, easy to understand and modify. You will attain popularity, success, and programming Nirvana.

For the Color Computer owner who has mastered the basics of Basic and wants to sharpen his programming skills, this book is a good buy. *— by T. Gray*

Kaleidophone

New Salem Research
West Main Street
New Salem, MA 01355
$34.95

IN RECENT YEARS it has become quite common to combine visual effects with music. Now the Kaleidophone lets your Color Computer and your stereo blend into an audio-visual delight.

The Kaleidophone KP-4 consists of a small black box with two cables. One cable connects to the joystick jack of your Color Computer. The other cable has a stereo phone plug and plugs into the headphone jack of your stereo. The KP-83 User Program is a skillful blend of Basic and machine language, which lets the speed and power of machine language be used for graphics, while Basic's flexibility and simplicity handles control of the program.

The hardware part of Kaleidophone simply samples the left and right stereo input and converts the volume levels into joystick input for the computer. The left channel is fed to JOYSTK(0), and the right channel to JOYSTK(1). The KP-83 User Program is a demonstration program to show what can be done. With 22 choices included in the menu, however, you can easily spend several hours experimenting with the demonstration program alone. Some choices include: "Loom," which is like a Navajo rug whose pattern expands and contracts with the music; "Snake," which weaves left and right depending on which stereo channel is louder; "Kaleidoscope," which is a kaleidoscope pattern flashing to the music; "Fly," which is sort of like flying through a tunnel; and "Shift and Vibrate" — you'll have to see this one for yourself!

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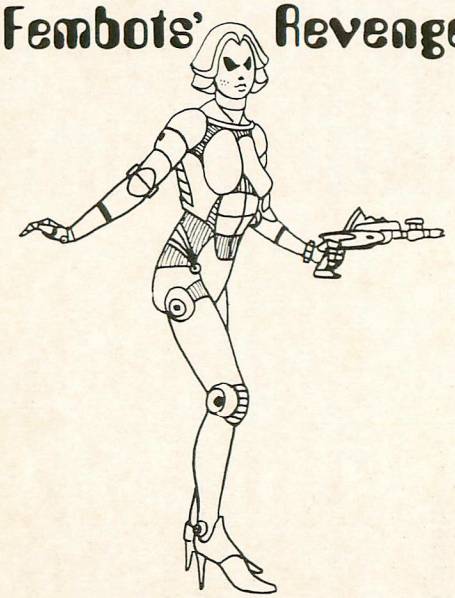

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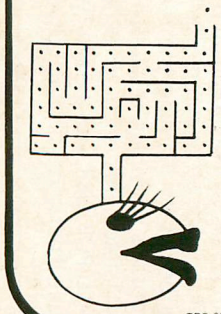

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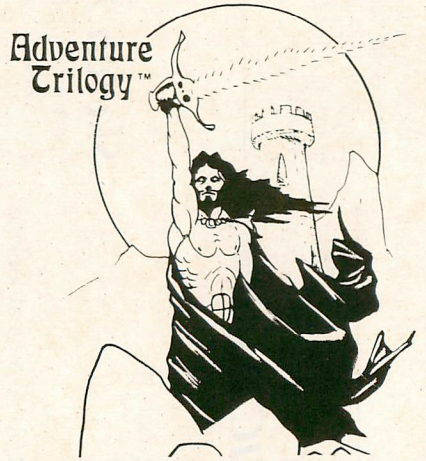

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This is only one aspect of the User Program. The other sections in the menu deal with user control. The manual explains how Basic programs can be added to the User Program, and how to use the built-in machine language functions. Graphic modes, color sets, sampling rates, display page origins, and other options are easily controlled within the User Program. Some machine language functions included are: shift screen outward to right and left from center; expand screen outward radially; increment graphic character codes; make screen symmetric; frame screen; contract inward; and others. These functions may be combined in any order, providing a limitless combination of effects.

It becomes apparent that the User Program is just a place to start, and the door to imagination is left open to the user.

The documentation provided is easy to follow, and additional programs and updates, on using and extending the system, are available annually from New Salem Research. Kaleidophone requires at least 16K, with either standard or Extended Color Basic.

If your Color Computer and your stereo haven't been formally introduced, the Kaleidophone will ensure that a visually harmonious relationship will result.

— M.K. Marston

The BASIC Book

by Harry L. Helms
McGraw-Hill
Toronto/Peterborough, NH
(603)924-9281
$8

SAY YOU'VE FOUND a great-looking program listing in a magazine, but it's not written for your system. Reach for *The BASIC Book,* by Harry Helms. It compares the versions of Basic for Apple II, Atari 400/800, Commodore PET, IBM Advanced, Radio Shack Level II, Radio Shack Color Computer Extended, and TI 99/4. The book avoids DOS commands, and assumes its reader has a working knowledge of at least one Basic dialect.

In 12 brief chapters and only 50 pages, Helms is forced to summarize savagely. He begins by warning the reader that programs with high-resolution graphics and statements such as PEEK, POKE, CALL, POP, USR, and the like "will be difficult, if not impossible, to convert."

After giving a few tips on how to go about a conversion (list all variables; make a flowchart; work by functional blocks rather than line-by-line), Helms examines different groups of Basic commands and keywords. These are found in a "Keyword Ready Reference Chart" at the front of the book which tells you which machine uses what words.

The book has some basic flaws. It does not appear to be well-researched, as Helms appears to have based his information on the reference cards provided by the manufacturers. For example, he claims that Radio Shack Extended Color Basic does not use the RND function. The Radio Shack Quick Reference Card omits this function (among other errors). Readers are advised to carefully check the material related to the Color Computer.

The BASIC Book also lacks one feature the reader would find most useful: a comparison table to translate from one dialect to another. To see if the joystick fire button is pressed, for example, you need to know that PTRIG = 0 (Atari) is the same as STRIG = 0 (IBM Advanced) and PEEK(65280) = 128 (Radio Shack Extended Color). This kind of information is present in the book, but you have to dig it out and organize it for yourself. (Perhaps this is why the last dozen pages of the book are headed *"Notes"*!)

This book will not answer your every prayer in converting the heathen program, but for the price, it's not a complete sinner.

— by T. Gray

Sketch Pad

Spectrum Projects
93-15 86th Drive
Woodhaven, NY 11421
(212)441-2807
$79.95 cassette

A PICTURE IS SAID to be worth a thousand bytes (I was told so by a wise old computerist). Unfortunately, computer pictures require time and patience, and many people find the process a bit too tedious. Young computerists particularly are often frustrated by this time factor. Color Computer owners have joysticks which may be used to draw pictures, but it takes a far steadier hand than mine to draw with a joystick.

Spectrum Projects has come up with an ingenious way of solving this problem. The Spectrum Sketch Pad is a 13 inch by 8 inch inclined drawing pad constructed of particle board. At the bottom center of the pad is a red spring-loaded push button. Just above the button is a 4 inch by 5 inch square covered by a plastic sheet. The plastic sheet is attached at the top, allowing the plastic to be lifted at the bottom. Just above the square is a 2 inch hole with a joystick mounted below the surface of the pad.

The joystick is controlled by a series of flat metal bars lying parallel to the pad. The bars are connected so that by moving the longest bar, the end of which covers the area of the square, the joystick control is moved proportionately. (This is very similar to a device used by artists and draftsmen to enlarge or reduce a drawing simply by tracing the original.) The longest bar has a small square of plastic with a small hole in it attached to the end, forming the drawing stylus. A pen or pencil may be inserted here and used to trace with.

The Sketch Pad plugs into the joystick jack with an attached cord. The red push button replaces the fire button on a joystick. Also included with the pad is a cassette containing the software program used with the pad. Three modes of drawing are provided in the program: Sketch, Chalk, and Crayon. These are the different graphics modes and options available in the program. The program even provides ways to make circles and select colors. The red push button is used to lift the "computer pen" so the stylus may be moved without drawing.

Six sketches are provided with the pad to help you get started. These sketches fit inside the square and the plastic is placed on top to keep them from moving while you trace.

My best efforts could not reproduce the sketch exactly, but even my worst effort was far better than I can do with a standard joystick. With the highest graphics resolution, the potential for a better defined picture exists, but since a joystick has only 64 horizontal or vertical positions, each position change results in several pixels drawn on the screen. Software could be written to divide the high resolution screen into several areas of 64 by 64 pixels, drawing one area at a time, each with full resolution.

The Sketch Pad will provide a way for young programmers to draw, and for older programmers to draw better and easier. If the thought of drawing pictures on your computer has always seemed a bit "sketchy," this product will help you say it with a picture.

— by M.K. Marston

Cosmic Clones

by Rob Shaw
Mark Data products
24001 Alicia Parkway #207
Mission Viejo, CA 92691
$24.95 cassette, $27.95 disk

HERE YOU ARE, defending your starbase against another set of invaders. All you have to do is knock the Clonial forces out of the sky before your missile launchers are destroyed, fuel cells used up, or the Clonial Death Layer slowly descends and mushes your base. That's all — oh, plus you have to avoid the Death Particles being emitted from the Death Layer.

Actually, as if this wasn't enough, sinister things happen that make the game rougher. If a Clonial Warrior makes it past your fire, he bounces off your base, and, if he makes it through the Death Layer, returns as a Superklone. Shoot the Superklone, and it turns into two Warriors. Shoot a Warrior and it turns into a — somewhat — harmless bomb. Harmless, that is, as long as it doesn't land on you.

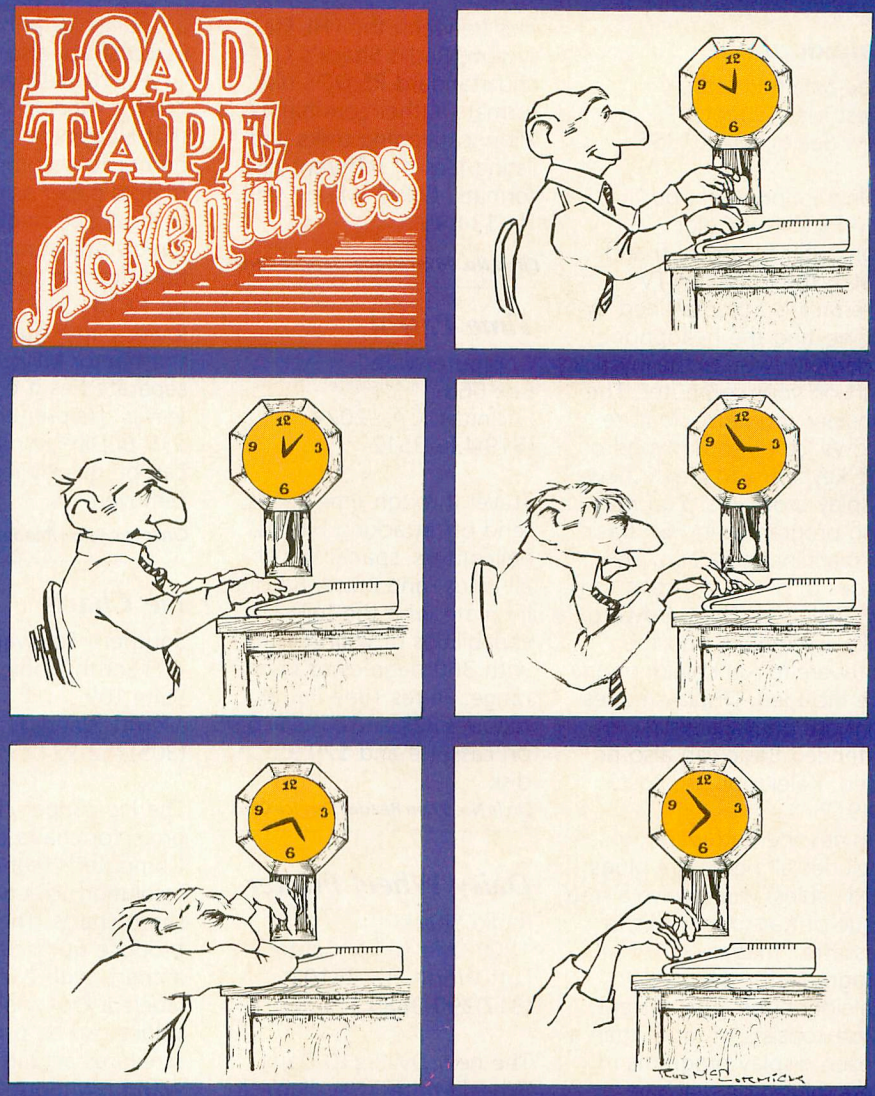
I used a joystick and the keyboard and found them both awkward and very tricky to handle.

Cosmic Clones gives you a free gas-up at 10,000 points (scoring is 200 for Superklones, 100 for Warriors, and 50 for Bombs). It also deals double Warriors if you succeed in knocking out the first five Warriors in quick succession. This is a bit of a surprise and the instructions on the back of the package don't mention this. I didn't get past the death dealing double, so there may be more undocumented activities in store.

Another minor item not mentioned in the instructions is that your shots will not go through the Death Layer. As the Layer descends this becomes a severe problem.

The game is good fun, enjoyable for adults and children. All in all, it's a nice way to fight the ever-present menace of invaders. *— by Leslie Venable*

■ ■ ■



There are, after all, better ways to spend a day.

I can think of half a dozen things I'd rather do than type all day. Please send me the tapes for the months I've listed below.

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MAIL TO: Zip

The Color Computer Magazine Tapes
Highland Mill, Camden, ME 04843

*March & April are combined. CC Space Trek and Banner Program not included.

Circle No. 85 on Reader Service Card

NEW:PRODUCT$

Kaleidophone

New Salem Research
West Main Street
New Salem, MA 01355

Kaleidophone lets you interface your Color Computer to any hi-fi and watch the music on TV. Interface is accomplished by connecting the headphone jack on the hi-fi to the joystick port on your computer. The "instant program" feature allows letters to be typed on the keyboard to create new display programs. You may also program it in 16K Basic or machine language. Ten pages of detailed instructions are included. The hardware, fully assembled, and the software to run Kaleidophone are included. Display modes that are unavailable in Extended Basic can also be used. Kaleidophone costs $49.95.
Besides the hardware (which includes all necessary plugs and cables) you receive a free issue of *Kaleidophonics,* a cassette "magazine" of programs for the Kaleidophone. The current issue consists of more than a dozen display programs in Basic plus nine machine language routines for high speed effects.

Circle No. 95 on Reader Service Card

O-Pak

Frank Hogg Laboratory Inc.
770 James Street
Syracuse, NY 13203
(315)474-7856
$34.95

FHL has taken its Hi-Resolution screen package from FHL Flex and added a number of useful utilities to it. This new package, called "O-Pak," is for the Radio Shack OS-9 operating system. O-Pak's Hi-Res screen has the same control codes and features found on FHL Flex, including screen formats of 64 x 32, 64 x 24, 51 x 24 and 32 x 16. O-Pak includes utilities that allow copying files between the FHL Flex system, Radio Shack's OS-9, and standard RS DOS disk formats. Other commands allow cataloging disks and listing files of different disk formats. O-Pak will be sold for $34.95.

Circle No. 96 on Reader Service Card

Time Patrol

Computerware
Box 668
Encinitas, CA 92024
(619)436-3512

Travel through time zones, fend off attacking blimps, helicopters, spacecraft of all kinds, and more. Become intimate with the full capabilities of your joystick with 360 degrees of firing range. Hi-res Time Patrol requires 32K and costs $26.95 on cassette and $29.95 on disk.

Circle No. 97 on Reader Service Card

Daisy Wheel Printer

Radio Shack
1800 One Tandy Center
Fort Worth, TX 76102
(817)390-3885

The new DWP-210 Daisy Wheel Printer is available for $799. It prints business and personal correspondence and reports at over 200 words per minute at 10 characters per inch. The DWP-210 features switch selectable 10 or 12 characters per inch pitch, or proportional spacing. The interchangeable drop-in 100-character daisy wheel (available separately) provides a wide variety of fonts to give letters and reports added impact. The DWP-210 prints originals along with two copies and features 1/120-inch minimum space and 1/48-inch line feed. It is code compatible with all TRS-80 Scripsit word processing software packages. It features a TRS-80 Color Computer compatible serial interface as well as a standard parallel interface, is U.L. listed, and includes a carbon ribbon and a Courier 10 print wheel. Radio Shack also has a new DWP-210 Bi-Directional Tractor Feed Kit for $149.95 that allows the DWP-210 printer to accommodate fanfold paper as well as letter or legal size single sheet paper. Adjustable left and right tractors accept paper up to 13" wide. Upper and lower paper guide bars on the tractor kit keep paper separated as it enters and leaves the printer. The DWP-210 Bi-Directional Tractor Kit can be quickly installed or removed.

Circle No. 98 on Reader Service Card

Pie Charts

Southern Software Systems
485 South Tropical Trail,
Suite 109
Merritt Island, FL 32952
(305)452-2217

The Pie Zapper creates "pie" or sector charts on the Color Computer's highest resolution screen to bring you sharp charts. The Zapper can produce up to 18 sectors on a chart, with each sector labeled. Optional numerical values can be printed on the screen as actuals or percents, with or without totals. It also has up to six sector styles with large titles for each chart. Tapes or disks will store completed charts, and the system is menu driven. A data editor allows for entering, inserting, Listing and saving data sectors. The Zapper uses its own set of characters to put numbers and labels on the screen. Printouts are possible with readily available screen print programs for almost any printer. The Zapper costs $15.95 for the 16K tape version and $19.95 for the 32K disk version. Extended Color Basic is required. The Zapper comes with a 14 day money back guarantee.

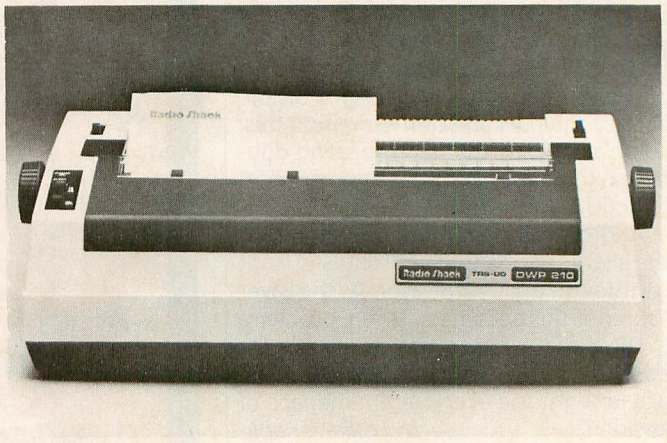
Circle No. 99 on Reader Service Card

Infidel

Infocom Inc.
55 Wheeler St.
Cambridge, MA 02138
(617)492-1031

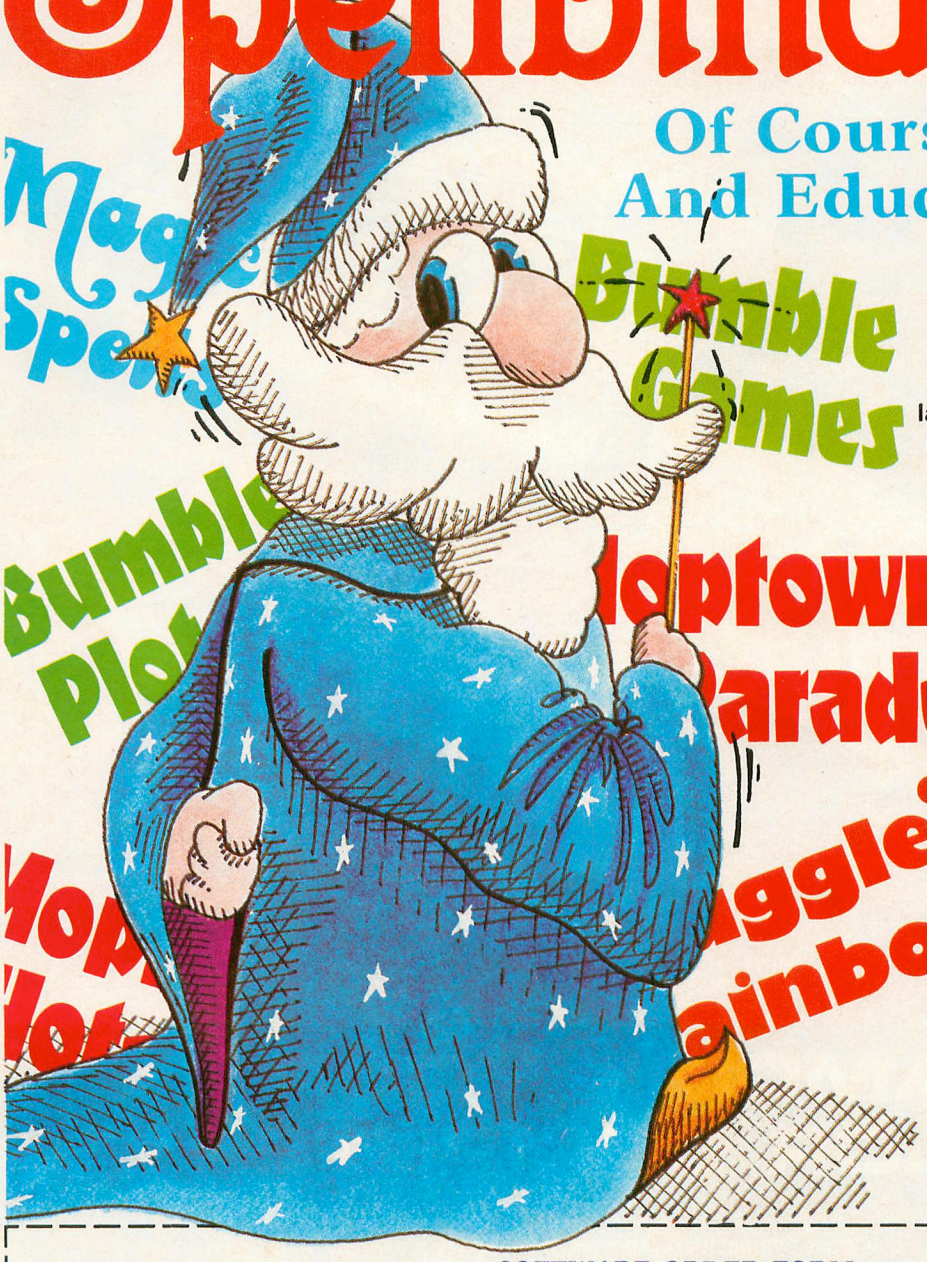
Set in the Egyptian desert near the banks of the Nile River, Infidel challenges you to find the buried entrance to the last great pyramid and, once inside, seize priceless treasures that have remained hidden for thousands of years. But you and your party are ill-equipped. Tempers flare. Relations deteriorate. When you force your men to dig on a Holy Day, they've had enough. You're drugged and left for dead — a worthless infidel. The first challenge is how to find the right spot and enter the pyramid. Inside, you'll encounter rooms and chambers filled with death traps. Only after you unravel the mysteries of this pyramid

more



Spellbinding?

Of Course! And Educational Too!



"Hello, I'm Merlapple™ the Wizard. My friends and I from Follett Library Book Company are helping grade school children all over the United States build logic, math and language skills through six unique programs designed for the Radio Shack TRS-80 color Computer.

These widely-acclaimed, award winning games from The Learning Company capture the fancy and test the reasoning processes of boys and girls ages pre-school through thirteen. Using both high and low resolution graphics, the games range from easy to "mind-boggling", each offering a distinct challenge to its players. "How-to-play" enactments contribute to program understanding while both graphic and musical feedback enhance learning.

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Magic Spells	90203C	$40		90203D	$55	
Moptown Hotel (3 programs)	90204C	$30		90204D	$35	
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AMDISK YOUR COLOR COMPUTER®

Get 312 Kbytes* of on-line, formatted storage capacity for your Color Computer with the Amdisk-III. The Amdisk-III is a disk drive system that combines the capacity and compatibility of 5¼" floppies with the convenient size and ruggedness of the state-of-the-art in technology — the 3" microfloppy cartridge.

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Delker Electronics: (615) 459-2636
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Emerald Computer: (206) 778-9826
The JIB Company: (312) 952-0299
Saguaro Software: (602) 885-6508
Skyline Marketing: (312) 286-0762
Spectrum Projects: (212) 441-9357
The Software Station: (313) 532-2550
or ask for the Amdisk-III at your local computer dealer.

* An additional 312 Kbytes may be accessed by manually flipping the media over.

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(312) 364-1180 TLX: 25-4786

AMDEK

REGIONAL OFFICES: Calif. (714) 662-3949 • Texas (817) 498-2334

Amdek . . . your guide to innovative computing!

will you achieve success. Players use complete sentences instead of the standard two-word commands, so they don't have to play guessing games with the program. Infocom games recognize a 600-word vocabulary, including adjectives. Infidel will retail for $49.95 ($59.95 for some versions).

Circle No. 100 on Reader Service Card

Hurricane Plotter

The Software Connection, Inc.
5460 N. State Rd. 7,
Suite 108
Ft. Lauderdale, FL 33319
(305)484-7547

The Hurricane Plotter/ Predictor program is designed for 16K tape or 32K disk systems and requires Extended Basic. It will distinguish between a tropical storm and a hurricane, and will determine, based on present course and speed, whether the storm is a danger to a given area. If the storm is a danger an alert is given and the computer will calculate when the storm is expected to hit the area. At the press of a key, once the storm has been plotted, a map shows exactly where the storm is in relation to the United States. A city symbol is relocatable for any city or area the plotter covers. The program costs $19.95.

Circle No. 101 on Reader Service Card

Computer NEWSletter

MHN Services Inc.
P.O. Box 952
Cleveland, OH 44120
(216)283-8871

The Computer NEWSletter is a guide to microcomputer information, published ten times a year. Each issue is a directory to the recent periodical literature and lists major articles from computer publications. The first issue references over 1300 articles from over eighty individual periodicals including **The Color Computer Magazine.**
Each reference lists title and author; name, volume, date and page of periodical; a description of contents (including short abstracts when necessary); the name of the computer language involved; and a signal indicating the presence of program listings. Listings are divided under headings like Tutorials and Utilities, Games, Software Reviews, Hardware Reviews, etc. And each edition carries listings under two broad categories: articles relevant to a specific computer or group of computers, and articles of interest to all computerists. The first issue has been published in six editions: for Apple computers, for Radio Shack TRS-80 Computers, for the Color Computer, for all Commodore Computers, a combined edition for Atari, TI-99 and Timex/Sinclair Computers, and a combined editon for the IBM-PC and all other microcomputers. *The Computer NEWSletter* is available by subscription at the cost of $17.50 for ten issues. Be sure to include the name and model of your computer when subscribing.

Circle No. 102 on Reader Service Card

COCO Sleuth

Computer Systems Consultants, Inc.
1454 Latta Lane
Conyers, GA 30207
(404)483-1717

Computer Systems Consultants' COCO Sleuth disassembler system is a derivative of Super Sleuth, which has been available for several years. COCO Sleuth runs under COCO DOS and processes object programs in COCO DOS format, producing COCO DOS text files. Three programs let the user examine and modify binary program files on disk or in memory, on computers with at least 32K bytes of memory and at least one disk drive.
COCO Sleuth allows many trial disassemblies before producing the final disassembly. Programs may be disassembled from disk or memory into source code format and the source may be displayed, printed, or saved on disk for later assembly. Address ranges may contain characters, hex constants, addresses, or instructions. Labels may be changed globally to labels of the user's preference. Cross reference listings of labels may be produced from any Motorola formatted assembler program, including COCO Sleuth generated programs, to assist in debugging and modification. Programs in ROM or on disk may be "altered" and saved on disk, then used to program a new ROM. COCO Sleuth is supplied as a set of 6809 object code files. The processors which may be analyzed are 6800, 6801, 6802, 6803, 6805, 6808, 6809, and 6502. It is available for $49.

Circle No. 103 on Reader Service Card

Software Previews

Questron
P.O. Box 576
So. Holland, IL 60473

Questron Software has catalog available on tape that gives you displays of most of their software. Program categories include business, utility, education, games, graphics, and music. Also on the tape is a free program (choice by category) game, utility, or "art demonstrator." It is available for $2. A "traditional" flyer also available on request.

Saturn Printer Interface

Saturn Electronics Company Inc.
57-61 Cloverdale Blvd.
Bayside, NY 11367
(212)423-4626

The Saturn Printer Interface is a serial to parallel interface for the Color Computer. It will interface with most Centronics parallel type ports and requires no power supply. It features a user adjustable baud rate from 300 cps to 9600 cps, and a user manual. All cables and connectors are provided. It comes with a one year unlimited warranty and costs $70.

Circle No. 104 on Reader Service Card

Comunications Handbook

by Alfred Glossbrenner
St. Martin's Press
175 Fifth Ave.
New York, NY 10010
(212)674-5151

The Complete Handbook of Personal Computer Communications by Alfred Glossbrenner shows how a computer saves you time and money. In the handbook is detailed information on CompuServe, a service that offers food coupons, fashion notes, personalized nutrition programs, The World Book Encyclopedia, advice on how to prepare for SATs and how to select a college, and more. Electronic shopping through Comp-U-Card is covered too. Comp-U-Card offers nearly 50,000 items discounted for sale to computer users. Another data base, called TradeNet, channels goods and services that are swapped. You may be able to trade any skill you have, from repairing cars to stuffing envelopes, for something like a vacation condo or a car. Yet another data base Glossbrenner discusses offers names and phone numbers from 4800 United States telephone directories, a daily index of

more

2000 news stories, and a magazine index that will search 600,000 citations from 370 popular periodicals. The handbook comes in paperback and costs $14.95.
Circle No. 105 on Reader Service Card

Junior's Revenge

Computerware
Box 668
Encinitas, CA 92024
(619)436-3512

Junior's Revenge is for the arcade lover. Poor little Junior, a young, tireless ape, must overcome four screens of obstacles to rescue his father, the king, from mean old Luigi. He will traverse jungle and swamp, climb vines, avoid vine 'gators, dodge ZuZu birds, open locks, and conquer Luigi's hideout of vibrating pipes before he frees his big daddy. How far can you help him go? Junior's Revenge requires 32K and costs $28.95 on cassette or $31.95 on disk.

HJL-57 Professional Keyboard

HJL Products Inc.
P.O. Box 24954
Rochester, NY 14624
(716)235-8358

A new keyboard, developed to replace the calculator-style keys in the TRS-80 Color Computer, has been introduced by HJL Products Inc. The HJL-57 Professional Keyboard is available in two models, one for the original Color Computer, and one for the TDP-100 and F versions. The HJL is supplied as a user-installed kit and includes: an assembled keyboard, mounting hardware, a black plastic bezel, and installation instructions. No soldering, drilling, or gluing is necessary since it plugs in and drops in place on existing mounts. With sculptured, low-profile keycaps and full-travel switch movement, the new keyboard is designed to improve typing speed and reduce data entry errors. The three-color layout is identical to the original Color Computer keyboard. The HJL-57 keyboard also includes four software-definable function keys, one of which is latchable. Switch contacts are rated for 100 million cycles minimum, and covered by a protective membrane to guard against dust, dirt, and accidental spills. The HJL-57 is warranted for one year and sold with a 15-day money-back guarantee.
Circle No. 106 on Reader Service Card

Computer Book Catalog

Sybex
2344 Sixth St.
Berkeley, CA 94710

Sybex Inc.'s 45-page Fall book catalog is free. It lists 29 new and revised titles plus all of Sybex's current releases. The full-color catalog includes photographs and descriptions of Sybex books for the first-time computer user through

The Driving Force!

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J & M Systems, Ltd. is a leader in the Model III marketplace with our JFD-III Disc Controller. With thousands in operation, we have set new standards in controller performance and reliability. We bring these same high standards to the COCO, resulting in the highest quality disc controller system on the market. Compare these functions before you buy:

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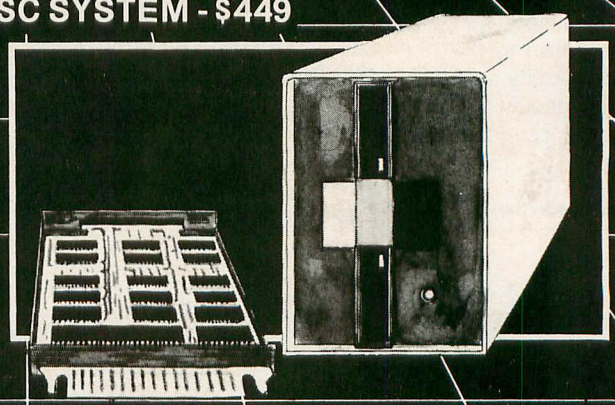

J & M Systems, Ltd., 137 Utah NE, Albuquerque, N.M. 87108
(505) 265-1501

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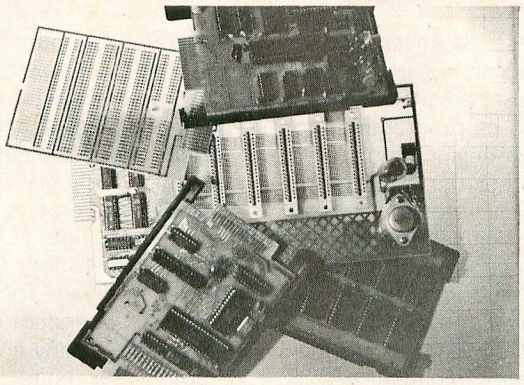
the advanced programmer. Subject matter ranges from general interest to hardware, software, operating systems, and programming languages. The catalog also includes descriptions of self-study cassette courses available from Sybex. Books and courses can be purchased at book and computer stores or directly from Sybex. Write Sybex for a free catalog, or call toll-free (800)227-2346. In California call (415)848-8233.

Circle No. 107 on Reader Service Card

Com-Protect III

Com-Protect Inc.
Rt. 4, Box 427X
Slidell, LA 70458
(504)641-1316

Com-Protect III protects hardware from power outages, power surges, spikes, brown-outs, RF line interference, and more. It costs $79.95.



Word-Pak

P B J, Inc.
911 Columbia Avenue
North Bergen, NJ 07047
(201)330-1898

The Word-Pak is a video board designed to plug into the expansion port of the Color Computer and provide the user with a high quality, 80-column video output. The board is compatible with most non-graphic Basic programs and can be used with disk through the use of a Y cable. Software provided with the board offers terminal functions such as: erase to end of line, erase to end of screen, home cursor, sound bell, x, y cursor positioning, and the ability to reprogram the screen format for compatibility with other computers. Additional software support includes a Flex patch, which lets the user run standard Flex software without modification, and an enhanced version of TEXPROIII (text editor/processor). Cost is $139.95 (a and +) or $23.95 (bare board).

Circle No. 108 on Reader Service Card

Bio Detector

Computerware
Box 668
Encinitas, CA 92024
(619)436-3512

The Bio Detector is a bio-feedback system that measures galvanic skin response. Finger sensors attach to the Bio Detector box which plugs into the joystick slot of the Color Computer. Load the program, wrap the finger grips on the subject, and adjust the response level on the Bio Detector unit. The program graphs skin responses on the screen so the user can learn self-control. Watch yourself relax and get tense — graphically — and with sound. The Bio Detector comes with hardware, software, and instructions. Silver contacts give greater sensitivity and adjustable finger grips fit any subject. 16K of memory is required. The cost is $34.95.

Circle No. 109 on Reader Service Card

PRODUCTS FOR YOUR RADIO SHACK

COLOR COMPUTER

NEW!

MACRO-80C

The Micro Works is pleased to announce the release of its **disk-based editor, macro assembler and monitor**, written for Color Computer by Andy Phelps. THIS IS IT — The ultimate programming tool!

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

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

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

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

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

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

MICROTEXT — Get printouts while using your modem! Also download to cassette. General purpose terminal Rompack. **Price: $59.95**

YOU NEED COLOR FORTH!!

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

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

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

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NEW:PRODUCT$

The bitCard

Chartscan Data, Inc.
120 South University Dr.,
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(305)473-4741

bitCards are intended to be given as gifts to friends and relatives who own or have access to a microcomputer. They are challenging text-and-graphic adventures whose themes relate to a specific holiday or event. The bitCard can be ordered custom-programmed, so that each is unique. A person who receives a bitCard as a gift will find several personal references to himself as he proceeds through the adventure. (For example, he may find his own name scribbled on a piece of paper uncovered in a locked drawer.) A bitCard draws the player into a fantasy world of which he is an integral part.

"A Christmas Adventure" will be available in early October for Christmas gift-giving. It will also be programmed to deliver a personal holiday greeting to the recipient in whatever words the sender wishes. (The sender's message will appear as part of an animated graphics scene — the player's reward for successfully completing the adventure. Impatient players can jump ahead to this final scene to learn the identity of the sender by using a password.) BitCard costs $16.95, on 16K cassette.

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The Sourcerer

Computerware
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The Sourcerer is a menu driven symbolic 6809 disassembler that produces symbolic source code that can be assembled. It is compatible with most editor/assemblers. Features include: automatic equate generation for labels and symbols outside of disassembly range; FCC, FCB, and FDB generation; 6809 machine language for speed; position independent code, relocateable to any area of memory; user defined symbol/label buffer area for flexibility; files with or without line numbers; and symbolization of extended addresses, if desired. Also included is an apprentice program to find the start and end of machine language programs. Disassemble to disk or cassette, printer, or screen. The Sourcerer requires 16K and costs $34.95 on cassette or $39.95 on disk.

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FOR...NEXT (12,83)

DECEMBER BRINGS THE SHORTEST days of the waning year and some most-welcome holidays. December will also bring the announcement of the winners of our Summer Programming Project — oh, such excitement. We've had lots of *really* interesting submissions, and we can't wait to tell you who won.

Look also for Dreidel, a Hanukah game for children, and a civil and Hebrew calendar program that will help you plan your next year. We'll have Defense! an action game, and an article that explains how to use a digital video camera.

There will be other surprises — and don't forget our regulars, either! See you then. ■■■

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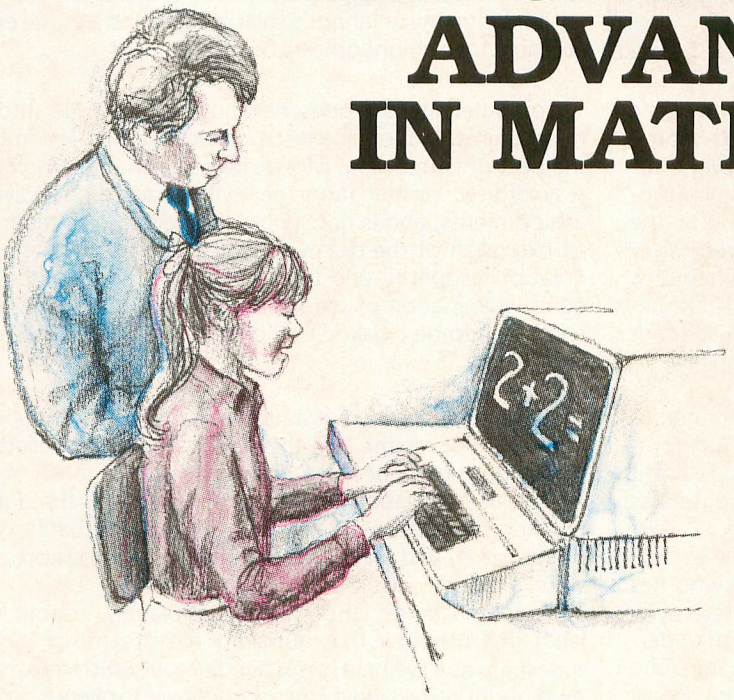

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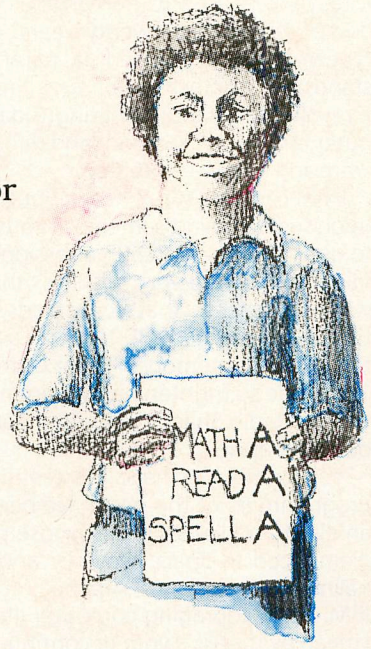

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END OF FILE

This is my page. Dennis Kitsz and I recently debated views on computer literacy. Our orientation toward computers is different, as are our views about their proper uses. Dennis' intellectual attributes go far beyond computers and music. He is a compassionate thinker; socially concerned, and politically astute — he is also my friend. It is for these reasons that I give him my page.

— K.L., Editor

Fine. Let's use computers for education. Let's make them fun. Let's stop the high-tech intimidation. And let's put one in front of every student. But let's not lose sight of something deliberately — almost religiously — guarded by the "user-friendly" crowd: Computers mean power. They meant power when they were room-sized behemoths owned only by governments and large corporations. Just because now they're kid-colored and priced less than a Broadway show doesn't mean they aren't power. They still are — in the hands of those who know.

In September's "End of File," Kerry Leichtman treated us to a view of the educational future of computers — computers as trivial appliances no more glamorous or significant than a spiral notebook or a Bunsen burner. Computers as more doodads for the educational media stockroom.

But no, Kerry: computer literacy isn't trivial. It may be dull, it may seem alien to humanists, but it will define who has power in the next twenty years. In Rumania, where even typewriters are licensed, a paranoid government understands the significance of such technology. *There* it can be a revolutionary tool. Offering today's students mere "computer familiarity" is a poor and dangerous substitute for software and hardware literacy.

How can I be sure? I can't, but I become very suspicious upon seeing advertisements for businesspeople to learn how to use Visicalc — at $895 a session. I am angered by simple-minded software worth far less than a crate of lettuce or a wheel of cheese that commands $29.95 prices. I am disturbed by the nearly 300 letters I've received asking me how to install 64K memory in Color Computers — a task so simple (but made so frightening by warning labels) that virtually untrained Radio Shack clerks do it daily. The mystical veil must be pulled aside.

Yes, computers have represented power. The computer programmers of the past have been part of a brotherhood, an elitist and sexist group whose privacy and potency were glamorized in Space Odyssey and Fail-Safe, honored as a hallmark of corporate America, and prestigiously priced by IBM. So discouraging computer literacy (and I'll get to what I mean by that) is a vote to continue that pattern of privilege. And it's definitely *not* my vote.

What is computer literacy, after all? To me it's much the same sort of literacy that Americans desire for themselves in reading and writing, in hobbies, in sports and fashion. The same sort of literacy that is seldom pursued in music and art. Computer literates can understand the existence of rounding errors that affect calculations, can recover a week's worth of data lost in a blown disk directory, can program a few quick lines to solve a handful of workshop problems, can install a few extra memory circuits, can modify an expensive existing program. Literacy also provides an overall capability that is much more powerful and extensive than these few trivial examples. It's the sort of literacy that results in self-sufficiency rather than dependence.

Computers are not spiral notebooks or Bunsen burners. They are amorphous, flexible tools whose definitions extend as far as their creators, owners, and users want them to extend. My computers can be an extension of my writing and musical composition; used to keep my finances straight and my addresses current; used to run my recording studio and to turn on a frozen pipe alarm; used to guide my HO train set, to design my neighbor's solar garage, and provide entertainment for a neighborhood full of kids.

Computer literacy goes beyond the mundane into the realm of imagination and discovery. It is a tool that combines the best of Gutenberg, Morse, Bell, Edison and Marconi — a synergistic combination that synthesizes their individual achievements, and is not simply counted among them. It is an extension of the discoveries of the great physicists, the great philosophers, and the great mystics. It is the technological culmination of work that began in the Renaissance, and is not to be cloaked in the harlequin raiment of "user-friendliness."

I am often described as a hacker. It's not a description I'm fond of; it boxes me into the class of tinkerer or dilettante or weirdo, simply because I think computer literacy should include the alleviation of my human limitations through expanding the horizons of a machine. I believe in that flexibility of approach, and an economy of means — hardware, software, or simply concept.

These machines embody the calculating, robotic, and labor-saving power that humanity has dreamt of for centuries! It is as if we held in our hands a tool which transforms, on thought command, from a screwdriver to pliers to a pencil to a thermometer to a drill to a flashlight. Why, when on the verge of technological liberation, should we sacrifice the next generation's skills on an altar of misplaced egalitarianism or know-nothing appliance mentality?

I don't mean to say that computer literacy is being done right. Far from it: it's cluttered by stupid software, overblown claims, and technological confusion. Learning Basic is only one part of computer literacy, like learning notes and rhythms is only one part of knowing music. Computer literacy is at its heart conceptual — it means knowing what the machine can do, and that means understanding what the machine is capable of doing.

We Americans are notoriously lazy about our technological marvels. Specialists fix our cars, keep our TVs running, put in our plumbing, connect our electricity, take our temperatures, analyze our psychological problems, and care for our children. We have in large measure given up our responsibilities and self-sufficiency, and have become a nation of convenience addicts. Okay, so modern life is complicated ... but not so complicated that when the computer finally emerges as a powerful, economical, popular tool, we should abdicate understanding its workings because the task isn't easy.

Ten years ago, there were rumors of a computer the average person could own. There was philosophical blustering about the beginning of a new age for humankind. A few months later, the computer was a reality. I do not believe that one decade is enough time within the framework of human history to decide the fate of future generations' dealings with these kinds of machines. In fact, I believe it is precisely the right time to learn everything we can.

— Dennis Bathory Kitsz

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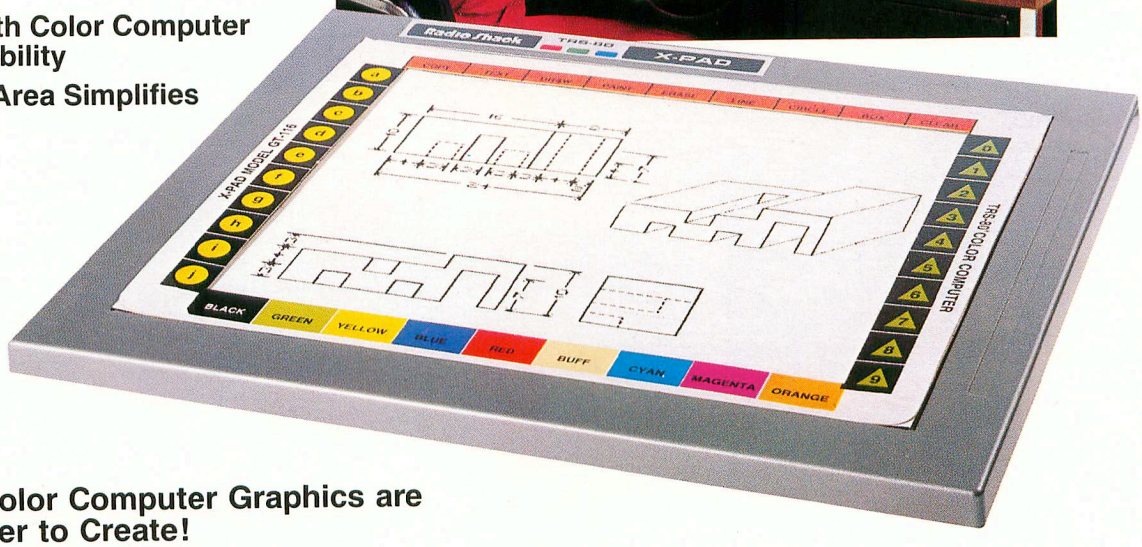

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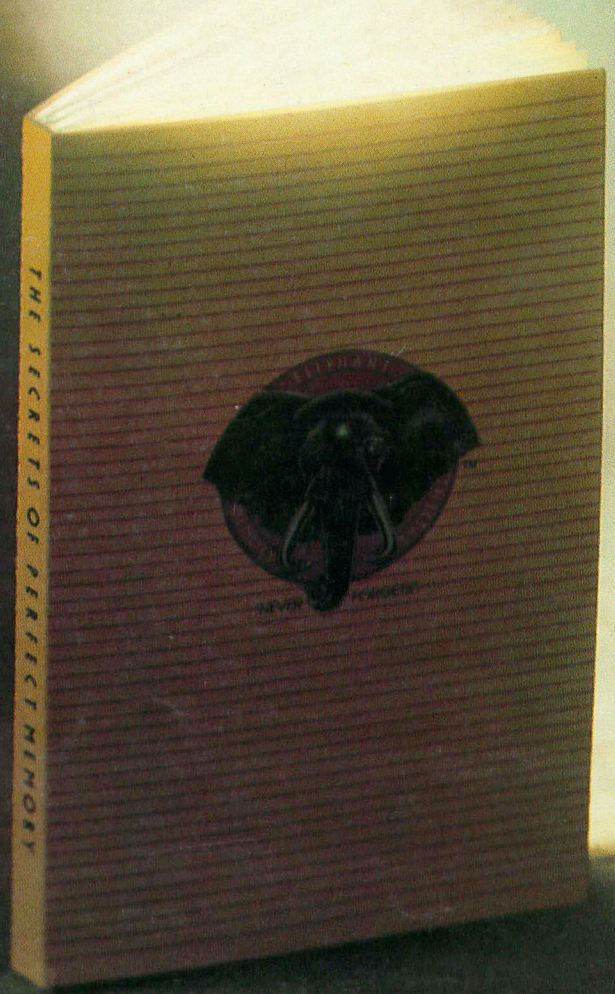

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