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DIGRESSIONS

TANDY'S UNEXPECTED SURPRISE

The word is out. Tandy has announced the long-awaited Super CoCo at the Comdex show in Las Vegas. Great News? Well, yes and no. The Model 2000, as it's called, looks like a winner, but it is, unfortunately for us, not really a CoCo.

The Model 2000 uses an 80186, 16-bit microprocessor. Why not a 68000, you ask. Tandy has decided to go along with the de facto industry standard MS-DOS operating system of IBM. They want a substantial piece of the large IBM-compatible personal computer market, and they have a machine with which to get it that is more than just another work-alike.

The 2000 comes in two versions: a 128K two-drive, 5¼-inch trimline floppy unit or a 10-megabyte hard-disk unit. It is expandable to an impressive 768K. The 2000 operates at 8 MHz, and Tandy claims that it is three times faster than the PC. Expansion is easy; you just slide expansion boards into one of four slots in the back. A 640-by-400-pixel hi-res graphics option is also available. The 2000 can use either a black-and-white or color monitor, or a color TV.

The cost of the base unit, without monitor, is $2,750. With monitor and graphics capabilities, it costs $4,197. With the hard-disk drive, it will go for $4,250. (See 80 Micra's January 1984 issue for a complete review.)

This machine is clearly out of the CoCo's realm. It will not run any Color Computer software, nor any Model 1/II/III/IV/12/16 software, for that matter. For this reason, HOT CoCo will not cover the Model 2000.

There's no need to be too disappointed in the nonexistence of the Super CoCo. Tandy has proven their commitment to their 6809 line with the introduction of OS-9 and Basic-09, an impressive line-up of new software, and a bigger, improved offering of peripherals such as the Multi-Pak and the CGP-220 Ink Jet Printer.

We all wanted to see an “ultimate” CoCo, with a super hi-res screen, hundreds of colors, dual processors, and ungodly expansion capabilities. Maybe Tandy will produce such a machine someday. But we still have the Color Computer, and will for some time to come. And that's nothing to be disappointed about.

The 64K and CoCo 2

It seems we are hearing from a lot of new 64K or CoCo 2 owners. Our feeling is that these machines, especially the CoCo 2, are selling well. We'd like to know how many more of these new CoCo owners are reading HOT CoCo. Drop us a line and tell us your opinions on your new machine and on our magazine. The more we hear from you, the better we can make HOT CoCo.

What configuration did you buy—standard or Extended Basic? What software did you buy with it? What peripherals? Are you happy with your new CoCo? Is this your first computer? These are just a few of the questions we'd like to see you answer. Please write. Our address is HOT CoCo, Pine St., Peterborough, NH 03458. Thanks.—M.N.
If Our Programs Don’t Work

Having trouble entering our listings from the magazine? Here are a few tips that might help.

First, we print all our Basic listings in the CoCo’s 32-column format. This means that each line should appear the same on the screen as it does in the magazine. If a line on your screen does not match the same line in the magazine, reread what you typed; you might have made an error.

Second, make sure the program is for your computer. Read the System Requirements box. The information in this box represents the minimum system configuration needed to run that particular program. Also, read the article thoroughly before typing in the program. Sometimes the article contains instructions vital to making the typed-in listing work. For instance, some CoCos will not accept the high-speed POKE (POKE 65495,0). The article for a program using this POKE will tell you to change those POKEs to 65494,0 if your computer will not work at the faster speed.

Some CoCos are sensitive to spacing in the program lines. Occasionally a computer will read a line such as FOR R = 1 TO 20 incorrectly, interpreting the FOR not as a keyword, but as a variable. If you’ve removed spaces from a program listing to save space, and that program will not work, reinsert those spaces.

If everything is okay so far, check the published listing with what you’ve typed. Common typing errors include confusing a zero with the letter O, a one with the letter I, or a colon with a semicolon. DATA statements are particularly tricky because of the long lists of numbers. Be very careful with these.

Assembly listings usually require an editor/assembler to enter them into your CoCo. The two most common editor/assemblers are Radio Shack’s EDTASM + and The Micro Works’ SDS80C. An Assembly listing assembled using the SDS80C will probably not run under EDTASM +. You can hand-assemble Assembly listings using a short Basic listing such as that found on page 135 of the November 1983 HOT CoCo. Hand-assembly is a tedious task best left to more experienced users. If you wish to use Assembly listings from magazines frequently, we suggest you invest in an editor/assembler.

If all the above fails, send us a printout or a detailed description of the problem you experienced along with any error messages. We’ll try to work it out for you. We cannot help you if you have modified the original program in any way.

---

HOT CoCo February 1984
HOT Stuff

I have never subscribed to a magazine I enjoy as much as HOT CoCo. However, it did cost me $270 to update my 4K to 64K with Extended Color Basic (and later add a printer).

I put the money so I could take fuller advantage of all the things HOT CoCo brings me each month.

I really enjoy "The Basic Beat" (and need it) and the 32-character program listings. I hardly make a mistake when typing from them.

Please keep up the good work.

Marvin E. Duke
Plainfield, IN

What About The New User?

I enjoy your publication and find it very informative in most respects.

However, I do feel that you have not addressed one important area—advice on how to select and build a complete system.

As a newcomer to home computing, I find myself overwhelmed by the many ads in HOT CoCo, hawking all types of expansion and support equipment.

I am confident that a series of articles addressing the questions and concerns of a novice who is ready to expand his system, but lacks the knowledge to do so, would serve the best interest of both your readers and your advertisers.

James R. Vespi
Dolgeville, NY

We realize that several of our readers could benefit from advice in this area, and we have articles planned and already written to meet the need.—eds.

POKEing for Character

Ed. note—POKE 31978,203 will allow you to run Rokicki's "Give Your Computer Some Character" (HOT CoCo, September 1983, p. 104) on the new 64K CoCo that uses the 1.2 ROMs. This POKE cures the poor keyboard response when using his program.

Reassembling "Smashout"

I just finished getting the "Smashout" program (HOT CoCo, November 1983, p. 80) to run. It's an excellent program, but there is a serious problem: I couldn't use Radio Shack's EDTASM+ ROM pack to assemble it, and I suspect that many readers with other assemblers will have the same trouble.

Mark Goodman used the SDS80C editor/assembler, which has some very unusual features. I have two 6809 assemblers and neither permits duplicate labels as used in this program.

A second unusual feature involves the CLI instruction in line 0009, which my assembler doesn't recognize. I did find the code required to enable the IRQ, which is what the CLI statement is supposed to do. Thank goodness the program was very well documented.

A third problem is the BSZ instruction used in lines 0351 and 0360. EDTASM+ doesn't recognize this either.

I solved the duplicate label problem by assigning unique labels for each section of the program: A1, B1, etc. in the first section, A2, B2, etc. in the second section, and so on.

Of course, you must also change the references to each label in each operand that refers to those labels. To remain consistent, I renamed M1 as M11, M2 as M22, and B1 as B11.

EDTASM+ requires single bytes only for FCB statements, unlike the method used for TABLE, M1, and so on. The solution here is to enter the data on separate lines.

The BSZ instruction appears to initialize the areas to zero. There is no corresponding instruction in EDTASM+, and five FCB statements (as shown below) must replace the assignment made at line 0351 for S1. This avoids a display problem in which message M3 attaches to M2, because the token 0 terminates each message, and the first 0 in S1 terminates message M2.

You can replace the BSZ on line 0360 (BTAB) with an RMB statement, because the memory initialization at this point is not critical.

The following changes allowed me to assemble the program and obtain exactly the same machine code:

<table>
<thead>
<tr>
<th>LINES</th>
<th>OLD</th>
<th>NEW</th>
</tr>
</thead>
<tbody>
<tr>
<td>0009</td>
<td>CL1</td>
<td>ANDCC # SEF</td>
</tr>
<tr>
<td>001-0169</td>
<td>A@ ... Q@</td>
<td>A1 ... Q1</td>
</tr>
<tr>
<td>0170-0192</td>
<td>A@ ... B@</td>
<td>A2 ... B2</td>
</tr>
<tr>
<td>0193-0243</td>
<td>A@ ... C@</td>
<td>A3 ... G3</td>
</tr>
<tr>
<td>0244-0270</td>
<td>A@ ... E@</td>
<td>A4 ... E4</td>
</tr>
<tr>
<td>0271-0305</td>
<td>A@ ... G@</td>
<td>A5 ... G5</td>
</tr>
<tr>
<td>0306-0337</td>
<td>A@ ... D@</td>
<td>A6 ... D6</td>
</tr>
<tr>
<td>0325 AND 0350</td>
<td>M2</td>
<td>M22</td>
</tr>
<tr>
<td>0332 AND 0349</td>
<td>M1</td>
<td>M11</td>
</tr>
<tr>
<td>0330 AND 0349</td>
<td>B1</td>
<td>B11</td>
</tr>
<tr>
<td>0351 SI BSZ 5</td>
<td>S1 FCB 0</td>
<td></td>
</tr>
<tr>
<td>0360 BTAB BSZ 96</td>
<td>BTAB RMB 96</td>
<td></td>
</tr>
</tbody>
</table>

You will have to enter all multiple FCB statements such as M11 FCB 19, 13, 1, etc. as individual items, as:

M11 FCB 19
FCB 13
FCB 1 etc.

As programmers make more assembly-language contributions, I'm sure we'll see more variations in assembler mnemonics. Authors should specify the assembler they use. Perhaps HOT CoCo can develop a contributor's standard that will be general enough for everyone's use.

Bill Ottly
West Long Branch, NJ

Thanks for the information, Bill. We prefer Assembly listings to be in EDTASM+ format, but we will accept exceptional listings in other formats. It was our oversight that we didn't mention the SDS80C requirement in the article.—eds.

'Preciate it, Elmer

This is Elmer writing. The goofus who writes Elmer's Arcade made a mistake in the "Sprinks" program (HOT CoCo, October 1983, p. 12). He said to tell you he is sorry. He

Continued on p. 12
The HJL-57 Keyboard

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doesn’t want me to tell you he is so embarrassed he is hiding beneath a pinball machine at my place and won’t even come out for an Uncle Judy’s Celery Tonic. The listing for Sprinks works fine for Extended Color Basic, but you’ll need the following fix lines to make it work, as advertised, in Color Basic:

\[ \begin{align*}
\text{130} & \ V = 100 \\
\text{440} & \ KK = 0 \\
\text{450} & \ IF \ KK > V \ THEN \ 670 \\
\text{455} & \ KK = KK + 1 \\
\text{560} & \ J = J + (V - KK) + 100 \\
\text{780} & \ V = V - 3
\end{align*} \]

The goofus used a TIMER command in the listing. It doesn’t work in Color Basic.

Thanks,

Elmer

Meet Me in Antwerp

We have a CoCo user’s group in Antwerp, Belgium. If you’re interested, phone 03-889-30-50 or 03-321-64-08.

G. Peersman
Wolstraat 35/13
2000 Antwerpen

Meet Me in Calgary

The Calgary Color Computer Club meets at 7:30 p.m. on the first Wednesday of each month at the Queen Elizabeth High School, 512 18 St. NW, Calgary, Alberta.

We would also like to establish interclub activity by inviting other clubs or members to write us about specific problems they’re having. If any of our members have an answer, they’ll get in touch.

David A. Logan
Public Relations
Calgary Color Computer Club
Box 453
Trochu, Alberta
Canada T0M 2C0

We’ve Moved

Please let your readers know that we’ve moved. New orders and product support are available at our new address.

Also, thanks for reviewing our products, PLUS32, ROMKIL, ROML, and TAP2DSK in your November 1983 issue. Although the re-

view listed TAP2DSK as being sold separately for $25 on tape and $29 on disk, it comes free with the purchase of ROML.

Roger L. Degler, President
Micro Technical Products Inc.
814 W. Keating
Mesa, AZ 85202

Say Cheese

I’m planning to start a computer-portrait business using a TV camera, and a freeze-frame image-feed to a computer with a printer readout that I can transfer to T-shirts, posters, or whatever.

I need a list of manufacturers of TV-image digitizers, heat-transfer printer ribbons, and all the other components that go into such an endeavor.

Does anyone make a system for the Color Computer? I could also use some advice on product resolution.

Bill Smith
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Correctly Reading The Keyboard In Assembly

Table 1 in my article, “Read the Keyboard in Assembly” (HOT CoCo, October 1983, p. 106) is wrong. The Y-coordinate series should be 254, 253, 251, 247, 239, 223, 191, and not 254, 253, 251, 247, 247, 239, 223.

Larry Landwehr
Madison, WI

Meet Me in Toledo

The Greater Toledo Color Computer Club meets at 7:30 p.m. on the first Thursday of the month at the Wernert Civic Building on Douglas (north of Laskey) in Toledo, OH. For more information call 478-6961 or 537-1432.

John Nyitray
5720 Brooke Lane
Sylvania, OH 43560

Starting Up in Louisiana

Anyone interested in a Color Computer user’s group in the Lake Charles area of Louisiana should contact Ron Hicken at 477-3797 after 5:30 p.m., or Sam Selph at 625-7660 after 6 p.m.

Our group is now in the planning stage, and we’d like to get all interested people on our mailing list.

Ron Hicken
Lake Charles, LA

Meet Me in San Berdoo

The Citrus Color Computer Club (4Cs) invites all CoCo, TDP-100, and Dragon owners in the San Bernardino/Riverside area to join. Membership fees are $12 per year. Family memberships are $20 per year.

For more information, write Citrus Color Computer Club, c/o Personal Relations Chairman, 18227 Muriel Ave., San Bernardino, CA 92407.

Michael J. Schindler
San Bernardino, CA

HOT CoCo’s Consumer Watch

Softlaw (formerly Nelson Software) has informed HOT CoCo that any reader who has ordered their VIP Calc should receive the program soon. Tom Nelson of Softlaw said that they will ship VIP Calc by Dec. 17, 1983. Any reader with VIP Calc on order who still has not received this program within a reasonable amount of time after this date should contact HOT CoCo.

Have a problem with one of our advertisers (or any Color Computer software or hardware vendor)? Let us know about it. We’ll try to resolve it for you. Send your complaints to Rita Rivard, HOT CoCo, Elm St. and Rte. 101, Peterborough, NH 03458.
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- Drives any printer
- Embedded format and control codes
- Runs in 16K, 32K, or 64K
- Menu-driven disk and cassette I/O
- No hardware modifications required

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 checkboard 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.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with 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 COLUNDS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 x 24 and 85 x 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 x 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, Termite, 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 other word processors. Compatible with spelling checkers (like Spell ‘n Fix).

Cassette verify command for sure saves. Cassette autoretry 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, subscript, superscript, 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.

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

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

Cognitec
704 N. Nob St.
Del Mar, CA 92014

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

(Add $2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter compatible spelling checker (Spell ‘n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

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Feedback

Hot? CoCo

I would like to announce the opening of the CoCo-Cold BBS, serving the interior of Alaska.

Kerry Clabaugh
CoCo-Cold BBS
4239-4 599th St.
Fort Wainwright, AK 99703
907-ELO-COCO (BBS)
907-356-1834 (voice)

Meet Me in North Huntington

We recently formed the 6809s Computer Club for CoCo owners in the North Huntington, PA, area. The club is new but growing. We have a newsletter and charge a membership fee.

William A. Walker, Secretary
114 Kenneth Drive
Delmont, PA 15626

Meet Me for Adventure

We have formed a new International Adventure User's Group for all Radio Shack microcomputer owners interested in playing or writing adventure games. Members will maintain contact through a monthly newsletter.

Contact me for more information.

Maurice Dow
84 Camberley Crescent
Brampton, Ontario L6V 3L4
416-451-9452

Meet Me in Raleigh

The Raleigh Color Computer Club meets the second and fourth Wednesdays of each month at 7:30 p.m. at a local school. We have over 40 programs written by members for our use.

Newcomers are always welcome. Contact me at the address below.

David Roper
Box 681
Garner, NC 27529

Replacement Keyboard Help

How hard is it to replace the keyboard on a CoCo? I'd like to see an article explaining how it's done.

Richard Thomas
Wappingers Falls, NY

Replacing the keyboard is fairly easy, even for nonhardware types. Most manufacturers supply adequate instructions for the versions they sell. Or, if you'd like to build your own, we have a simple construction project coming up in a future issue.

Santa Barbara BBS

I've started a 300-1200 baud, 24-hour BBS in Santa Barbara, CA. We invite all CoCo owners to drop in on it.

Jim LeDoux, SYSOP
CoCo Corner BBS
805-687-9400
Santa Barbara, CA

Looking for You
In Fayetteville

We know there are CoCo users around here, because HOT CoCo sells out at the newstands each month. If you are interested in starting a CoCo user's group in the Fayetteville, NC area, please contact us.

Rich and Noël DeLuna
5501 Crestview Place
Spring Lake, NC 28390

Future File Expansion

Here is some additional information for using "Stock Transaction Tracker," (HOT CoCo, January 1984, p. 58).

Under normal circumstances, STT creates and maintains a fixed number of records (file size, defined by the variable FILES in line 10 when the file was first created). When you first create your file, you can choose the maximum size by redefining FILES before using STT.

But how do you expand your STT file after you've created it? For example, if you have a 25-record file and attempt to expand it by changing FILES to 35, you'll get an input-past-end-of-file (IE) error in line 820.

Staying with this example, you must modify line 10 to redefine FILES to 35. Then CSAVE the modified STT program. Next, run STT and begin loading your old (25 record) file. When the IE error in 820 appears, enter Close. Then enter GOTO 830. After a second or so you’ll get a return-without-GOSUB (RG) error in 840. Now enter GOTO 500, which brings you to the menu. You can continue on as normal, saving the new size file before ending.

When you tried to load a 25-record file into the program that was expecting 35 records, it prematurely encountered the end-of-file marker and created an IE error. Since you'd already loaded your data, you simply closed communication and continued on to line 830 where padding all entries with blanks to a fixed length of eight characters conditioned the data.

After you’d done this, the program didn’t know where to return to, and created an RG error. As with any error, you simply commanded GOTO 500 to reenter the program without disturbing any existing variables.

You might also check our review of the Super Pro Replacement Keyboard from Mark Data (HOT CoCo, August 1983, p. 20) for some information and an installation tip or two.—eds.

Send your letters to Feedback, HOT CoCo, 80 Pine St., Peterborough, NH 03458.
SORTC** for OS9*
THE ONE AND ONLY

SORTC is a high speed, full-record compounding disk sort, which gives microcomputer users mainframe capabilities. It has been specifically designed to sort data efficiently while offering the user great flexibility in designing sort programs. It is written in BASIC09* for use under OS9.

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

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

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

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

ORDERING INFORMATION
SORTC, from JBM's MIDWARE line of quality software, is available on either five and one-quarter or eight inch diskettes for a price of $150.00. All of JBM's software packages come complete with comprehensive user's manuals. For more information, or to place an order, contact:
DEPT. FSEA
The JBM Group, Inc.
332 West Church Road
King of Prussia, PA 19406
TEL: 215-337-3138
TWX: 510-660-3999
VISA and MASTERCHARGE accepted.

*OS9, BASIC09 are registered trademarks of Microwave Corporation.
**Uses the same algorithm as JBM's SORTC for Digital Equipment Corp. RSTS Systems.
The Colour Software Workbench (CSW) is a system of machine language programs that run on a 32K or 64K TRS-80 Color Computer Extended Disk Basic System. It lets you develop machine language programs in a combination of Pascal and 6809 Assembler source languages. The 240+ page CSW User's Guide that is included explains the fundamentals of the languages as well as how to use the package.

Part TWO of the CSW User's Guide provides you with the background information needed to write programs using the Colour Software Workbench.

LEARNING EXERCISE
- Complete Pascal and Assembler Language Source
- Uses All Parts Of The Workbench
- Resulting Program is a Text Processor

PASCAL
- Describes Standard Language Elements Supported
- Constants Include Decimal and Hexadecimal Integers, ASCII characters and strings
- Types Include:
  - Integer, Char, Boolean, Enumerated, Subrange
  - Multi-Dimensioned Arrays
  - Records and Variant Records
  - Sets of Up to 256 Elements
- Files
- PROCEDURES and FUNCTIONS with FORWARD
- Variables and LABELs
- Arithmetic, Boolean, and Set Expressions
- Statements: IF, WHILE, REPEAT, CASE, GOTO, EXIT, FOR, BEGIN, assignment (=)
- Input/Output: RESET, REWRITE, READLN, EOF, WRITE, WRITELN, CLOSE, PAGE
- Built-in Functions and Procedures: ABS, CHR, CURSOR, ODD, ORD, PRED, SUCC

ADVANCED PASCAL
- Strings Support: Assignment, Comparing, Concatenation
- String Procedures and Functions: STRINGCOPY, STRINGDELETE, STRINGINSERT, STRINGPOS, HEX, ENCODE, DECODE
- Type Extensions for Structured Type Breaking
- ROM Routine Access via CALL Built-in Function
- Static and Public Variable Allocation
- Separate Compilation and Assembler Interface via INTERFACE, EXTERNAL, and PUBLIC
- Listing and Multiple Source File Directives
- Explanation of Error Messages

6809 MACRO ASSEMBLER
- Motorola Compatible Source Conventions
- Macro Facility With up to 9 Macro Parameters
- Separate Compilation and Pascal Interface via PUBLIC and EXT Directives
- Listing Control Directives
- Explanation of Error Messages

TECHNICAL NOTES
- CoCo ROM Compatibility
- Pascal Runtime Library Assembler Interface
- CSW Object File Format

Hi-resolution and 3-dimensional skeletal graphics packages included. This includes full Pascal & Assembler source code. Includes: HIRESCLEAR, HIRESLINE, GRAPHDISPLAY, MOVESKELETON, SHOWSKELETON

DEFT Systems, Inc.
Colour Software Workbench™

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or CALL TOLL FREE: 1-800-368-3238 Operator B
(in Virginia) 1-800-542-2224 Operator B
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Garage sale at Miz Murphy's place! Watch the joint!" Elmer yelled before I could close the door.

So I watched Elmer's Arcade. Only two little kids came in, and they didn't have any money, so I gave them a few nickels to watch Felix the Cat cartoons on the Kinetoscope.

Elmer came back just before noon. His feet dragged along the pavement. His eyes were glazed. He looked like the title character in that old movie, *The Mummy.*

"I didn't get it," he muttered.

"Get what?"

"Miz Murphy, she always said when she was sure her son Harold wasn't coming back to get it, she'd sell it. So finally, you know, Harold's gone into insurance in Michigan and has five kids of his own, and he ain't coming back to get it, so she sold it and I didn't get to buy it."

"Buy what, Elmer?"

"Vibra-Football, you fool! No, wait a minute, I'm the fool. I left here with only five bucks in my pocket. And a consortium of kids from Seventh Street outdid me. Nobody would take a check! Arg-h-h-h!"

"You lost me when you mentioned Vibra-Football," I told him. "Take it easy and tell me what happened. Slowly."

"Wait, I'll get us each an Uncle Judy Celery Soda, and I'll explain," said Elmer. The effect was calming.

This was the story, and it was quite poignant:

When Elmer was a kid his mom and dad gave him a football simulation game. It had a metal playing field that vibrated and little red or blue plastic players with two thin metal strips on their base. These strips caused the players to move when the board rattled. The players also had little magnets on their bumpers. When the designated ball carrier of one team hit the magnet of an opposing team's player, that was a tackle.

As Elmer recalled, it was most fun.
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as a two-k'd game. You could spend an entire snowy Sunday afternoon lost in the pleasure of setting up defensive and offensive postures designed to confuse your opponent.

"In short," said Elmer as he drained his Uncle Judy's, "that game was the impetus, the inspiration for getting me into this magnificent business."

"What happened to your Vibra-Football, Elmer?"

"Ah! When I joined the Navy my ma sold it. She burned my trunk of comic books too."

"Sad ain't the word, kid. Desolated is more correct.

"Sad!"

"Sad!"

"Sad ain't the word, kid. Desolated really says it!"

"I can't put Vibra-Football on the program. It's simple to play. There is an offensive posture designed to confuse your opponent."

"In the pleasure of setting up defensive postures, I knew I'd picked the right name, even if I didn't know what the program was going to be."

Broken Field Nightmare is my first success with Elmer. He actually likes the computer game. It isn't Vibra-Football, but it has its persuasive elements.

This program listing works in Color Basic, Extended Color Basic, and— with the change indicated for line 130 of the listing—MC-10 Basic.

It's simple to play. There is an orange runner that begins each round

```
100 REM * BROKEN FIELD NIGHTMARE
 110 REM * TRS-80 COLOR COMPUTER *
 120 REM * ELMER'S ARCADE # 8 / RICHARD RAMELLA
 130 Q=1024
 140 REM * FOR MC-10 MAKE LINE 130 Q=16384
 150 CLS0
 160 PRINT @ 133,"BROKEN FIELD NIGHTMARE *:",Q
 170 FOR T=1 TO 1000
 180 NEXT T
 190 CLS0
 200 M=10
 210 H=301
 220 US=CHR$(94)
 230 DS=CHR$(118)
 240 LS=CHR$(8)
 250 RS=CHR$(9)
 260 AS=CHR$(246)
 270 BS=CHR$(233)
 280 FOR A=160 TO 190
 290 IF A=160 THEN FOR B=A TO A+
 300 PRINT "STEP 32: PRINT @ B,CHR$(207)
 310 PRINT @ A,CHR$(207)
 320 NEXT A
 330 PRINT "TIME":;H-N-1;
 340 PRINT "TACKLERS:" M;
 350 FOR T=1 TO 1000
 360 NEXT T
 370 PRINT "SC`:S C+(H-N)
 380 PRINT @ 133,"FINAL SCORE:" SC
 390 NEXT T
 400 PRINT "GO:";H-N-1;
 410 PRINT "LS=:CHR$(131)"
 420 PRINT "BS=:CHR$(207)
 430 PRINT "US=:CHR$(94)
 440 PRINT "DS=:CHR$(118)
 450 PRINT "LS=:CHR$(8)
 460 PRINT "RS=:CHR$(9)
 470 PRINT "AS=:CHR$(246)
 480 PRINT "BS=:CHR$(233)
 490 PRINT "US=:CHR$(131)"
 500 PRINT "BS=:CHR$(207)
```

Program Listing. Broken Field Nightmare

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SYSTEMS SOFTWARE

MACRO-80C: DISK-BASED EDITOR, ASSEMBLER AND MONITOR—With all the features the serious programmer wants, this package includes a powerful 2-pass macro assembler with conditional assembly, local labels, include files and cross referenced symbol tables. MACRO-80C supports the complete Motorola 6809 instruction set in standard source format. Incorporating all the features of our Rompack-based assembler (SOS-BOC), MACRO-80C contains many more useful instructions and pseudo-ops which aid the programmer and add power and flexibility. The screen-oriented editor is designed for efficient and easy editing of assembly language programs. MACRO-80C allows global changes and moving/copying blocks of text. You can edit lines of assembly source which exceed 32 characters. DBUG is a machine language monitor which allows examining and altering of memory, setting break points, etc.

Editor, assembler and monitor—along with sample programs—come on one Radio Shack compatible disk. Extensive documentation included. By Andy Phelps. $99.95

SOS-BOC: SOFTWARE DEVELOPMENT SYSTEM—Our famous editor, assembler and monitor in Rompack. Like MACRO-80C, it allows the user to write, assemble and debug assembly language programs with no reloading, object patching or other hassles. Supports full 6809 instruction set. Complete manual included. $89.95

MICROTEXT: COMMUNICATIONS VIA YOUR MODEM! Now you can use your printer with your modem! Your computer can be an intelligent printing terminal. Talk to timeshare services or to other personal computers; print simultaneously through a second printer port; and re-display text stored in memory. Download text to Basic programs; dump to a cassette tape, or print, or both. Microtext can be used with any printer or no printer at all. It features user-configurable duplex/parity for special applications, and can send any ASCII character. You'll find many uses for this general purpose module! ROMPACK includes additional serial port for printer. $39.95

MICRO WORKS COLOR FORTH
• Faster to program in than Basic
• Easier to learn than Assembly Language
• Executes in less time than Basic

The MICRO WORKS COLOR FORTH is a Rompack containing everything needed 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. And 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.

Includes a 112-page manual with a glossary of the system-specific words, a full standard FORTH glossary and complete source listing.

MICRO WORKS COLOR FORTH—THE BEST! From the leader in FORTH, Talbot Microsystems. $109.95

MACHINE LANGUAGE

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

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

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

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ADVENTURE—Black Sanctuary and Calixto Island by Mark Data Products. Each cassette requires 16K, $19.95 each.

CAVE HUNTER—Experience vivid colors, bizarre sounds and eerie creatures as you wind your way through a cave maze in search of gold treasures. This exciting Hi-Res game by Mark Data Products requires 16K for cassette version. $24.95

For every color computer...
at the left of the field. Use your imagination and you will see it leans to the right. You tap the arrow keys to make a broken field run to the right among the magenta, stationary tacklers that await you.

On your first run there are 10 tacklers and a clock of 300. A few plays will give you an idea of how long a clock of 300 is. The object is to take the runner to the touchdown line at right as quickly as possible. Your score is based on how soon you hit paydirt. The clock runs slower when you keep your player in motion. Your runner can be next to a tackler, but if you attempt to run through a tackler or out of bounds, the game ends.

The first score is easy because there are only 10 tacklers. However, after each touchdown, five more tacklers come onto the field and the clock is cut by 10. It gets tougher.

The final score of the game is the number of points you have run up, multiplied by the greatest number of tacklers you have faced. This is a nice scoring system that can get up into the tens of thousands if you’re adroit.

There’s not much new to share in the way of programming tips in Broken Field Nightmare. So instead, let me haul out my soapbox and hold forth briefly on the topic of zapping aliens.

Today I received a collection of games that CoCo programmers sent to the TRS-80 Microcomputer News. They were published back in July. There were 14 games, and 11 of these games had to do with shooting aliens, or destroying enemies, cities, and even whole planets.

True, little boys enjoy the power fantasy of destruction, but isn’t it time for programmers to drop the puerile themes of interplanetary havoc?

Let’s face the fact that computer games have to do with maneuvering little lights around the screen in a quiet setting, and the tension is only within.

Let’s have more games with aggressive themes that don’t lean so heavily on invasions from space and killing aliens.

What was regrettable about the 11-out-of-14 space holocaust orgy in Microcomputer News is that the programs were fine, the games were fun and well worth publishing. The themes were trite.

And it is the triteness of the motifs, not the fantasy of violence, that most concerns me. If all we can come up with are space cowboy games, computer gaming will go the way of the stereoscope. What? You don’t know what a stereoscope is?

Believe this or don’t believe it: Last week a fleet of aliens hovered over our little town, and of course they were zapped out of the sky immediately by a group of video vigilantes who’d hooked homebrew nuclear warheads onto their 4K systems.

Only one alien survived, and then just long enough to gasp, “We came to ask you to join the—rattle—Federation, but now it’s... too... late...”

If anyone has trouble keying in Broken Field Nightmare, send a listing or at least a description of error messages and the lines in which they occur to me, Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. Include a self-addressed, stamped envelope, and I’ll answer quickly. From other countries, include a self-addressed envelope and coin equal to the necessary postage. I can’t help if you’ve changed the program in any way, so save enhancements until we get it running.

---See List of Advertisers on page 130---
How are INPUT#-1 and PRINT #-1 used to store data on tape? With the help of a few other commands, including OPEN, CLOSE, and EOF, they can store names, numbers, or practically any other information. The method is almost identical to that used to store data to disk.

Program Listing 1 is about as short a data-storage program as I could produce and still include instructions. Without the instructions, you might find it difficult to know when to play your recorder and when to record.

Listing 1 asks if you want to record data or search the tape for recorded data. You must record first to give the program something to search for, so press 1. The computer will instruct you to press play and record. Do so on an unrecorded section of tape.

Line 90 opens for output device #1, the recorder, and stores the data under the name PHONE. Type a name, a comma, and a number. Repeat with several different names and numbers. Type END,END after you've entered all the names.

Line 130 prints the names and numbers onto tape. Notice that numbers are stored as strings (B$). I choose to do this for people who put dashes in numbers, perhaps telephone numbers. The recording contains only the data.

You must save the program separately by typing SAVE "NAME". Using the tape counter as an indicator, write yourself a note where on the tape you've stored the program and the data. You can use the one program to save several different sets of data.

After you've saved the data to tape, you can use the program to reenter it. Run Listing 1, press 2, position the tape to a point slightly before the section containing data to read. Press the recorder's play button and any computer key. The program will read data from the tape and print it to the screen.

Line 210 opens for the input device #1 and looks for data called PHONE. Notice that CLOSE is used in lines 160 and 260. After every open and data transfer you must execute a CLOSE.

In line 220 the end of file (EOF) looks for the end of your data file. When found, the EOF receives the value of -1, and the program goes to line 260, closing the input.

This program needs improvement. As is, it is not possible to add names to a list. You would have to retypew the entire list. To be able to store names in memory and just type in the new names, you must store the data into an array as it is read from the tape.

I prefer to use the previously covered DATA and READ commands to store information with a cassette system. Then I only need one recording, and the program contains the data. It takes more memory, but 16K or 32K is not too expensive anymore. You can have 16K for as little as $12.

There are some uses for PRINT#-1 and INPUT#-1 that READ and DATA cannot handle, as Program Listing 2 shows.

This listing allows you to draw eight-color pictures on the screen. Use the arrow keys to direct your painting. You can save the drawing on tape, or, if you have an 80-column printer, you can transfer the picture from the screen to paper.

The program prints the picture in letters. Grab your crayons and color the letters according to the chart in Table 1 for a copy of your masterpiece.

To make a printout of a picture stored on tape, remove line 480 and run the program as usual to load the picture.

When drawing pictures, remember that you can't have two different-colored set positions within one PRINT@ position. If you draw a red line adjacent to a white line, you might see the white line turn red.

To erase a small area on the screen, hold down the clear key while moving your cursor. It will erase any area you
pass over, but the program won't allow it to erase the entire screen.

10 FORA=0 TO 8:READ JWS(A)+NEXTA:DO
ATA X,Y,B,R,W,M,C,O
20 CLS:PRINT"DRAWING PROGRAM"
30 PRINT:PRINT"PRESS":PRINT 1
"TO DRAW,"
40 PRINT 2"TO LOAD PICTURE FR
ON TAPE."
50 INS:INKEYS
60 NKS=INKEYS:IFNKS="1"THENGOTO
70 ELSE IF NKS="2"THENGOTO 160
ELSE 60
70 CLS:PRINT"USE THE ARROW KEYS
to DIRECT YOUR LINE."
80 PRINT"THE CLEAR KEY WILL AL
LOW YOU TO MOVE WITHOUT LEAVING
A TRAIL."
90 PRINT"THE ENTER KEY IS USED
to CHANGE THE COLOR OF YO
R LINE."
100 PRINT"PRESS THE SPACE BAR WH
EN READY TO SAVE A PICTURE TO T
APE."
110 PRINT"BE SURE THE RECORDER H
AS TAPE AND HAS THE PLAY AND RE
CORD BUTTONS PRESSED."
120 PRINT"PRESS ANY KEY TO CONTI
INUE."
130 PRINT"PRESS ANY KEY TO CONTI
INUE."
140 IF INKEYS="*"THEN 140
150 GOTO 210
160 CLS:PRINT"HAVE RECORDER READ
Y WITH TAPE OF PREVIOUSLY RECORD
ED PICTURE."
170 PRINT"THE RECORDERS PLAY BUT
TON MUST BE PRESSED."
180 PRINT"THE RECORDERS PLAY BUT
TON MUST BE PRESSED."
190 IFNKEYS="*"THEN190
200 GOTO 330
210 CLS:X=32:Y=15
220 C=1
230 IF PEEK(341)=247 THEN Y=Y-1
240 IF PEEK(342)=247 THEN Y=Y+1
250 IF PEEK(343)=247 THEN X=X-1
260 IF PEEK(344)=247 THEN X=X+1
270 IF PEEK(338)=191THEENC=C+1
280 IFPEEK(348)=247 THEN GOTO 49
290 IF C=9 THEN C=1
300 IF PEEK(345)=247 THEN 370
310 IF X=0 THEN X=0
320 IF X=63 THEN X=63
330 IF Y=0 THEN Y=0
340 IF Y=31 THEN Y=31
350 IF PEEK(339)=191THEENSET(X,Y,
C):RESET(X,Y):ELSESET(X,Y,C)
360 GOTO 230
370 LOW YOU TO DRAW. Lines 200-360
are instructions. Lines 210-360
allow you to draw. Lines 380-420
store a picture from the monitor to
tape. Lines 430-480 transfer a picture
from tape to the video monitor. Lines
490-520 produce a paper print from
the video. I think it's a fun program
and hope it to be one that you enjoy
using.

Can you calculate a square root on
a Color Basic machine? Sure, Pro
gram Listing 3 uses an old method I
learned on a four-function (+, -, *,/) calculator.

Guess the square root of the num
ber you're working with. Divide the
original number by your guess. Average
the result with your guess. If this
result was not accurate enough, then
divide the original number by this
result and average again. Repeat until
your result is accurate enough for your
problem. The computer cannot make
a good guess for the square root, but it
is very good at repeating the dividing
and averaging.

Study Fig. 1 and Listing 3 to see
how they correspond. In Fig. 1 I fol
lowed the program through three
loops while trying to find the square
root of 20. Remember that you can in

Listing 2 has five main parts. Lines
20-200 are instructions. Lines 210-360
allow you to draw. Lines 380-420
store a picture from the monitor to
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Study Fig. 1 and Listing 3 to see
how they correspond. In Fig. 1 I fol
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loops while trying to find the square
root of 20. Remember that you can in
The Basic Beat

put the number for which you want to find the square root, or that number can come from another part of the program. The program has possible uses in solving quadratic equations or distance formulas.

If you enjoyed square roots, you will love sines and cosines. Yes, you can calculate them on a Color Basic CoCo also. Figure 2 shows the equations that will calculate the sine and cosine of an angle when the angle is expressed in radians.

Since angles are usually measured in degrees, line 20 in Program Listing 4 is an equation to change degree measure to radian for the computer. Radian measure equals degree measure times \(0.0174533\).

Next problem, what is the 5!? The exclamation point is called a factorial. Five factorial \((5!)\) is \(1\times2\times3\times4\times5\).

The computer does not have a factorial command, so you must program the CoCo to multiply the numbers as necessary. Table 2 lists factorial values.

The Color Basic CoCo does not include exponents either, but there’s always multiplication: \(D^3 = D\times D\times D\).

If you calculate the terms of the equations in Fig. 2, you will find that after the first four, the numbers become very small. So small that they can be eliminated for most uses. Put all of this together and Listing 4 will calculate the sine and cosine of any degree angle.

Sorry I got so mathematical with you. Next month I’ll give a little study of semigraphics mode 8 to light up your screen in eight colors on a 64-by-64 resolution black grid.

I’ll also include a short discussion of converting Model I/III programs to color.

Two months ahead is the topic of converting machine-language listings to Basic. I have ordered diplomas for graduation. The party will be at your house.

---

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With the MFX-1 and some support programs from Gore Software, you can turn your Color Computer into a real-time weather-fax machine. It will let you display (and print out) the latest weather maps transmitted on the short-wave bands, weather satellite photo/maps, and press wire photos.

In some parts of the country you can phone a toll-free number and get two minutes of radar weather display.
Rainbow Quest will take your child on a space adventure of the future. The planet Rainbow is a faraway land of ancient and mysterious cities, mazes, and puzzling events for young readers to discover. Rainbow Quest by Richard Ramella is a book-and-cassette adventure for the Radio Shack Color Computer. Children read and play along as Molly and Sam meet pirates, robots, and strange creatures as they make their way across the planet Rainbow. To reach their goal, they must survive on their own and face the challenges they meet along the way. Readers will help Molly and Sam find their way through dark and confusing mazes, solve word and number puzzles, and conquer invaders in arcade-style games.

Each obstacle they meet is a program, on the Rainbow Quest cassette, ready to load and run.

Rainbow Quest has 25 programs in all. Book and cassette are sold together in a protective storage binder with complete instructions. Each Rainbow Quest package for the Color Computer is $24.97.

To order Rainbow Quest, call toll-free for credit card orders, 1-800-258-5473. (In New Hampshire, call 924-9471.) Or mail your order with payment or complete credit card information to: Wayne Green Inc., Attn. Book Sales, Peterborough, NH 03458.
it automatically disconnects.

With a stereo tape recorder you can record the signal to tape, and display or print an entire picture or much more detailed ¼- or ½-picture strips. The smaller the area displayed, the greater the detail. You can select portions of a recorded signal to blow up.

When I first hooked up to a weather-fax station, I found that the numbers and text displayed with a whole map were unreadable, because the amount of pixel data exceeded the CoCo’s display capability. The ¼-frame strip was much better—numbers, text, and the various weather symbols were clearly readable.

Wire photos are transmitted as negatives, but the software lets you reverse them if you want. These and the photo/maps are printed in four shades of gray, and it’s important to properly adjust your monitor’s contrast control to accent the differences between the shades.

The following software is available for the MFX-1:

- SWL-FAX copies weather maps and wire photos. The cassette also includes a program that copies up to 20 words per minute of good Morse code and prints it to the screen. SWL-FAX comes with the MFX-1.
- Radar displays radar data received via telephone from the Weather Bureau office. The manufacturer supplies a list of Bureau offices around the country and their telephone numbers.
- Polar Orbit receives data from weather satellites. It can copy the same material as SWL-FAX, but doesn’t have the 60-rpm speed that is needed for some foreign broadcasts.
- WEFAV-V2 copies the GOES satellite broadcasts on 1691 MHz.
- WEFAV Print prints out the recorded GOES satellite and Polar Orbit weather photos in four of the available eight shades of gray.
- Weather Map 64 Print requires 64K and will print out 480 pixels per line with 800 lines for extremely accurate detail. It works in the graphics mode.
- The MFX-1 and each program comes with its own accurate documentation.

Gore Software offers an Experimenters Kit for $39.95 that consists of the SWL-FAX program, a manual with circuits and schematics for building your own MFX-1, and time-based circuits. This kit is for hardware hackers who like to get their own parts and build their own devices.

Still think the CoCo is only a game machine? Try this with any other personal computer.

\[\text{Fig. 1. Sample Weather Photo/Map}\]

\[\text{VC} \]

Britt Monk
Avalon Hill Game Co.
4517 Harford Road
Baltimore, MD 21214
16K, Extended Color Basic
$20, cassette

by Steve Brown

The air seems almost too heavy to breathe. Wisps of steam rise from green rainwater pools on the broad field before you, only to mix with shimmering heat waves over the swaying elephant grass. For the fifth time in as many minutes, you wipe the sweat from your reddened eyes and strain to get a better look at the knot of black-clad figures moving slowly toward you across the plain. Are they friends, or are they VC? You’ll soon find out.

VC, Avalon Hill’s tactical-simulation game, puts you into that situation in a re-creation of battalion-level tactics of the Viet Nam war. The game pits you, as commander of a combined force of U.S. Airmobile Cavalry, U.S. field artillery, and units of the South Vietnamese army (ARVN), against battalions of North Vietnam-
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ese regulars (NVA), VC soldiers, and VC irregulars in a frustratingly realistic scenario of combat and maneuver. As with conventional war games, VC sets up the scenario for the conflict: a simulation of political/military warfare between guerrilla forces (commanded by the CoCo) and your "Pacification" forces.

Your object is to win the hearts and minds of the local villagers while destroying all VC and NVA units in your province (Huy Binh). Like the real Viet Nam war, VC demonstrates the challenging and unconventional tactical problems created by a conflict with no front lines and no safe rear areas.

The game begins with your forces clustered in one sector of the playing area. The rest of the screen is filled with unidentified Vietnamese population groups. You must move your units out among the populace, seeking out the enemy while making friends with the neutral natives. Of course, you won't usually know which of the villagers are VC, or where the enemy units are.

You maneuver your units with the joystick or the arrow keys. During each turn, you can choose one of your units to move. Each unit can move within certain limitations and is assigned a specific power against the enemy.

In VC, as in most war games, combat between opposing units can only take place when the units are adjacent.

The relative strengths of the opposing units influence the outcome of combat. The CoCo calculates the combat results according to its odds tables. You command the following units:

- One U.S. Airmobile Infantry Battalion—capable of moving to any open space on the board. Its initial combat strength is equivalent to five VC units.
- One U.S. Artillery Battalion—can bombard any square on the screen, including friendlies as well as bad guys.
- Ten ARVN Infantry Battalions—can move only one square at a time, in any direction. ARVN units have an important quality that the U.S. units do not: They can move into Vietnamese villages and detect VC units hidden among the civilian population.

At the outset, you are confronted with a screenful of light green triangles, representing population groups. For the most part, these groups are classed as neutral civilians, politically indifferent to the struggle. However, hidden under the guise of the neutral civilian symbols are also VC and NVA Battalions.

By moving your units out among the people, you can reveal them as enemies or turn them into allies. In the beginning of the game there are no friendly civilians. You must win friends, as indicated by the green triangles changing to blue.

The game has an all-too-real twist in that friends of yours become enemies of the VC and are likely to come under Communist attack. Moving one of your units next to a concealed VC or NVA unit changes the green triangle into a representation of an enemy soldier.

Avalon Hill states that the purpose of their game is to "demonstrate some of the challenging and entertaining tactical problems posed by an unconventional conflict." More conventional military strategists should find this quite different from what they're used to.

You have 12 units, but you never know exactly how many the North Vietnamese have. You can move one unit per turn; the VC move 10. You never know where the enemy will appear, and you must pay attention to civilian groups as well as military units.

The constantly shifting population of plain green triangles is impossible to surround and difficult to cordon off. Grand sweeps and end runs with your units will gain some friendly civilians, but your forces are too few to sweep the whole board except in the easier levels of difficulty.

Spreading units out among the people wins more friends, but movement in dribbles invites ambush from multiple VC battalions. On the other hand, concentration of forces in the accepted manner of warfare means large areas of the terrain left uncovered and unprotected from VC infiltration.

Of greatest value, like the knight on the chessboard, is the U.S. Airmobile unit, symbolized by a miniature helicopter that putputs to the location you choose to employ its great firepower.

The numbers of units opposing you are as shifting as the allegiances of the population groups. At the beginning, the status banner at the screen bottom displays an estimate of NVA and VC battalions in the province.

The higher the level of difficulty chosen, the greater the initial number of enemy units. But as the game progresses, the VC actively recruit new battalions from the neutral civilians.

Level 0 is relatively easy. Level 1 seems like a quantum leap in difficulty. Level 5 makes the original Tet Offensive of 1968 look like a Sunday picnic. There is ample challenge for the best tactician here.

VC is very playable, although the limitations placed on the program by the need to accommodate 16K surely rob it of some of the complexities and nuances that serious war gamers seek. At the same time, one doesn't have to be a serious war gamer to enjoy the challenge that VC provides. It combines the best of the adventure game and some of the arcade type of action into a new form of entertainment. Besides, who else but your CoCo will stay up to play until 2 a.m.?
the video display. Computerware has also revamped and speeded up the sorting routines.

Flexi Filer's price puts it into competition with some very potent programs. It must therefore be judged by stringent standards; for $64.95, the product performs all the elementary functions required of a file manager.

Flexi Filer holds its own when evaluated against other CoCo file managers in its price range. It does lack Pro-Color-File's computational power and password-protection features, as well as Homebase's text records and extensive file-manipulation utilities.

On the other hand, Flexi Filer is probably the easiest of the three systems to learn, and it incorporates some powerful logic for selecting records from a file. It also features a flexible report generator.

As befits a serious file handler, it is capable of handling disk files adequately for small business applications.

Flexi Filer is typical of file managers in that it is menu driven. There are five menus in all:

- **Main** lets you select one of Flexi Filer's four major functions (defining records, printing reports, etc.).
- **Define** lets you specify the structure of records in a given file. Like many other data managers, Flexi Filer uses video forms to guide the data entry process; these are laid out under the Define menu.
- **Records** lets you add records to a file, delete them, change them, examine them, and so on. This is the menu employed to initially fill up a file once the structure of the records has been established under the Define menu.
- **Reports** contains options for defining and printing both abbreviated labels and full-fledged reports. At any given time, there can be only one label format in RAM and one on the disk for any particular data file; you can define and store up to 10 report formats, however.
- **Disk Info** lets you obtain complete or partial disk directories, purge old data files, or specify autostart files that load automatically in response to certain screen prompts. This can be useful in setting up turnkey systems.

The 31-page manual includes at least one feature that other software documentation could emulate: a flowchart depicting the relationships among the five menus, including illustrations of the menus themselves. This is useful for reminding the occasional user of how to build and manipulate a data file.

To make things even clearer, there are step-by-step tutorials for creating a data file and for printing labels and reports. It includes printouts from the sample files on the program disk, and worksheets for laying out data-entry screens and both 80-column and 132-column reports.

Flexi Filer is not completely memory-resident; that is, the size of a data file is limited not by RAM, but by the space available on the work disk. This creates large files, but you must access the disk often in the course of a work session.

If you are restricted to a single disk drive, you can strip the Flexi Filer programs (there are several) down to 20 grams; the remaining 48 are enough to handle about 900 records of 100 bytes each. A formatted 68-gran disk, which you could use in a multi-drive system, holds about 1,400 such records.

You must store the files that define formats for data-entry screens and reports, as well as the Select files that are rearranged during sorting operations, on drive 0; only the raw data for a data base can be put elsewhere.

A Flexi Filer record can contain up to 35 data fields, and you can use five types of data: alphanumeric, numeric, fixed numeric (dollars-and-cents format), exponential notation, and dates.

The first two can be of variable length, while the latter three are fixed at eight characters each. These can handle just about any type of information, although you need to exercise caution.

When the time comes to actually enter data, you see the form for each field in turn. Each record is automatically saved on disk when it is finished, and you are returned to the Records menu.

The previous record also remains in RAM. This is helpful because it lets you copy common fields from one record to the next with a single keystroke.

It also causes a problem: Flexi Filer does not accept a blank entry for a data field if a previous record has data in that position.

In one trial, I set up a sample file using several date fields, some of which were to remain empty in particular records. As soon as one record received an entry in such a field, however, I was unable to enter blanks, zeros, or anything else to denote a lack of information for subsequent records. The program simply copied the date from the last record that occupied that field.

I resolved things by entering dates like 01/01/01, to indicate the lack of real information. Once you've entered information into a data base, you can use other Records menu options to examine, edit, print, or delete individual records. Earlier versions of Flexi Filer required you to know the number of the record sought. In version 3.1, however, it is possible to invoke a Find Record option to look for a match between a specified target string and the first field of each record in the file. It's a far simpler approach.

Report definition is complicated, but Flexi Filer's versatility makes mastery worthwhile. There are two stages: you must first set up a Title Area, and then a Records Area. The Title Area is a header containing up to five lines of descriptive information, including data-column headings. The Records Area contains the actual data.

Since printed reports can be either 80 or 132 columns wide, Flexi Filer resorts to a little trickery to permit formatting on the CoCo's 32-column screen. Index lines at the top of the screen represent every fourth position on a printed page.

Using the arrow keys, you move a block cursor to establish the start of each piece of text in the Title Area. Since each point in this part of the screen represents a clump of four print positions, you cannot type the header information here; instead, you enter it in a separate area. In effect, you work with a split screen having two different scales. Dots representing the number of four-column increments required for each header item appear in the Title Area.

You can send as many as four printer control codes when you print a report, to do things like set up expanded or bold-face type. The data-column
headers entered when you define a report need not be the same as the names of the data fields to which they refer. This flexibility is a big help when it comes to setting up professional-looking reports.

You have complete control over the placement of data items. You can exclude any fields you like, and completely revise the order in which fields appear on a report, relative to their positions in the data records themselves. With the ability to define 10 different formats per file, you can compose concise summaries and detailed reports.

I use Flexi Filer to keep track of payments for the reviews, columns, and other pieces that I write. But totalling the payment column of each report exhausts Flexi Filer’s computational abilities. It doesn’t print the total directly under the column; instead, it appears at a preset tab position on a separate summary page, along with the title of the column. If several columns are totalled, the results all appear in one column on this sheet.

The abilities to reorder a file and to select subsets of the data are important attributes of a file manager. Flexi Filer has powerful sorting and selection routines. You can put files into ascending or descending order according to any field and specify the number of characters to be used in the sort.

In the interest of speed, Flexi Filer 3.1 conducts all sorting operations with the aid of a Select file. This small file contains pointers to all the records. The main file itself is not rearranged during a sort, as it was in earlier versions of the program.

You can also create another type of Select file: one that contains an ordered list of just the records selected from the data base according to some criterion.

Flexi Filer shines in its ability to select records. You can specify up to 36 simultaneous criteria. These amount to specifications of the numerical or string values of data fields; it isn’t possible to select records according to Field 3 > Field 2, for example.

The full complement of equality and inequality relations are available, and you can combine them with the logical AND or OR operators. You need to know the selection syntax so that Boolean operations are carried out in the correct order, but this is a minor point.

I was generally impressed with Flexi Filer 3.1. That bug in the date field entry routine was annoying, as was the difficulty I found when trying to insert a new field into a previously defined record format (it can’t be done, so design your formats with care), but view these problems in context. The system is easy to use, and is strong in record selection and report generation.

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At the same time, this is a curiously uneven package; the manual is slick and comprehensive looking, but turns out to have some surprising weak spots. Before I get into the details, though, I should at least mention another matter: the embryonic operating system that comes with the program.

**Color TRSDOS**

Disk Graphics uses the Color TRSDOS 1.7 loader, which offers at least the basis of a real disk operating system. Color TRSDOS options include exiting to Basic, executing a machine-language program (Disk Graphics itself is the default), copying files on a single- or multiple-drive system, and generating a directory or disk-allocation map.

You can limit the directory to specific file names or extensions and employ “wild card” search characters. You can even put a six-digit clock display onto the upper right corner of the video screen.

In Disk Graphics, Color TRSDOS is a nice accessory, allowing you to leave the program long enough to review the names of the files you want to graph.

**Elements of Disk Graphics**

Again, the Disk Graphics program generates line, bar, point, or pie charts, and it can print all but the latter with associated “key charts” containing keys or legends to help the reader interpret the various symbols used to plot several variables on a single graph. All operations—chart selection, data entry, and so on—are menu driven, and full-screen editing is available in almost all cases.

The editing procedures are consistent, although they take a little getting used to. You use the down and up arrow keys to move the cursor forward and backward, respectively, from item to item on a given prompting screen (many operations require several screens). Use the enter key only when you’ve completed a screen to your liking; it records all changes (many items have defaults) and presents the next screen.

Conventional Basic editing is available within a given data item: Backspacing erases the previous character, a shifted zero controls the case shift. The break key causes the main menu to return, although sometimes you
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The Disk versions each have a Mini Disk Operating System which will masterfully handle from 1 to 4 drives. It offers smooth operation for such features as the ability to read a directory, display free space on the disk, kill files, save and automatically verify files, and load, rename and append files. Library programs simply do not have the limitations of BASIC.

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By Tim Nelson
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The Writer will work with you and your printer to do things you always wanted to do. Every feature of your printer can be put to use, every character set, every graphics capability at any baud rate, EVEN PROPORTIONAL SPACING. All this with simplicity and elegance. You can even automatically print multiple copies.

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(formerly Super "Color" Terminal)
RATED BEST IN JANUARY 1984 "RAINBOW"
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 termнал, does much more than any other terminal and does it reliably. That you can send and receive programs, messages, even other boards, other computers, even the mainframe at work.

For your important communication needs you’ve got to go beyond software that only lets you chat. You need a smart terminal so that you can send and receive programs, messages, even other VIP Library files. VIP Terminal, the official Dragon microcomputer terminal, does much more than any other terminal and does it reliably. None can compare in features.

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

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(Tape does not allow hi-res displays in 16K)

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RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"
By Tim Nelson

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32K DISK $59.95
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All Disk Programs are also available on 3" Diskettes for the Amdek Color AMDISK-III Micro-Floppy Disk System for an additional $3.00 each.

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have to press it several times to back-track out of a nested command level.

The main menu offers the following options:
- Clear Features
- Create a Chart
- Load Information
- Save Information
- Edit Features
- Display Results
- Exit Program

Disk Graphics creates two types of files, definitions and features, for each graph, under the same user-specified file name. The /DEF file essentially contains an echo of the keystrokes used to define the graph in the first place (i.e., what was typed in response to screen prompts). There are also some additional carriage returns and other control characters.

Separate subcommands of the load-information and save-information options save and recall both these files. You can recall either file if you just want to reproduce a stored graph. If you want to edit data values, titles, and so on, it is easiest to work with the /DEF file. Load it and then choose the create-a-chart option; if you then indicate that you want to revise the chart already in memory, you can get right down to a review of your entries.

Display Options

There are several attributes that you must specify when defining a chart, such as period names, shading exceptions, and separate four-color codes for video display and color printer (and corresponding shading for black-and-white video or printer). One of the best things about the documentation is a four-page reference card that illustrates most of these parameters.

Disk Graphics can draw charts on a "superscreen" having 999 addressable points in each direction. It can place charts anywhere on the superscreen; the default position puts the lower left corner of the chart at the origin (0,0).

Note that the superscreen uses conventional Cartesian coordinates, with vertical values increasing upward. You can think of the video display as a movable "window" into the superscreen, and there are a couple of display options: 256 by 192 elements in black and white or 128 by 96 in color.

Both video and printed charts can be reduced from their default sizes by factors of 1/2, 1/4, or 1/8. This is especially handy for previewing things that are too big to fit on the video screen at once, even though the details will no longer be legible.

Disk Graphics contains its own printer driver routine.

Bar Charts and Key Charts

Bar charts can be horizontally or vertically oriented. The program can show up to 255 "periods" (time intervals or other independent variables), and can plot up to 255 "groups," or data items, per period. However, things can get awfully crowded if you try to use more than six or eight. Figure 1 shows a bar chart that I made up to demonstrate a few features.

Disk Graphics can't handle decimals, or integers greater than 30,000. Therefore, you might have to scale data, which can be a nuisance. You can edit the features file to insert a decimal point for appearance's sake, though.

It is possible to mix uppercase and lowercase lettering in the titles and labels. I found one peculiarity, though. Disk Graphics uses a red-and-yellow menu format in which yellow letters represent lowercase; however, my computer has a display board that treats such reverse video as lowercase. Therefore, when I want an uppercase printout, I have to enter lowercase letters, and vice versa.

One final point about titles and labels: Unless you choose to go into features editing, their sizes are not under your control. Disk Graphics tries to fit in the largest titles possible, subject to its own algorithms. As a rule, the appearance of stock titles is quite satisfactory, as is the graph scaling the program provides.

It is important for you to keep close track of the order in which the program requests data in a multigroup plot. In Fig. 1, I entered all the data for Period 1 (1981) first, followed by everything for Periods 2 and 3, in the same group order. You can imagine the confusion if things get out of sequence at this point!

The program documentation gives rules of thumb for setting the size of a key chart. If there is a lot of empty space on the primary graph, you can locate a key somewhere within it. If there isn't enough empty space, and you must locate the key outside the primary, as in Fig. 1, then it's necessary to put the lower left corner of one or both charts at some superscreen coordinate other than the origin.

Line Charts

Figure 2 is a four-group line chart in which data-point sizes identify the group members. I gave the XYZ company a point size of 0. QED, PDQ, and RFP get 1, 2, and 3, respectively. Nine is the largest available size, and you can use up to four colors to further distinguish between groups. You
can also color and texture connecting lines. Note that the key chart in Fig. 2 is in a very different position from the one in Fig. 1.

Pie Charts

Figure 3 illustrates a pie chart using the 1983 data from Fig. 1. I had to re-enter the data by hand; Disk Graphics lacks any simple provision for transferring data from file to file. However, the pie-chart option does calculate percentages from the raw data, but Disk Graphics does not compute averages nor any other statistical factor.

Point Charts

Point charts or scattergrams frequently contain a lot of information, and the Disk Graphics manual contains a program to help you produce the data. It’s worth studying as an illustration of how to concatenate numerical data into strings for a chart-definition file.

Other than that, point chart setup is similar to the definition of line or bar charts. You plot one variable against another, and you can use point size or color to distinguish between data groups. In this case, though, the scalelines option produces both horizontal and vertical scales to make a chart appear as if it’s been drawn on graph paper.

Evaluation

Disk Graphics is a fairly complex program that repays whatever effort you put into it. In general, you can expect to be generating professional-looking graphs in fairly short order.

I do wish the manual were better, though. It’s 86 pages long, but devotes an awful lot of space to literal, keystroke-by-keystroke instructions for generating sample charts. These might be all right if they were accompanied by a little more description of what all the options mean.

The author apparently assumed that someone wanting to make, say, a pie chart, would read only the appropriate section of the book; maybe that’s why so much of it is on the same spoon-feeding level.

Still, I think that an expanded section on interfacing Disk Graphics to other programs would be extremely valuable. As it stands, the manual presents the Basic program for /DEF file generation without comment, leaving you to work through it unaccompanied. Fixing this up, and perhaps modifying the program to handle a greater variety and range of numerical data, could give Radio Shack a real winner.

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Physics

Dorsett Educational Systems Inc.
Box 1226
Norman, OK 73070
16K, Extended Color Basic
$4.40, cassette program
$59, 16-program set
(8 cassettes in vinyl album)
by W.C. Banta

At $59, this package is a bargain. It’s a series of physics lessons in which a well-practiced, tape-recorded male voice narrates the instruction, visually accompanied by picture and text illustrations of key concepts.

I liked the attractive, upper- and lowercase graphics letters. Almost every time a new screen comes up, the letters appear at different places—nice for variety and important for keeping up interest. There are two dozen or so screens on each side of the 16 tapes, so it takes a few hours to make your way through the whole course sequence.

Each screen comes up with an interesting, colorful, and generally appropriate display. When the subject is negative acceleration, the program shows a car accelerating up and down a hill. An animated Newton swings a weight on the end of a string to discuss rotational forces. Einstein’s familiar face appears next to his equations. Bullets shoot from guns, and yoyos move up and down. Even the static graphics are interesting.

High-quality sound is one advantage that cassettes have over disks. In this case, a professional-sounding voice plays through the TV speaker, explains the physics concepts, and asks you questions about the lesson.

No animation appears when the voice is speaking, so the lesson loses some chances for interesting effects and examples. The motor and audio can function while the CoCo is at work on the video, but there apparently are technical problems in timing that make it hard to bring off these effects well while the tape is running.

The lessons handle questions and answers exceptionally well. There is

![Photo 1. Physics Software Screen Display](image)
On Writing Educational Software

Eds. note—The computer is perhaps the fastest-growing medium in American education. There’s a real need for high-quality educational software that can present lesson concepts in ways that are unique to computer-aided instruction (CAI).

A computer at home or in a classroom can give individual attention to students in a way that would be difficult for the teacher. A computer can go beyond the limitations of a textbook and use attractive graphics and sound to animate and demonstrate the lesson. And, a student can interact with his computer in a way that he can’t with even the most sophisticated TV program or film.

Educational software authors should look closely at ways in which they can design their programs to most effectively use the computer’s special abilities.

Here, W.C. Banta offers a few suggestions for CAI programmers.

Computers can ask questions and keep score, so the student’s mind can’t wander as much as it can with a book. He or she has to answer questions before going on. For some reason, computers seem to present a challenge that motivates most students to do well. Young people aren’t nearly as intimidated by this new technology as older people tend to be. Students often put an energy into learning about the workings of their computer that they can’t find for more conventional subject matter.

Computers can do conditional things—they can respond differently to different input, so with a little imagination, CAI can adapt to the needs of individual students. A good programmer can arrange it so that students who pick up the subject matter easily can move along quickly, while those who have difficulty can get all the patient instruction they need.

A good program can ask the student to provide the data to make predictions or do calculations. As an example, here are some ideas a programmer might use in a physics package:

- Instead of asking the student to continue using the same old variables for an equation, the program could generate new variables each time. For example, a random-number generator might produce different values for the wave length of light in a diffraction problem.

- Sometimes, ask the student to provide the variables for the problem. Let the student see the equation for the velocity of an object falling freely for n seconds, then ask him or her to specify the weights of two different objects.

The program could compute and display the velocities of the two objects and show that weight doesn’t matter—they fall at the same rate. Show the steps in the computation. Students remember things better if they take part in discovering the answer.

- Make more of a game of it than just to see how big a score you can get at the end. Follow your instincts and reward right answers with the kinds of things that you like. Give your CAI something of the flavor of video games. For example, how about a graphics display to keep score of your right answers? It might come up every few screens so you can see your progress.

Perhaps new and better screens come up when the student answers more and harder questions properly. Record the highest scorer during this session.

- Make use of the computer to make long and repetitive calculations. For example, the computer, given the initial velocity and angle of the cannon, might plot a graph for the trajectory of a cannonball.
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REVIEWS

- Electromagnetic Waves;
- Electrons and Electricity;
- Electromagnetism—AC Voltage;
- Solid State Physics—Electronics;
- The Elements and their Atoms;
- Atomic and Nuclear Energy;
- Using Nuclear Physics; and the
- Theory of Relativity.

This is good educational software. However, I have some complaints about the package. I'm sorry to bring up these gripes in a review of some very good computer-aided instruction (CAI), but the problems are more evident with good software, because you're not so concerned with the usual problems of sloppiness, inaccuracy, lack of inspiration, and so on.

Good CAI gives you a tantalizing glimpse of what good teachers and programmers could accomplish if they got together to design software that uses the computer's potential as an educational medium.

For example, I was disappointed that the Physics package didn't use sound more effectively. There was no background music, and a little would have helped keep up interest.

More important, sound would have helped illustrate some lesson points. In the tape on sound, the narrator talks about tuning forks and flutes and the purity of waves, but you never hear these sounds themselves.

Then there's the use of color. Even when the lesson describes the spectrum, it doesn't use colors to show the physical principles involved. Color simply provides entertaining graphics. This has some logic in that schools or homes without a color monitor can still use the package, but the color displays are more fun.

My third gripe is that using the program reminds me of reading a textbook. Educational software shouldn't copy any other media, least of all books. Computers have unique possibilities as educational tools, and CAI authors should use these to the best advantage.

But again, I point out the possible improvements in the Dorsett package only because it is such a good package overall. It should give other educational software authors some sound principles upon which to build.

If it's your job to teach (or learn) physics, and if you have a CoCo, you'll find few better ways to spend $59.

The objective is to help children develop and enhance their logical-thinking abilities. The Moptown series uses different adaptations of the concepts, "same/different" to accomplish this objective.

The simplest game displays one of the 16 Moppets and asks you to tell which one it is by determining if the character is tall or short, thin or fat, and so on. The next game, "Who's Different?", displays four Moppets, three of which are the same. Not only do you identify the character who's different, you also tell why. The same/different concepts in each successive game become more complex.

The Moppets in Moptown Parade are drawn with the Color Computer's graphics characters, CHR$(128)-CHR$(255). The Moppets on Moptown Hotel are in four-color, medium-resolution graphics. These three games are significantly more difficult than the games on Moptown Parade.

I decided to put the games to the test and called in my experts—aged 7, 10, and 11. They started with the easiest, and advanced when they mastered each. I discovered one weakness that was consistent in each game. The instructions were often harder to interpret than the game concept.

After I explained them, my experts had little difficulty with each game on the first disk. As we began the games on the more difficult Moptown Hotel
disk, the two younger experts began to lose interest. The 11-year-old was getting the hang of the more complicated instructions when our time expired.

I feel that younger kids will need some help playing the games until they get used to the instructions and using the computer keyboard. Recognizing the letters that signify the answers and locating them on the keyboard were factors for the 7-year-old. However, I believe the games are effective.

Technically, they are well written. I found only one bug. When the score on one of the games exceeded a certain value, it caused an out-of-string-space error. I could not get the program to crash on further attempts.

I had one minor disappointment with the medium-resolution graphics programs on the Moptown Hotel disk. The prompting questions are graphically redrawn each time they are used. (The same questions use the normal character set on the first disk.) It would have been simpler to use Extended Color Basic's GET/PUT commands to speed up these portions of the programs.

The programs effectively disable the break key, and any errant keypress does not destroy the game you're playing. The games are menu-driven so you can play repeatedly, or select other games. They are written primarily in Basic and could be modified, if desired.

The disks are not protected and Follett Library provides a means to obtain back-up copies in case the disks become damaged. It appears that all the programs could have fit on one disk, so I presume the two-disk approach is based on marketing factors.

Unless you are a skilled programmer, and want to develop your own educational games, this program package combines graphics and an enjoyable game medium in which children can learn concepts as simple as same/different, and as difficult as deductive logic.

The price charged for these programs suggests that they are primarily marketed for schools. However, the games are good enough to get a lot of use in a family or small neighborhood group.

As the Color Computer gains recognition and favor with educators, I look forward to more fun and useful programs like Moptown.

---

Photos 2 and 3. Screen Display Samples from the Dorsett Educational Software Line

### Phonics ADP, Part 1
### Reading V Development, 3-4
### Spelling
### Dorsett Educational Systems Inc.
### Box 1226
### Norman, OK 73070
### $4.40, cassette program
### $59, 16-program set (8 cassettes in vinyl album)

by John Steiner

Dorsett Educational Systems has a series of courses for the elementary-school classroom or home use. The series uses the Talk/Tutor system to introduce concepts and drill and practice them.

The Talk/Tutor system is cassette based and makes use of the CoCo's ability to send cassette audio through the TV or monitor speaker.

After you load a driver program from the first cassette in the series, the software controls the cassette recorder, which you must keep in the play mode.

A narrator tells a story or gives information to the student. He then asks a question about the material, and the student must type in his response. The program series is not disk compatible, so you must detach the disk drive.

I have reviewed three different courses: Spelling, Phonics, and Reading Development. All three series are well designed, and produced with attention to detail. The packages were obviously written by people who are familiar with the principles of elementary education.

Though the programs are priced individually, they are really written as a series, and are probably best purchased as a set. Each set contains eight cassettes, with a program on each side.

These programs are not games, but tutorials. Since they are not overly exciting, some students might have motivation problems. Those programs that followed a story line were more interesting to watch than those that just displayed one or two pages of information before asking a question.

### Phonics

Phonics is the study of word construction. Dorsett's Phonics programs provide complete descriptions of consonants, vowels, sight words, two-letter sounds, and final sounds.

The program display is in PMODE 4, color set 0, which means the text has high-resolution graphics illustrations. The green-on-black color set makes the monitor look like a green screen monitor.

There is no use of color, but the high-resolution screen displays upper- and lowercase characters. The program automatically puts the computer into lowercase, and requires capitals for the beginning of sentences and proper names.

The program gives the student information audibly and asks a question to which he must respond before he continues. Most questions are multiple choice and allow two or three options.
The narrator gives positive reinforcement for a correct answer, and an incorrect response brings a low, short-duration tone and a new screen. Most of the time, the screen provides the correct answer. In cases where there are only two choices, the program indicates only that the choice was wrong. This immediate reinforcement is essential to the learning process.

The narrator speaks clearly, and is not condescending. His delivery is professional, which adds to the quality of the programs.

**Spelling**

The Spelling course teaches plurals, suffixes, homonyms, spelling by syllables, and doubling consonants. Since there are only two choices, the process.

Spelling lists into these programs, they are probably best used in remedial or tutorial applications. The programs do an excellent job of explaining the rules of spelling.

As in the phonics program, Spelling uses PMODE 4 to display the written information. Characters within words can be enlarged and emphasized using the high-resolution graphics. For example, the student is asked to make the word "fox" plural by typing the appropriate characters. After he has typed the letters and pressed enter, the program emphasizes the correct letters by enlarging them on the CRT.

**Reading Development**

The Reading Development program uses low-resolution text screen and character graphics for display. Inventive characters illustrate the CoCo’s power of effective color use in teaching.

The program uses both text and graphics characters to build its drawings. It creates a person using a color-grids block for a body, an O or Q for a head, forward and back slashes for arms, and any combination of <, >, \, /, and / for legs. One of my favorite objects drawn with this technique is the sky diver. The program uses animation sparingly, when it can assist in making a point.

Reading Development stresses vocabulary with new words usually worked into a story or a string of separate but somehow related events. It defines a new word and gives the student a chance to use it.

As in all the other programs, an incorrect response provides a correction and low audio tone. If the lesson asks him to type in a word and he does it incorrectly, it gives him the correct spelling and a chance to answer again.

Because the program uses the text screen, it can’t display lowercase letters; therefore, all work in this series is in uppercase. This can be a disadvantage in your situation, though the series stresses vocabulary rather than spelling.

**The Package**

A teacher could easily use these programs in the elementary classroom given enough equipment. The audio tracks require headphones, and it would be difficult for more than one student to use the program at the same time.

The end of each lesson reviews all the important concepts. When that is completed, a message screen appears telling how many questions were asked and how well the student responded.

No documentation describing any philosophy or methodology came with the review copies of the software. However, a quick review of the programs revealed that you really don’t need it. Teachers interested in using these packages should have no trouble integrating them into the curriculum.

The software seems completely error-trapped. I could find no way to hang up the program, short of pressing the break key or reset. Break causes the program to prompt to start a new lesson. If you press any key without installing a new tape, the program continues from where it left off.

Pressing the reset button causes program execution to stop completely. Typing "EXEC" causes program execution to continue.

If you try to load the programs without first executing 1/0 error. Each tape in the M200 series has the loader on it, while the M400 series has the loader at the beginning of programs one and nine.

I could find only one problem with this series. When the student chooses a wrong answer, the screen usually displays an incorrect answer page. There is no screen prompt telling the student to press any key to continue. Several students who tried the program waited for the program to continue, until the instructor prompted them to press a key.

Dorsett is respected in the educational-software market, and these packages illustrate the reasons. Schools that use the Color Computer in the elementary grades should consider Dorsett’s material. They have done an excellent job of capitalizing on the advantages of the CoCo.

---

**Panic Button**

*First Star Software*  
22 E. 41st St.  
New York, NY 10017  
16K, Extended Color Basic, 1 joystick  
$24.95, cassette  
$39.95, ROM pack

by Robert Codyer

If you’ve ever worked on an assembly line, you know the pressures of maintaining a strict pace while making few mistakes. If you haven’t had such a job, then Panic Button gives you a feel for assembly work.

The object of Panic Button is to fill an order for certain items, such as robots, cakes, houses, telephones, televisions, and lamps.

The screen displays the assembly line with three conveyor belts, some flat shelves on which you can store parts, a panic button that temporarily stops the conveyor belts, and a worker that you control with the joystick. Also, the screen includes a timer and a scoreboard that shows the number of units you must build, the number completed, your current score, and your high score.

On level one, a robot’s head, torso, and legs drop onto the top conveyor belt. Position your worker next to a part and press the joystick button to pick it up. To drop a part, press the joystick button again. You must stack the parts on top of each other in the correct order.
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RUN • Box 954 • Farmingdale, NY 11737
When you complete each robot, the belts take it to the bottom of the screen. You must continue to build robots until you fill the order or you run out of time.

Sometimes the robot parts drop together in the correct order. The pieces might also fall together in incorrect order, and once they're assembled, you can't separate them.

If you can't keep up with it all, press the panic button to stop the conveyor belts for a short time so you can assemble what is already on the screen. At the end of that time the angry face of your boss appears on the panic button, and the conveyor belts start rolling again.

If you haven't filled the order before the time runs out, "You're Fired!" appears on the screen. If you have filled the order in time, you can move on to the next level of difficulty.

At each level, the number of items to build increases by one. Parts also begin dropping from different areas of the screen. Rather than wait for parts to come along the conveyor belts to you, you must pursue the parts to complete the order.

Regardless of the skill level, you get two minutes to fill each order. And to complicate things even further, parts you don't use start flying around. These parts don't interfere with the assembly operation, but you'll lose your concentration.

As a break in the game, after you've finished the order for cakes, you're given the chance to toss a cake into the boss' face. Neat-o!

I thought Panic Button was a fun, provocative, and challenging game. It requires concentration and quick reflexes. Panic Button is First Star Software's first Color Computer game. I hope it won't be their last.

---

Mudpies

Computer Shack
1691 Eason
Pontiac, MI 48054
32K, Extended Color Basic, joystick
$27.95, cassette
$29.95, disk

by Mark E. Reynolds
HOT CoCo staff

And now, ladies and gentlemen, in the center ring... hey! What's that kid doing out there? Someone stop him before he throws that mudpie!

Twelve-year old Arnold has sneaked into the circus. But no sooner does he step inside when the clowns are on to him. They come swarming from the doors around the room and maneuver to catch him.

But Arnold sees lots of mudpies lying around (you sure that stuff's mud? Weren't the elephants just in here?) and starts a rapid-fire assault against his pursuers.

In this delightful game, a clever embellishment of the idea behind the arcade game Berserk, you must move Arnold through four different rooms, picking up mudpies and collecting points by hitting clowns with them.

Avoid the clowns and the juggling dumbbells they throw, grab an occasional meal from the junk food lying around, and run through the only open door before an accident gets you a trip to the infirmary.

You get from 100-800 points for hitting a clown. When they move into a tight group, you can hit several with one pie. Earn 10,000 points and add an extra Arnold to your reserve, plus a try at the Mudslinger Round, in which you work against the clock to hit as many clowns as possible.

On the right side of the screen is a gauge showing Arnold's hunger level. If it drops too low, Arnold slows down, but you can perk him up by getting him to some of the junk food in the room. But be careful—don't let him eat too much.

Over the past two months or so, I've seen some excellent new Color Computer games. The graphics in Mudpies might lack the sophistication of some, but for sheer playability, this game has no equal.
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See List of Advertisers on page 130

HOT CoCo February 1984 45
Readers seem to be particularly intrigued with codes, and with the idea of hiding a meaningful communication within an innocent-looking message. Among the many ways to send a message in simple substitution cipher and yet make the message difficult to detect and decode is to focus attention elsewhere.

Misdirection is the secret to a magician's stage success. The left hand performs the switch while the audience's attention is drawn to his right. Poe's classic story, "The Purloined Letter," reveals how someone hid an important document by simply placing it in plain sight among a batch of letters between bookends on a writing desk.

The CoCo can help you disguise your messages in this way.

Take special note of the spacings between words in the paragraphs on this page. Seen at a glance, word spacings seem to occur at random, though they have a definite, rhythmic pattern. Word spacings can be as distinctive as an author's style. If you were to hide a plaintext message within any particular paragraph, you would have to maintain the rhythm of the spacings and the choice of words as camouflage.

Glance at Fig. 1, taking in the whole paragraph and its general appearance. At first, it appears to be a closely packed paragraph in cipher. The spacings resemble those of the
plaintext on this page; though, in looking more closely, you will note that there are no double spaces, such as would occur between sentences. Still, that’s not at all unusual in a cryptogram. But why are there so many single letters? This is a departure from ordinary plaintext.

In simple substitution or transposition, the letter relationships, though altered, remain quite close to those occurring in plaintext. But count the number of times each letter is used in the first five lines of Fig. 1.

These totals are unusually similar, while in plaintext they vary markedly. You might suspect then that this is a sophisticated cipher indeed, or perhaps a sample of pseudorandomness.

The latter assumption is correct. Every letter in Fig. 1 was produced with the RND(X) function of the CoCo. I altered the random word spacings to make them more like those with which Fig. 2 is produced every line in Fig. 1.

Now look carefully at Fig. 2. Test it for randomness by counting the number of times each letter is used in a few lines—say the first five again. Quite similar? It should be, because the same program produced the first few lines of both examples. In fact, the same program produced every line in Fig. 2, although I introduced a subtle refinement beginning in the seventh line.

With this clue, can you detect any variation in the rest of the lines that

Daniel Gaughan’s program demonstrates an analytical approach to solving the November cryptograms.
Note that this cryptogram retains one of the prime requirements for cipher messages: It is easily reduced to plain-text by the intended receiver, who is privy to its particulars. I bet that you can come up with a suitable program to perform this little bit of stage business, so I'll leave my version for a later issue of HOT CoCo.

Daniel J. Gaughan of Westfield, MA sent this month's Program Listing—the first that successfully cracks the cryptograms on p. 77 of the November '83 HOT CoCo. As he explains: “My program takes the length of ... C$, divides by two, and rounds up if the number is uneven. L1 becomes the length of the message. Lines 150-170 reverse the left half of C$. Lines 180-200 do the same for the right half. Lines 220-240 print alternate characters from the right and left halves. Lines 270-290 then print the alternate characters from the left and then the right.”

Mr. Gaughan mentioned that it is necessary to insert line 145, L1 = L2, to correct a slight letter mixup caused by dividing lines with an odd number of letters in two of the cryptograms. Actually, when a solution comes out as closely as did those of his program, there is no need to carry debugging any further. The important thing is that the program decipher the message.

Figure 3 is a printout of his program's output.

Ellen Mayo of West Hampton Beach, NY, wrote an 18-line program that runs equally well. She included an "odd-determining" sequence in her line-dividing routine that eliminates the bug experienced by Mr. Gaughan. The variables used are germane to her program, but adapting the function to Mr. Gaughan's program should present little or no difficulty:

```
170 IF D/2<>INT(D/2) THEN L = (D+1)/2 ELSE L = D/2
```

Another cryptopuzzle, using techniques similar to those of the old wizard and his stars, is in the debugging stage. Another, using color in the encryption process, might carry a prize or two for successful decryption. So sharpen your cryptowits; there's more on the way.

Write to Karl Andreassen at 24750 Chianti Road, Clevelder, CA 95423.
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I GOT THE (BIO)RHYTHM

The theory of biorhythms is simple. From birth to death each of us is influenced by three internal cycles: a physical cycle, an emotional cycle, and an intellectual cycle. Our most vulnerable times are called Lows. Highs are the times we are at our peak, and Criticals are the cross-over days when we are most susceptible to problems.

Good times, bad times! Calculate your ups and downs with this special CoCo biorhythm program.

While there are many biorhythm programs on the market, most come in the form of a plotted graph. I wrote this version because I wanted one that I could use in calendar form. With 16K there isn't much space left after entering the program, but I've had no problem with overflow.

Biorhythm II provides you with information to help you anticipate the up and down cycles of your life. With this information you can, in anticipation of an event, compensate for or avoid an unpleasant situation. Conversely, you can accomplish a specific goal by taking advantage of an anticipated High.

The formula used for the actual biorhythm calculation comes from *55 Advanced Computer Programs in Basic*, by William Scott Watson.

<table>
<thead>
<tr>
<th>Table 1. Calendar Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Load Tape—LOAD &quot;BIO&quot;</td>
</tr>
<tr>
<td>b) RUN</td>
</tr>
<tr>
<td>c) Credit page</td>
</tr>
<tr>
<td>d) Color page</td>
</tr>
<tr>
<td>e) Birth month</td>
</tr>
<tr>
<td>f) Day of birth</td>
</tr>
<tr>
<td>g) Birth year</td>
</tr>
<tr>
<td>h) Birth time</td>
</tr>
<tr>
<td>i) If unknown, enter 12 a.m.</td>
</tr>
<tr>
<td>j) Biorhythm start</td>
</tr>
<tr>
<td>(C = Conception, B = Birth)</td>
</tr>
<tr>
<td>k) Reading day*</td>
</tr>
<tr>
<td>l) Reading year*</td>
</tr>
<tr>
<td>m) Computing biorhythm</td>
</tr>
<tr>
<td>n) Physical calendar</td>
</tr>
<tr>
<td>o) Sensitivity calendar</td>
</tr>
<tr>
<td>p) Intellectual calendar</td>
</tr>
<tr>
<td>q) Critical calendar</td>
</tr>
<tr>
<td>r) Biograph</td>
</tr>
<tr>
<td>s) Restart at credit page</td>
</tr>
<tr>
<td>t) Biograph</td>
</tr>
<tr>
<td>(As requested in k)</td>
</tr>
<tr>
<td>u) Restart at credit page</td>
</tr>
</tbody>
</table>

System Requirements

16K RAM
Extended Color Basic
Program Listing. Biorhythm for CoCo

10 ' BIORHYTHM FOR CC
20 CLEAR100
25 DIMA(12),D(12),N(25),P5(31),S5(31),C5(31),P1(31),E(60)
26 RESTORE
27 FORI=1TO12:READA(I):NEXTI
28 FORI=1TO12:READD(I):NEXTI
29 FORI=1TO31:READ P1(I):NEXTI
30 DATA 0,31,59,90,120,151,181,2
31,243,273,304,334
32 DATA 31,28,31,30,31,30,31,31,30,31,31
33 DATA 31,28,31,30,31,30,31,31,30,31,31
35 T2=12:V=0:CLS
37 DATA 1056,1060,1064,1068,1072,
1076,1080,1152,1156,1160,1164,1
168,1172,1176,1248,1252,1256,126
0,1264,1268,1272,1344,1348,1352,
1356,1360,1364,1368,1440,1444,14
48 P=6.28318:N=0
40 PRINT@11."BIORHYTHM"
45 PRINT"CREATIVE ENGINEERING,AS
SOC 1983";PRINT;PRINT" HIT < @
> TO CONTINUE TO NEXT PAGE TH
ROUGHOUT OPERATION"
48 K4$=INKEY$:IFK4$=CHR$(64)THEN
200ELSE48
200 CLS
210 PRINT@7."BIORHYTHM COLORS"
220 PRINT@32."PHYSICAL LOW"
230 PRINT@64."SENSITIVITY LOW"
240 PRINT@96."INTELLIGENCE LOW"
250 PRINT@160."PHYSICAL HIGH"
260 PRINT@192,"SENSITIVITY HIGH"
270 PRINT@224,"INTELLIGENCE HIGH"
280 PRINT@288,"PHYSICAL CRITICAL"
290 PRINT@320,"SENSITIVITY CRITI
CAL"
300 PRINT@352,"INTELLIGENCE CRIT
ICAL"
310 PRINT@384,"DOUBLE CRITICAL"
320 PRINT@416,"TRIPLE CRITICAL"
330 PRINT@448,"NOTE-LOW=BL,HIGH=
OR,CRITICAL=RD"
340 POKE1082,80:POKE1114,83:POKE
1146,73
350 POKE1084,175:POKE1116,175:PO
KE1148,175
360 POKE1210,80:POKE1242,83:POKE
1274,73
370 POKE1212,255:POKE1244,255:PO
KE1276,255
380 POKE1338,80:POKE1370,83:POKE
1402,73
390 POKE1340,191:POKE1372,191:PO
KE1404,191
400 POKE1434,80:POKE1435,83:POKE
1436,191
410 POKE1466,191:POKE1467,191:PO
KE1468,191
420 POKE1027,175:POKE1028,255:PO
KE1029,191
430 POKE1048,191:POKE1049,255:PO
KE1050,175
440 POKE1504,131:POKE1505,131:PO
KE1506,131:POKE1507,131:POKE1481

The Program

Lines 27-37 read the data for the days
of the month. Lines 200-450 set up the
first screen identifying the color coding
used on the calendar. Lines 460-580 are
your inputs. Lines 1120-1670 set up the
calendar outline. (See Table 1.)

Lines 1990-2270 set up the bar chart,
or biograph, as the last page, and use a
combination of the data calculated for
the biorhythm. The balance of the pro­
gram is used for calculations of bio­
rhythm. Lines 580 and 1680 are error
traps. If the year input for reading is less
than the birth date, you must start
again.

For more information on biorhythms,
consult The Complete Book of Bio­
rhythm Life Cycles, by Dr. Robert E.
Smith, Aardvark Publishers Inc.

Address correspondence to A. Wall­
lace Smock, Creative Engineering Asso­
ciation, P. O. Box 26352, Trotwood,
OH 45426.

Photo. Intellectual Cycle Screen Display
Listing continued

175:POKE1482,175:POKE1489,255:P
OKE1490,255:POKE1501,191:POKE150
2,191
450 K5$=INKEY$:IFK5$=CHR$(64)THE
N460ELSE450
460 CLS;PRINT@8,"ENTER BIRTH DAT
E";PRINT
470 INPUT"MONTH(1-12)";M:AB=M
480 INPUT"DAY(1-31)";D:AC=D:D=D+
1
490 INPUT" YEAR OF BIRTH(****)";Y :
AD=Y
500 INPUT" TIME OF BIRTH-HR.,AM/P
M";T$:T$=VAL(T$)
510 IF RIGHT$(T$,2)="AM" THEN T$=
S=T$:T$=VAL(T$)
520 IF RIGHT$(T$,2)="PM" THEN GOS
UB1100
530 INPUT"BIORHYTHM TO START AT
CONCEPTION OR BIRTH <C> OR <B>";
C$;IFS$="C"THENB1=-6720 ELSEB1=0
540 GOSUB1690;Z= T3
550 PRINT@291,"MONTH AND YEAR OF
READIN G";PRINT
560 INPUT" MONTH (1-12)";M:M1=M
570 INPUT"DAY (1-31)";D2:IF D2 >D (M
1) THEN26
580 INPUT" YEAR (***)";Y:Y1$=STR.
$(Y):IF Y< AD THEN1680
590 CLS;PRINT"COMPUTING YOUR BIO
RHYTHM....."
600 GOSUB1690
610 V1=Z-T3:V1=ABS(V1):V2=INT((V
1*24)+(T1)-(B1)):V=ABS(V2/24)+(D
(M1)-AC):V=INT(V)
620 V=V-D(M1)
630 FORI=1TO D(M1):V=V+1:J1=J1+1
640 X=23:GOSUB1890:P5(I)=X1:X=28
;GOSUB1890:S5(I)=X1:X=33:GOSUB18
90:C5(I)=X1
650 NEXT I
660 FORI=1TO D(M1)
670 IFI=D2 THENGOSUB1980
680 NEXTI
690 N=1:GOSUB1110
700 FORI=1TO D(M1)
710 IFP5(I)=61THEN GOSUB900
720 IFP5(I)=26THEN GOSUB910
730 IFP5(I)=44 OR P5(I)=46THEN G
OSUB920
740 NEXTI
750 K$=INKEY$:IFK$=CHR$(64)THEN7
60ELSE750
760 N=2:GOSUB1110
770 FORI=1TO D(M1)
780 IFS5(I)>61THEN GOSUB930
790 IFS5(I)=26THEN GOSUB940
800 IFS5(I)=44 OR S5(I)=46 THEN
GOSUB950
810 NEXTI
820 K1$=INKEY$:IFK1$=CHR$(64)THE
N830ELSE820
830 N=3:GOSUB1110
840 FORI=1TO D(M1)
850 IFC5(I)=61THEN GOSUB960
860 IFC5(I)=26THEN GOSUB970
870 IF C5(I)=44 OR C5(I)=45THEN G
OSUB980:NEXTI
880 NEXTI
890 K2$=INKEY$:IFK2$=CHR$(64)THE
N100ELSE990
900 C=255:L=80:GOSUB990:C=0:L=0:
RETURN
910 C=175:L=80:GOSUB990:C=0:L=0:
RETURN
920 C=191:L=80:GOSUB990:C=0:L=0:
RETURN
930 C=255:L=83:GOSUB990:C=0:L=0:
RETURN
940 C=175:L=83:GOSUB990:C=0:L=0:
RETURN
950 C=191:L=83:GOSUB990:C=0:L=0:
RETURN
960 C=255:L=73:GOSUB990:C=0:L=0:
RETURN
970 C=175:L=73:GOSUB990:C=0:L=0:
RETURN
980 C=191:L=73:GOSUB990:C=0:L=0:
RETURN
990 POKEP1(I),L;POKEP1(I)+2,C:
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The 96KX is a plug in cartridge that allows use of all 64K of RAM for 64K Computers. An output connector is included for Disk Drives, Cartridges, or other accessories. Powerful permanent software allows exchanging information in PAGE 0 & PAGE 1, moving blocks of data in either page or from one page to another, writing or reviewing data or characters in memory, editing BASIC programs with errors, changing any statement number, storing HEX or DECIMAL Values in Memory, and much more. The 96KX has a ROM that occupies the upper 8K of memory to be used as a true 96K Computer with 32K of ROM and 64K of RAM. The 96KX Software is always available as a HELP program and can be called with a simple keyboard command. Also included is a hardware interrupt switch for running ML programs or accessing the cartridge when the computer fails to function properly. Expand your computer now with a 96KX for only $89.95.

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EµSE 1 S30 0: RETURN
1S20 DRAW#2 9-3 0 1920 C= l9l :L =73 :G OSUB 1960 :C =0 :L =
POKE 1472,S0 :POKE 1473 ,S7 :POKE 1477,48:RETURN
1S30 0: RETURN
1S40 DRAW#2 9-31
1S50 POKE 1472, S0: POKE 1473, S7: POKE 1477, 48: RETURN
1S60 POKE 1149, 74: POKE 1181, 65: RETURN
1S70 POKE 1149, 70: POKE 1181, 69: POKE 1121, 66: RETURN
1S80 POKE 1149, 77: POKE 1181, 6S: RETURN
1S90 POKE 1149, 6S: POKE 1181, 80: RETURN
1600 POKE 1149, 77: POKE 1181, 65: RETURN
1610 POKE 1149, 74: POKE 1181, 85: RETURN
1620 POKE 1149, 6S: POKE 1181, 89: RETURN
1630 POKE 1149, 74: POKE 1181, 83: RETURN
1640 POKE 1149, 6S: POKE 1181, 88: RETURN
1650 POKE 1149, 79: POKE 1181, 67: RETURN
1660 POKE 1149, 78: POKE 1181, 79: RETURN
1670 POKE 1149, 68: POKE 1181, 69: RETURN
1680 CLS: PRINT"READING CANNOT BE
BEFORE BIRTH DATE, HIT @ TO STAR
T AGAIN": INPUTA$: IF A$= CHR$(64)
THEN26
1690 Y2=0: Y3=0: Y4=0: Y5=0: T3=0: J=
0:Y2=Y-1800
Y5=INT((Y2+200)/400)
1710 K=0
1720 IFY3*4=Y2 THEN1740
1730 GOTO1790
1740 IFY4*100=Y2 THEN1760
1750 GOTO1790
1760 IF Y5*400-200=Y2 THEN1790
1770 GOTO1790
1780 K=1
1790 T3=365*Y2+Y3-Y4+Y5-K
1800 T3=T3+A(M)+D-1
1810 IFM<THEN1830
1820 T3=T3+K
1830 IF INT(Y2/4)=Y2/4THEN1850
1840 GOTO1870
1850 IFM>2THEN1870
1860 T3=T3-1
1870 J=T3-7*INT(T3/7)
1880 RETURN
1890 X1=INT(SIN((V/X-INT(V/X))*P
)*18)+44:RETURN
1900 C=191:i=L=80:GOSUB1940:C=0:L=
0:RETURN
1910 C=191:i=L=83:GOSUB1950:C=0:L=
0:RETURN
1920 C=191:L=73:GOSUB1960:C=0:L=
0:RETURN
1930 C=191:GOSUB1970:C=0:RETURN
1940 POKE P1(I),L:POKE P1(I)+34,
C:RETURN
1950 POKE P1(I)+1,L:POKE P1(I)+3
4,C:RETURN
1960 POKE P1(I)+2,L:POKEP1(I)+34
,C:RETURN
1970 POKE P1(I),C:POKE P1(I)+1,C:
POKE P1(I)+2,C:RETURN
1980 R=(S5(I)/10):R=INT(R):C6=(C
5(I)/10):C6=INT(C6):H=(P5(I)/10):
H=INT(H):S=(P5(I)+S5(I))/10:S=S
/2:S=INT(S):D5=(P5(I)+C5(I))/10:
D5=D5/2:D5=INT(D5):F=(S5(I)+C5(I))
)/10:F=F/2:F=INT(F):RETURN
1990 CLS: PRINT97,"HIGH",
2000 PRINT@225, "GOOD",
2010 PRINT@354,"LOW",
2020 PRINT@87, "ROMANCE",
2030 PRINT@119, "CREATIVE",
2040 PRINT@151, "HEALTH",
2050 PRINT@183, "SEX",
2060 PRINT@215, "DRIVE",
2070 PRINT@247, "FRIENDLY",
2080 PRINT@422, "R",
2090 PRINT@425, "C",
2100 PRINT@428, "H",
2110 PRINT@431, "S",
2120 PRINT@434, "D",
2130 PRINT@437, "F"
2140 PRINT@451, "BIOGRAPH FOR "
2150 FORL=1381TO1398
2160 POKE ,140
2170 NEXT T
2180 FORI=1TO60:READE(I):NEXTI
2190 DATA 1382,1350,1318,1286,12
54,1222,1190,1158,1126,1094,1385
1353,1321,1289,1257,1225,1193,13
161,1129,1097,1388,1356,1324,129
2,1260,1228,1196,1164,1132,1100
2200 DATA 1391,1359,1327,1295,12
63,1231,1199,1167,1135,1103,1394
1362,1330,1298,1266,1234,1202,1
170,1138,1106,1397,1365,1333,13
1,1269,1237,1205,1173,1141,1109
2210 FORI=1TOR:POKE(I),128:NEXTI
2220 FORI=1TOC6+11:POKE(I),128
:NEXTI
2230 FORI=21TO H+21:POKE(I),128
:NEXTI
2240 FORI=31TOS+31:POKE(I),128
:NEXTI
2250 FORI=41TOD5+41:POKE(I),128
:NEXTI
2260 FORI=51TOF+50:POKE(I),128
:NEXTI
2270 K7$=INKEY$: IF K7$=CHR$(64) TH
EN 26ELSE2270

END
Circuit Drawer is a computer-aided design (CAD) program that can assist a hobbyist in the design of many different solid-state electronics projects, including circuits. My program allows you to draw circuits on two high-resolution screens, create a parts list, and save both on tape or disk. Also, if you have access to a printer with dot-addressable graphics, you can print out your circuit design.

**Using Circuit Drawer**

CLOAD and run Circuit Drawer. If the program doesn't execute the first time, just run it again and you should see a black screen with a line near the top. The space above this line displays messages and prompts and, on the far right, the page number, which should be one when you first execute the program. There should also be a flashing cursor, in the form of a dot, in the center of the screen.

You move the cursor with the four arrow keys and the number keys 1-4. The arrows move the cursor in increments of five pixels, while the 1, 2, 3, and 4 keys move the cursor up, right, down, and left, in increments of one pixel. You have continuous movement since these keys are scanned with PEEK. Move diagonally by holding down two keys simultaneously. For example, hold the right and up arrows and the cursor moves towards the upper-right corner of the screen. The cursor also has wrap-around, so when it reaches any edge of the screen it appears on the opposite edge. This feature helps speed movements.

**Commands**

Hitting the enter key sounds a tone and leaves a point behind as you move the cursor away. The program lets you enter 20 of these points, but if you need more, change the DIM X(n), Y(n) in the beginning of the program. The points you leave behind on the screen are used in the first six commands.

- **Draw Line:** When you hit D, the program draws a line between all the points left on the screen.
- **Erase Line:** Hitting E draws a black line between all the points, erasing everything along the line.
- **Erase Block:** With the cursor and the enter key, choose opposing corners of a block and press B. Everything within the corners of the block is erased. You can enter the corners of several different blocks, and all the blocks within them are erased.
- **Move:** To move anything on the screen, enter the corners of the block that contains what you want to move. Then pick one corner of where you want to move the block and press M. This corner should be in the same relative position as the first corner on the original block. If you pick a place too close to the edge of the screen, a warning sounds and an error message appears at the top of the screen. Otherwise, the computer erases the original block and places it in its new block.
- **Replicate:** Press R to copy a block from one place to another. The only difference between Move and Replicate is that Replicate doesn't erase the original block. Both Move and Replicate accept only three points, so if you chose more than three points, the extras are erased and remain unused.
- **Circle:** To draw a circle on the screen, choose two points, the first at the center of the circle and the second where you want to draw the edge of the circle. Hit A.
- **Quit:** If you make a mistake in placing one of your points, or want to make a change, press Q. All the points you entered are erased and the cursor moves back to its initial position.
- **Component Placement:** Move the

**System Requirements**

- **32K RAM**
- Extended or Disk Color Basic
- Dot-Matrix Printer (optional)

---

Hobbyists—this computer-aided design program is great for solid-state electronics projects.

---

**Fig. 1. Sample Printout Created Using Circuit Drawer Complete with Parts List.**
cursor to the place where you want a component and hit C for a list of the first 10 components. If you press 2, the program shows you the next eight components. Repeatedly hitting the 2 switches you back and forth between the two component pages. Pressing I allows you to enter a part number. If you choose 18, an IC, it asks you to input the desired number of pins and, since the computer draws a dual inline package IC, you must enter an even number. After entering a part number, enter the direction in which you want the component drawn by pressing one of the arrow keys. The program draws the part and returns to the hi-res screen. If at any point you want to get out of this routine, enter Q.

Parts List Management: To create or edit a parts list for your circuit, press P

---

**Program Listing. Circuit Drawer**

```
70 CLS: IP=CLEAR: CLEAR2000: DIMAS$(59),PS(10),C(200),X(20),Y(20)
80 FORI=1 TO 5: READAS$(1): NEXT
90 ES="255ABABABAB"$=CHR$(128): IF$="": SC=1: X=1:28: Y=96
100 PMODE4: PCLS: LINE(0,12)-(25,5,12), PSET: DRAW BM249, 10*ASS(18)
110 PMODE4: PCLS: LINE(0,12)-(25,5,12), PSET: DRAW BM249, 10*ASS(19)
120 IFPP=THENPRESET(X,Y) ELSEPSET: NEXT: N=0: RETURN
130 IFPEEK(341)=247 THENPP=PPOINT
140 IFPEEK(342)=247 THENPP=PPOINT
150 IFPEEK(343)=247 THENPP=PPOINT
160 IFPEEK(344)=247 THENPP=PPOINT
170 IFPEEK(339)=247 THENPP=PPOINT
180 IFPEEK(341)=247 THENPP=PPOINT
190 IFPEEK(342)=247 THENPP=PPOINT
200 IFPEEK(343)=247 THENPP=PPOINT
210 IFY<15 THENY=190 ELSEY=190: NEXT
220 IFX<5 THENX=249: ELSEIFX>249 THE
230 IFX>249 THENY=190 ELSEY=190: NEXT
240 IS=INKEYS
250 IFP=CHR$(13) THENSOUND50,1,X
260 IFP=CHR$(13) THENSOUND50,1,X
270 IFP=CHR$(13) THENSOUND50,1,X
280 IFP=CHR$(13) THENSOUND50,1,X
290 IFP=CHR$(13) THENSOUND50,1,X
300 IFP=CHR$(13) THENSOUND50,1,X
310 IFP=CHR$(13) THENSOUND50,1,X
320 IFP=CHR$(13) THENSOUND50,1,X
330 IFP=CHR$(13) THENSOUND50,1,X
340 IFP=CHR$(13) THENSOUND50,1,X
350 IFP=CHR$(13) THENSOUND50,1,X
360 IFP=CHR$(13) THENSOUND50,1,X
370 IFP=CHR$(13) THENSOUND50,1,X
380 IFP=CHR$(13) THENSOUND50,1,X
390 IFP=CHR$(13) THENSOUND50,1,X
400 IFP=CHR$(13) THENSOUND50,1,X
410 IFP=CHR$(13) THENSOUND50,1,X
420 FORI=1 TO 5: READAS$(1): NEXT
430 FORI=1 TO 5: READAS$(1): NEXT
440 FORI=1 TO 5: READAS$(1): NEXT
450 FORI=1 TO 5: READAS$(1): NEXT
460 IF(DX+X) >249 OR (DY+Y) >1850 R(D
470 IF(DX+X) >249 OR (DY+Y) >1850 R(D
480 IF(DX+X) >249 OR (DY+Y) >1850 R(D
490 IF(DX+X) >249 OR (DY+Y) >1850 R(D
500 IF(DX+X) >249 OR (DY+Y) >1850 R(D
510 IF(DX+X) >249 OR (DY+Y) >1850 R(D
520 IF(DX+X) >249 OR (DY+Y) >1850 R(D
530 IF(DX+X) >249 OR (DY+Y) >1850 R(D
540 IF(DX+X) >249 OR (DY+Y) >1850 R(D
550 IF(DX+X) >249 OR (DY+Y) >1850 R(D
560 IF(DX+X) >249 OR (DY+Y) >1850 R(D
570 IF(DX+X) >249 OR (DY+Y) >1850 R(D
580 IF(DX+X) >249 OR (DY+Y) >1850 R(D
590 IF(DX+X) >249 OR (DY+Y) >1850 R(D
600 IF(DX+X) >249 OR (DY+Y) >1850 R(D
610 IF(DX+X) >249 OR (DY+Y) >1850 R(D
620 IF(DX+X) >249 OR (DY+Y) >1850 R(D
630 IF(DX+X) >249 OR (DY+Y) >1850 R(D
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680 IF(DX+X) >249 OR (DY+Y) >1850 R(D
690 IF(DX+X) >249 OR (DY+Y) >1850 R(D
700 IF(DX+X) >249 OR (DY+Y) >1850 R(D
710 IF(DX+X) >249 OR (DY+Y) >1850 R(D
720 IF(DX+X) >249 OR (DY+Y) >1850 R(D
730 IF(DX+X) >249 OR (DY+Y) >1850 R(D
740 IF(DX+X) >249 OR (DY+Y) >1850 R(D
750 IF(DX+X) >249 OR (DY+Y) >1850 R(D
760 IF(DX+X) >249 OR (DY+Y) >1850 R(D
770 IF(DX+X) >249 OR (DY+Y) >1850 R(D
780 IF(DX+X) >249 OR (DY+Y) >1850 R(D
790 IF(DX+X) >249 OR (DY+Y) >1850 R(D
800 IF(DX+X) >249 OR (DY+Y) >1850 R(D
810 IF(DX+X) >249 OR (DY+Y) >1850 R(D
820 IF(DX+X) >249 OR (DY+Y) >1850 R(D
830 IF(DX+X) >249 OR (DY+Y) >1850 R(D
840 IF(DX+X) >249 OR (DY+Y) >1850 R(D
850 IF(DX+X) >249 OR (DY+Y) >1850 R(D
860 IF(DX+X) >249 OR (DY+Y) >1850 R(D
870 IF(DX+X) >249 OR (DY+Y) >1850 R(D
880 IF(DX+X) >249 OR (DY+Y) >1850 R(D
890 IF(DX+X) >249 OR (DY+Y) >1850 R(D
900 IF(DX+X) >249 OR (DY+Y) >1850 R(D
910 IF(DX+X) >249 OR (DY+Y) >1850 R(D
920 IF(DX+X) >249 OR (DY+Y) >1850 R(D
930 IF(DX+X) >249 OR (DY+Y) >1850 R(D
940 IF(DX+X) >249 OR (DY+Y) >1850 R(D
950 IF(DX+X) >249 OR (DY+Y) >1850 R(D
960 IF(DX+X) >249 OR (DY+Y) >1850 R(D
970 IF(DX+X) >249 OR (DY+Y) >1850 R(D
980 IF(DX+X) >249 OR (DY+Y) >1850 R(D
990 IF(DX+X) >249 OR (DY+Y) >1850 R(D
```

Listing continues...
Start New Parts List: Press 1 to create a new parts list. You are first asked to confirm that you want to start a list. If you answer "no," the program returns to the menu. If you answer "yes," it prompts you to enter your first part and continues prompting until you answer "end," at which point you return to the menu.

Delete: When you enter 3, the program asks for the item number you want deleted. When you enter the number, it is removed from the list and you see the updated parts list. Enter M at any time to return to the menu.

Display Parts List: Enter 4 to print out the parts list. Then press S if you want a screen display or P to print out the list. The list appears on the screen showing only 10 parts at a time, so press any key to continue listing or M to return to the menu.

Quit: Enter Q to return to the hi-res screen.

Write: This subroutine uses the DRAW command to draw all the standard ASCII characters. First, move your cursor to where you want to write, enter K. The computer asks if you're sure you want to erase the screen. An answer "yes" or "no." In your list. Since the Radio Shack Screen Print routine won't work in 32K, I had to use a basic subroutine to produce the output.
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center of the symbol is the position of the cursor.

Save: Enter S to save your circuit and parts to tape or disk. First enter a file name of up to eight characters long. Anything longer is automatically truncated to eight.

Next, you must tell the computer whether to save to tape or disk by entering T or D.

For the last entry, enter 1 if you want to save only the first screen, 2 if you want to save the second screen, or B if you want to save both screens.

Make sure that your recorder is in record mode or that you have inserted a disk. The program then saves the screen(s) as a machine-language file, and the parts list and other data as a basic file. After saving is completed, enter A to make another recording or Q to return to the screen. Enter Q at any of the above inputs to return to the screen.

Load: Enter L to load a circuit diagram and parts list from tape or disk. You must enter the file name and storage medium, as with saving. Make sure that your recorder is in record mode or that you have inserted a disk.

comments, or suggestions.

Listing continued

<table>
<thead>
<tr>
<th>Line Number</th>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1760</td>
<td>IFPEEK(341) =247THENP1=POIN T(X,X,Y-10) :Y=Y-10</td>
<td></td>
</tr>
<tr>
<td>1770</td>
<td>IFPEEK(342) =247THENP1=POIN T(X,X,Y+10) :Y=Y+10</td>
<td></td>
</tr>
<tr>
<td>1780</td>
<td>IFPEEK(343) =247THENP1=POIN T(X+8,Y) :X=X+8</td>
<td></td>
</tr>
<tr>
<td>1790</td>
<td>IFPEEK(344) =247THENP1=POIN T(X+8,Y) :X=X+8</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>IFXX&lt;8THENX=X-8 ELSE IF XX&gt;240THENXX=8</td>
<td></td>
</tr>
<tr>
<td>1810</td>
<td>IFYY&lt;20THENYY=20 ELSE IF YY&gt;180THENYY=YY-10</td>
<td></td>
</tr>
</tbody>
</table>

Address correspondence to Mark Wilson, 66 Somerset St., Millinocket, ME 04462.

Coming Next Month

Next month look for exceptional variety and quality as HOT CoCo assembles a fine assortment of programs and regular features. Gamers will like the new game Possum Run. Have you exhausted all the word-search puzzles in the Sunday papers? Generate your own with "Word-search."

On the lighter side of serious color graphics is the Eric Einam program called "Video Van Gogh." With it you can manipulate shapes on the screen, create your masterpiece, and store it. Take advantage of this one on a stormy day.

March HOT CoCo's feature tutorial, "What's Disk?" teaches you the workings of a disk. Then, go ahead and build a real-world interface with March's hardware feature.

Now that Charles Santee has been with us for a few months we discover that our Educated Guest has a sense of humor. You might remember his reference to Logo as "the sacred cow of education." His column is called "Slowgo." We say no more.

The Review section, as usual, guides you in your quest for the ideal CoCo accommodations. You'll probably be inspired by the Adventure in Wonderland review. Pooyan gets our thumbs up as well.

If it's practicality you want, our review of Statgraf, two programs with serious business and mathematics applications. We also feature a review of Kraft joysticks in our efforts to help you select peripherals.

Elmer's Arcade continues. Richard Statgraf, two programs with serious business and mathematics applications. We also feature a review of Kraft joysticks in our efforts to help you select peripherals.

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Color Computer Magazine, June '83
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HOTCoCo February 1984 61
No more late nights with the shoe box! No more struggling with the form 1040 in July! I've found freedom in the guise of a program to take the drudgery out of filing federal income-tax forms.

I wrote TAX83 with my tax situation in mind. You will find prompts and provision for individual listing and totaling of most items such as medical and miscellaneous expenses. TAX83 computes and prints schedules A, B, and W in a form that you can submit with the return. Though it does not format form 1040, it provides line numbers to guide you in the transfer of information to it.

The line numbers of the program are based on the 1982 form. If the IRS follows its usual procedure, several will be different on the 1983 form. Check a sample run when you receive the 1983 form, or face a delay of any refunds due. The folks at the IRS are not likely to make any interpretation, regardless of how obvious it might be. I have incorporated the changes to medical and casualty loss deduction.

**Advanced Preparation**
Your tax return requires hours of advanced preparation beginning January 1 of the filing year. Since TAX83 does not do everything in preparation, if you need any of the following you must do them manually before you run the program:

- schedules D, E, or F,
- form 2106 (employee business expense),
- documentation of casualty loss (TAX83 calculates),
- adjustments to income, and
- capital gains.

If you have been using the shoebox method of filing tax documents, now is a good time to organize. A good filing system helps you to take advantage of deductions. Buy or make a multi-com-

**System Requirements**

- 16K RAM
- Color Basic
- Printer

**Program Description**
TAX83 operates from a command menu and must run in menu numerical sequence in order to establish the value of the variables. See Table 1 for a line description.

If you have Extended Basic you might want to change the input of the address in line 130. By changing to LINE INPUT you do not have to worry about the comma. You can also dress up your printout via PRINT USING statements.

**Tax-time anxiety? Shoebox-file blues? Put an end to tax-form panic with this useful program.**

**Table 1. Line Descriptions**

<table>
<thead>
<tr>
<th>Line</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>120-130</td>
<td>Inputs of personal data—used on the various printouts</td>
</tr>
<tr>
<td>140-570</td>
<td>Data inputs for and printing of schedule B</td>
</tr>
<tr>
<td>580-650</td>
<td>Input of W-2 wages</td>
</tr>
<tr>
<td>660-1880</td>
<td>Inputs for and the printing of schedule A</td>
</tr>
<tr>
<td>1890-2030</td>
<td>Inputs of other income items and adjustments</td>
</tr>
<tr>
<td>2040-2560</td>
<td>Prints the form 1040 information</td>
</tr>
<tr>
<td>2570-2710</td>
<td>The command menu</td>
</tr>
<tr>
<td>2720-2800</td>
<td>Prompts you to prepare certain items beforehand</td>
</tr>
<tr>
<td>2810-2960</td>
<td>Subroutine for computation of allowable deductions</td>
</tr>
<tr>
<td>2970-2990</td>
<td>Subroutine to print personal data</td>
</tr>
<tr>
<td>3000-3150</td>
<td>Subroutine to compute and print schedule W</td>
</tr>
</tbody>
</table>
Super Screen is a powerful, machine language program that significantly upgrades the performance and usefulness of 16K or greater, Extended and Disc Basic Color Computers. The standard Color Computer display screen is totally inadequate for serious, personal or business applications so Super Screen replaces it with a brand new, 51 character wide by 24 line screen including full upper and lower case characters. Instead of a confusing checkerboard appearance, you now have true lower case letters along with a screen that is capable of displaying 1224 characters. The difference is startling! Your computer takes on new dimensions and can easily handle lines of text that were simply too long and complex to display on the old screen.

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

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

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

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

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

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partment file and label as follows so that you work top to bottom as you go through TAX83:
  - W-2 forms,
  - interest and dividends received,
  - other income,
  - medical expenses,
  - taxes paid,
  - interest paid,
  - contributions,
  - educational expense,
  - miscellaneous deductible expenses,
  - capital gains, employee business expense, IRA, and Keogh.

Once you have this file, sort your documents by filing them under the proper category. After you have completed this year’s return, use the file to categorize next year’s items as you receive them.

TAX83 occupies 9,148 bytes of memory. Your data inputs occupy perhaps another 1K. If you have 16K of Extended Basic, enter POKE 25,6 to free additional memory before you type in or load the program. If you have a utility program that strips and packs, you can reduce the memory requirements to the point that it will load without additional memory. Eigen Systems’ Stripper reduces it to 8,181 bytes. To get additional memory for your data, add line 5 PMODE 0: PCLEAR 1, since the program uses no graphics.

Type Run and make your way through the initial instructions to the command menu. The numbers at the top of the

"TAX83 does not calculate the amount of tax that you owe, but the taxable income. You can ascertain the amount of tax from the tax tables using the taxable income amount determined."

screen represent available memory. If you have many deductions, you might run out of memory. Since it is necessary to go through the menu in numerical sequence, the lower portion of the screen tells you the last menu item used.

The order of input is the same as that described for the file system. If you have made the advanced preparations indicated, you should be able to work through from top to bottom in half an hour or so. The prompts are self-explanatory; they display a $ or ask for an amount when a numerical input is required. Otherwise they ask for the source or item. If a particular item does not apply, just press enter and a zero is registered.

TAX83 does not calculate the amount of tax that you owe, but the taxable income. You can ascertain the amount of tax from the tax tables using the taxable income amount determined. The program calculates refunds or additional taxes from this entry.

There are many different combinations and situations. I have tested the obvious ones, but you have the ultimate responsibility for a correct return. Check the results so that you know the program is doing the job for you.

Address correspondence to John M. Gregg, 1008 Alton Circle, Florence, SC 29501.

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40 PRINT@160, "NO WARRANTY EXPRESSED OR IMPLIED"
50 PRINT@232, "COPYRIGHT 1983"
60 PRINT@297, "JOHN M GREGG"
70 PRINT@327, "1008 ALTON CIRCLE"
80 PRINT@357, "FLORENC E, SC 29501"
90 PRINT@397, "803 662 9500"
100 INPUT KD $ -
110 GOTO 2720
120 CLS: INPUT "ENTER NAME OF TAXPAYER" ; Z $
130 INPUT "SOCIAL SECURITY NUMBER" ; AAS: INPUT "TAXYEAR" ; M AS: INPUT "STREET" ; V A$: INPUT "CITY" ; V 1$: INPUT "STATE ZIP" ; V 2$: GOTO 2570
140 PRINT#-2, "SCHEDULE B OF ": G OSUB 2970
150 PRINT#-2
160 PRINT#-2
170 PRINT#-2, "INTEREST INCOME"
180 CLS
190 INPUT "ENTER INTEREST INCOME SOURCE <XX> TO TOTAL" ; U$
200 IF U$ = "XX" THEN 260
210 INPUT "AMOUNT INTEREST EARNED" ; KK
220 LL=LL+KK
230 PRINT#-2, U$, TAB(50) KK
240 GOTO 190
250 PRINT#-2
260 PRINT#-2, "TOTAL INTEREST INCOME IS, ENTER ON LINE 8A OF 1040"
270 PRINT#-2, TAB(70) LL
280 PRINT#-2:CLS
290 PRINT#-2, "DIVIDEND INCOME"
300 INPUT "DIVIDEND INCOME SOURCE<XX> TO TOTAL" ; VS
310 IF VS="XX" THEN 350
320 INPUT "AMOUNT OF DIVIDEND" ; MM
330 NN=NN+MM
340 GOTO 290
350 CLS: PRINT#-2, "TOTAL DIVIDEND INCOME" ; TAB(55) NN
360 INPUT "CAPITAL GAIN DISTRIBUTION SOURCE <XX> TO TOTAL" ; WS
370 IF WS="XX" THEN 440
380 INPUT "AMOUNT OF CAPITAL GAIN" ; OO
390 PP=PP+OO
400 PRINT$ , OO
410 PRINT#-2, W$, TAB(40) OO
420 GOTO 360
430 PRINT#-2
440 PRINT#-2, "TOTAL CAP GAIN DIS
450 PRINT#-2, "TOTAL CAP GAIN AND NONTAXABLE DISTRIBUTION TO TOTAL" ; X$
460 INPUT "NONTAXABLE DISTRIBUTION" ; QQ
470 RR=RR+QQ
480 PRINT#-2, X$, TAB(50) QQ
490 GOTO 460
500 PRINT#-2, "TOTAL NONTAXABLE DISTRIBUTION TAB(50) RR
510 PRINT#-2, "TOTAL NONTAXABLE DISDISTRIBUTION TO TOTAL" ; PP+RR
520 PRINT#-2, "TOTAL NONTAXABLE DISTRIBUTION TO TOTAL" ; PP+RR
530 PRINT#-2
540 SS=NN-PP-RR
550 PRINT#-2
560 CLS: INPUT "YOUR WAGES $" ; HA
570 GOTO 580
580 CLS: INPUT "SPOUSE WAGES" ; KA: LA=LA+KA
590 INPUT "ENTER ON LINE 8B OF 1040" T A:(70) SS
600 GOTO 590
610 CLS: INPUT "prepare to input schedule A when ready" ; Y$
620 PRINT Y$, Y$
630 IMPORT "FULL MED INS PREM $" ; V
640 INPUT "MEDICINE AND DRUGS $" ; X
650 INPUT "XX" = V + X
660 INPUT "ENTER ON TOTAL" ; Q$
670 IF Q$ = "XX" THEN 760
680 PRINT#-2, "SCHEDULE A FOR "
690 GOSUB 2970
700 PRINT#-2
710 PRINT"MEDICINE AND DRUGS $" ; X
720 INPUT "MEDICINE AND DRUGS $" ; XX: X=XX
730 INPUT "TO TOTAL" ; Q$
740 IFQ$="XX" THEN 760
750 GOTO 720
760 PRINTYA
770 Z=(YA*.01)
780 PRINT#-2, "TOTAL MED AND DRUG EXP " X
790 PRINT#-2, "1% OF LINE 31, 104" O $ " Z
800 IFZ>=X THEN 820
810 IFX>Z THEN 840
820 AA=0
830 GOTO 850
840 AA=X-Z

Listing continued
Listing continued

850 PRINT#-2, "DEDUCTION MED AND DRUG"; TAB(50) AA
860 PRINT#-2, "MED INS PREMS"; V
870 INPUT "OTHER MED AND DENT EXP $ "; CC
880 PRINT#-2, "MED INS PREMS"; V
890 INPUT "OTHER MED AND DENT EXP $ "; CC
900 IF SS="XX" THEN 920
910 GOTO 870
920 PRINT#-2, "TOTAL OTHER MED EXP"; TAB(50) EE
930 GG=YA+.05
940 PRINT#-2, "5% LINE 31, FORM 1"; TAB(50) GG
950 HH=AA+BB+EE+(V)
960 II=HH-GG
970 IF GG=HH THEN II=0
980 PRINT#-2, "AMT ABOVE 5%"; TAB(50) II
990 T=II+W
1000 PRINT#-2
1010 PRINT#-2, "TOTAL MED AND DENT EXP"; TAB(70) T
1020 PRINT#-2;CLS
1030 INPUT "INCOME TAX $ "; HE:A
1040 Print#-2, "INCOME TAX"; TAB(50) HE
1050 GOTO 1030
1060 PRINT#-2, "STATE INC TAX"; TAB(50) AE
1070 INPUT "REAL ESTATE TAX AMT" ;E
1080 PRINT"<XX> TO TOTAL";C$:F=CE
1090 IF CS="XX" THEN 1110
1100 GOTO 1070
1110 PRINT#-2, "REAL ESTATE TAX $ "; TAB(50) F
1120 INPUT "SALES TAX $ "; G
1130 PRINT"<XX> TO TOTAL";G$:H=H+G
1140 IF GS="XX" THEN 1160
1150 GOTO 1120
1160 PRINT#-2, "SALES TAX $ "; TAB(50) H
1170 INPUT "PERSONAL PROPERTY TAX $ "; I
1180 PRINT"<XX> TO TOTAL";D$:J=J+I
1190 IF DS="XX" THEN 1210
1200 GOTO 1170
1210 PRINT#-2, "PERSONAL PROPERTY TAX"; TAB(50) J
1220 INPUT "OTHER TAX $ "; K
1230 PRINT"<XX> TO TOTAL";D$:L=L+K
1240 IF DS="XX" THEN 1260
1250 GOTO 1220
1260 PRINT#-2, "OTHER TAX"; TAB(50) L
1270 PRINT#-2

1280 PRINT#-2, "TOTAL TAXES DEDUC"
1290 PRINT#-2;CLS
1300 INPUT "AMOUNT INTEREST" ;A
1310 INPUT "PAYEE <XX> TO TOTAL" "; P$
1320 C=C+A
1330 IF PS="XX" THEN 1370
1340 PRINT#-2, P$; PRINT#-2, A
1350 GOTO 1300
1360 PRINT#-2
1370 PRINT#-2, "TOTAL INTEREST"; TAB(70) C
1380 PRINT#-2
1390 PRINT#-2, "CONTRIBUTIONS"
1400 INPUT "CONTRIBUTION TO-<XX>
1410 IF DS="XX" THEN 1470
1420 INPUT "AMOUNT" ;M
1430 N=N+M
1440 PRINT#-2, D$;M
1450 GOTO 1400
1460 PRINT#-2
1470 PRINT#-2, "TOTAL CONTRIBUTIONS" ;TAB(70) N
1480 PRINT#-2;CLS
1490 INPUT "CASUALITY AND THEFT LOSS "; H$
1500 INPUT "TOTAL AMT LOSS" ; O
1510 INPUT "REIMBURSEMENT" ; P
1520 PRINT#-2, H$; O
1530 PRINT#-2, "REIMBURSEMENT" ; P
1540 PRINT#-2, "LINE 27" ; O-P
1550 PRINT#-2, "MINUS $100"
1560 S=O-P-100-(YA*.1):IF S<0 THEN S=0
1570 PRINT#-2, "TOTAL CASUALITY AND THEFT LOSS DEDUCTIBLE" ;TAB(70) S:PRINT#-2
1580 PRINT#-2, "MISC DEDUCTIONS" ;TAB(70) S:PRINT#-2
1590 XD=WD+UD:PRINT#-2, "EDUCATIONAL EXP" ;XD
1600 CLS:INPUT "MISC DEDUCTIONS FOR, <XX> TO TOTAL"; I$
1610 IF IS="XX" THEN 1660
1620 INPUT "AMOUNT" ; Q
1630 PRINT#-2, I$, Q
1640 R=R+Q:KE=Q+R
1650 GOTO 1600
1660 R=R+XD
1670 PRINT#-2, "TOTAL MISC DEDUCTIONS" ;TAB(70) R:PRINT#-2
1680 PRINT#-2, "TOTAL MEDICAL AND DENTAL DEDUCTION" ;TAB(70) R:PRINT#-2
1690 PRINT#-2, "TOTAL TAX DEDUCTION" ;TAB(70) R:PRINT#-2
1700 PRINT#-2, "TOTAL INTEREST DEDUCTION" ;TAB(70) R:PRINT#-2
1710 PRINT#-2, "TOTAL CONTRIBUTIONS DEDUCTION" ;TAB(70) R:PRINT#-2
1720 PRINT#-2, "TOTAL CASUALITY AND THEFT DEDUCTION" ;TAB(70) R:PRINT#-2

Listing continued
1730 PRINT$-2,"TOTAL MISCl DEDUCTION"
1740 PRINT$-2,"TOTAL DEDUCTIONS" J+F+H+L+C+N+S+R+T+AE+BE
1750 CLS:IE=J+F+H+L+C+N+S+R+T+AE +BE
1760 PRINT832,"INPUT NUMBER FOR YOUR FILING STATUS"
1770 PRINT8230,"1 SINGLE"
1780 PRINT8262,"2 MARRIED FILING G JOINTLY"
1790 PRINT8294,"3 MARRIED FILING G SEPARATE"
1800 PRINT8326,"4 HEAD OF HOUSEHOLD"
1810 PRINT8358,"5 QUALIFYING WIDOW"
1820 INPUT K$
1830 IF K$="1"THEN GOSUB 2810
1840 IF K$="4"THEN GOSUB 2810
1850 IF K$="2"THEN GOSUB 2870
1860 IF K$="5"THEN GOSUB 2870
1870 IF K$="3"THEN GOSUB 2920
1880 GOTO2570
1890 CLS:INPUT"PREPARE TO INPUT INCOME ITEMS";KA$:LINE INPUT"INPUT DEPENDENTS NAME, AGES";WA
1900 PRINT": TOTAL NUMBER EXEMPTIONS";OA
1910 INPUT"DIV & INT EXCLUSION $";PA:QA=LL+SS-PA:IF QA<0 THEN QA =0
1920 PRINT"REFUNDS OF STATE TAX "$;RA
1930 PRINT"RENTAL & ROYALTY INCOME $";GA
1940 PRINT"CAPITAL GAINS $";TA
1950 PRINT"BUSINESS INCOME $";PD
1960 PRINT"OTHER INCOME $";SA
1970 NA=MA+QA+RA+TA+GA+YY+SA+PD
1980 INPUT"MOVING EXPENSE $";UA
1990 PRINT"EMPLOYEE BUSINESS EXPENSE $";VA
2000 INPUT"PAYMENT TO IRA $";WA
2010 XA=UA+VA+WA
2020 YA=NA-(XA+WA):QA=LL+SS-PA
2030 GOTO2570
2040 CLS:INPUT"PREPARE PRINTER FORM 1848 INFORMATION";KA$
2050 PRINT$-2,"FORM 1040 FOR "
2060 GOSUB 2970
2070 PRINT$-2;PRINT$-2
2080 PRINT$-2,"FILING STATUS "$;
2090 PRINT$-2,"COMPLETE LINE 6"
2100 PRINT$-2,"TOTAL WAGES,LINE 7";TAB(70)MA
2110 PRINT$-2,"INTEREST INCOME ENTER ON LINE 8A";TAB(50)LL
2120 PRINT$-2,"DIVIDEND INCOME, ENTER LINE 9A";TAB(50)SS
2130 PRINT$-2,"DIV EXCLUSION, ENTER LINE 9B";TAB(50)PA
2140 IF QA<0 THEN QA =0
2150 PRINT$-2,"ENTER ON LINE 9C";TAB(70)QA
2160 PRINT$-2,"REFUNDS OF STATE TAX, ENTER ON LINE 10";TAB(70)RA
2170 PRINT$-2,"BUSINESS INCOME ENTER ON LINE 11";TAB(70)PD
2180 PRINT$-2,"CAPITAL GAINS, ENTER LINE 13";TAB(70)TA
2190 PRINT$-2,"RENT & ROYALTY INCOME, ENTER ON LINE 18";TAB(70)QA
2200 PRINT$-2,"FARM INCOME, ENTER ON LINE 19";TAB(70)YY
2210 PRINT$-2,"OTHER INCOME, ENTER ON LINE 21";TAB(70)SA
2220 PRINT$-2,"TOTAL INCOME, ENTER ON LINE 22";TAB(70)NA
2230 PRINT$-2,"MOVING EXPENSE, ENTER LINE 23";TAB(50)UA
2240 PRINT$-2,"EMPLOYEE BUSINESS EXPENSE, ENTER LINE24";TAB(50)V
2250 PRINT$-2,"PAYMENTS TO IRA, ENTER LINE 25";TAB(50)WA
2260 PRINT$-2,"AMOUNT FROM SCH W, ENTER ON LINE 29";TAB(50)W8
2270 PRINT$-2,"TOTAL ADJUSTMENTS ENTER LINE 31";TAB(70)XW+W8
2280 PRINT$-2,"ADJUSTED GROSS INCOME, ENTER LINE 32";TAB(70)YA
2290 PRINT$-2,"AMT FROM SCH A, ENTER LINE 34";TAB(50)3A
2295 PRINT$-2,"AMT OF CHARITABLE DEDUCTION FOR LINE 34B";TAB(70)NC
2300 PRINT$-2,"ENTER ON LINE 35";TAB(70)YA-13-NC
2310 PRINT$-2,"TOTAL AMT CLAIMED FOR EXEMPTIONS, ENTER LINE 36";TAB(71)OA*1000
2320 PRINT$-2,"TAXABLE INCOME, LINE37";TAB(70)YA-13-(OA*1000)-NC
2330 PRINT,"TAXABLE INCOME ";YA-I-(OA*100)-NC
2340 INPUT"ENTER TAX FROM TABLE ";AC
2350 PRINT$-2,"ENTER TAX FROM TABLE ";AC
2360 INPUT"TOTAL CREDITS";BC
2370 PRINT$-2,"TOTAL CREDITS, ENTER LINE 49";TAB(70)BC
2380 PRINT$-2,"ENTER ON LINE 50";TAB(70)AC-BC
2390 INPUT"OTHER TAXES ";DC
2400 PRINT$-2,"OTHER TAXES, ENTER LINE 51-58";TAB(70)DC
LISTING CONTINUED

2410 PRINT#-2,"TOTAL TAX, LINE 5
9 "TAB(70)AC-BC+DC
2420 INPUT"TAX WITHHELD $ ";HC
2430 INPUT"<XX> TO TOTAL";TS
2440 IC=IC+HC
2450 IF TS="XX" THEN 2470
2460 INTC=ITC+HC
2470 FC=IC+JC
2480 PRINT#-2,"TAX WITHHELD, LINE 5
9 "TAB(70)AC-BC+DC
2490 INPUT"ESTIMATED TAX PAYM ENT ";GC
2500 PRINT#-2,"TOTAL TAX PAYM ENT ";TS
2510 IF AC-BC+DC < FC+GC THEN 2550
2520 IF AC-BC+DC > FC+GC THEN 2530
2530 PRINT#-2,"ADDITIONAL TAX DU E, LINE 60 "TAB(70)AC-BC+DC-(FC+GC)
2540 GOT02580
2550 PRINT#-2,"AMT TAX OVERP AID , LINE 68 "TAB(70)(FC+GC)- (AC-BC+ DC)
2560 PRINT#-2,"AMT TO B E REFUNDED "TAB(70)(FC+GC)- (AC-BC+ DC)
2570 PRINTMEM
2580 CLS:PRINT"BEFORE BEGINN
ING COMPUTE"
2590 CLS:PRINT@0,"ENTRY IN ORDER ":PRINTMEM"MEM"
2600 PRINT@130,"1 W2 WAGES"
2610 PRINT@162,"2 SCHD B"
2620 PRINT@226,"4 SCHD A"
2630 PRINT@258,"5 1040 INFO"
2640 PRINT"LAST "JDS
2650 INPUTJDS
2660 IF JDS="" THEN 2580
2670 IF JDS="2" THEN 140
2680 IF JDS="3" THEN 1890
2690 IF JDS="4" THEN 660
2700 IF JDS="5" THEN 2840
2710 IF JDS="1" THEN 580
2720 CLS:PRINT"BEFORE BEGINNING COMPUTE"
2730 PRINT@104, "DEPRECIATION SC HD"
2740 PRINT@168,"FORM 2106"
2750 PRINT@232,"CASUALTY LOSS"
2760 PRINT@296,"ADJUSTMENTS TO INCOME"
2770 PRINT@360,"CAPITAL GAINS"
2780 PRINT@424,"SCHEDULES D,E,F"
2790 INPUTKDS
2800 GOTO120
2810 PRINT#-2,"SUBTRACT $2300"
2820 U=2300:IF IE>2300 THEN 2850
:IF IE<2300 THEN U=0:GOTO2830
2830 PRINT#-2,"USE STANDARD DEDU CTION";IE=0:GOSUB 6000
2840 GOTO2580

END
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When I brought my Color Computer home and set it up, and then looked at it sitting there beside my stereo equipment, I began to wonder if there wasn't some way to interface one to the other.

Simply using the stereo speakers instead of the TV speaker didn't seem challenging enough, so I decided to run impulses from the stereo into the CoCo. Then, not only could I hear my records and tapes, but I could use them to create displays that change in time with the music.

Do you have a stereo, a CoCo, and a record with a beat? Then build this interface and get down!

Sound and Music

Sound consists of pressure vibrations in the air. A microphone can convert these vibrations into electrical voltages. Figure 1 shows a pure 100-cycle tone. This wave has two main characteristics: its amplitude or loudness (1 volt in the example), and its frequency or pitch (100 cycles per second (Hz) in this case).

You can also measure frequency and pitch by the length of time it takes to complete one full cycle (as shown by the arrow in Fig. 1). This time is called the period of the wave. In the example, it is 10 msec (1/100 second).

Real tones are seldom pure and look more like the graph shown in Fig. 2. Although the time above and below the horizontal axis now varies, you can still measure the length of each half-period.

This length of time is inversely related to the dominant frequency of the music at that instant. In other words, the shorter the half-period, the higher the pitch. Similarly, the amplitude still exists but now varies so rapidly that it is more meaningful to use its average value (note that the pure tone of Fig. 1 can still be heard when its instantaneous amplitude is zero at times of 5, 15, ... msec). Figure 3 shows some music (the first four notes of Beethoven's Fifth Symphony) and the average amplitude (plotted as a broken line).

The CoCo must detect two things in the music. The length of the half-periods will give it a measure of the current amplitude.

System Requirements

16K RAM
Extended Color Basic
Detecting Pitch

The CoCo can use the cassette player to detect dominant pitch.

Figure 4 contains a flowchart of a machine-language subroutine to measure half-periods. The cassette port automatically clears a bit in location $FF20 whenever the amplitude of the input from the cassette player exceeds 1 volt. The cassette port sets the bit when the amplitude falls below that value. Although the length of time between these two changes is a little shorter than the full half-period, it's important to use the 1-volt threshold to avoid false readings due to random noise.

First wait for the signal to become negative (step A), since you don't want to start counting in the middle of a period. Then wait for the reading to return to positive (B) since you don't want to stop counting (C). Finally, when the signal goes negative again (D), the half-period has ended, and you can return the result (the count).

Program Listing 1 contains the Assembly code of a subroutine that does this counting. To make it more flexible, you can call it with a time limit of anywhere from 1-32,766 time units. It will give up and return zero if within a reasonable time (three times the specified period) it cannot find a half-period of that length or shorter. Otherwise, it returns the actual length of the positive half-period.

Each time unit represents approximately 20 msec, so the following formula gives the corresponding frequency:

\[
\text{frequency (Hz)} = \frac{25,000}{\text{result}}
\]

Program Listing 2 gives a simple Basic program that POKEs the subroutine into memory and plots a spectrum of the music. Radio Shack in fact sells a ROM pack (RS #26-3156) that does about the same thing, but since it is all in machine language, it's much faster.

But ROM packs are hard to modify. With this subroutine, you can make displays that vary with the pitch of the music using any Basic statement you want.

Detecting Rhythm

Listing 2 is just barely capable of detecting musical rhythm. If you carefully adjust the volume, you can get the peaks (beats) to exceed the 1-volt threshold while the rest of the music falls below it. Then nonzero returned values mean that the music is loud, while zeroes mean that it is soft. But this does not work too well, since you would have to readjust the volume control whenever the general level of the music changed.

A better approach is to use the joystick interface. The joystick port can distinguish up to 63 levels of input, as opposed to the cassette port's single, fixed 1-volt level.

But there's a price to pay for this greater range. Calling the joystick routine (JOYSTK(0)) takes nearly 2 msec—up to 100 times longer than the cassette subroutine—because the process requires additional calculation. And since the average amplitude is what you want, you'd need even more time to calculate that. Thus, if you try to do everything with software, there's not going to be much time left to generate displays on the screen.

Fortunately, there's a better solution. Figure 5 shows a schematic of a very simple circuit you can build for just a few dollars that does most of the hard work automatically. One end plugs into the headphone jack of your stereo and the other into the joystick port. The joystick port can recognize the 63 levels of input, and the table below shows what each level means.
100 REM SET VARIABLES 110 REM N IS NUMBER OF BINS 120 REM NV IS NUMBER OF HALF-PERIODS SAMPLED BEFORE PLOTTING 130 REM TH IS THRESHOLD ARRAY 140 REM P IS SPECTRAL AMPLITUDE 150 160 N=9;NP=9 170 DIM TH(N) 180 DIM P(N) 190 TH(1)=1 200 PMODE 1,1;PCLS;SCREEN 1,1 210 220 REM SET UP THRESHOLDS 230 240 FOR I=1 TO N-1 250 TH(I)=2*TH(I) 260 NEXT 270 280 REM POKE IN SUBROUTINE 290 300 FOR I=12800 TO 12873 310 READ V: POKE L,V: NEXT 320 DATA189,179,237,237,141,0,67,47,59,16,174,141,0,68,49,171,14,2,255,32,49,63,39,45,166,132,132,1,138,246, 330 DATA32,35,166,132,132,1,139,246,16,174,141,0,68,49,63,3,9,28,166,132,132,1,38,246 340 DATA32,32,163,141,0,14,83,67,92,38,5,76,36,27,95,38,39,45,166,132,132 350 DATA49,63,39,35,166,132,132,1,139,246,16,174,141,0,68,49,63,3,9,28,166,132,132,1,38,246 360 DATA32,38,5,76,36,27,95,38,39,45,166,132,132 370 REM THRESHOLD ARRAY 380 REM TH(I) = TH(I) +1 390 DEFUSR =12800 400 410 Q=USR(255) 420 FOR J=1 TO N 430 IF Q>=TH(J) AND Q<TH(J+1) THEN 440 NEXT: NEXT 450 460 REM DISPLAY SPECTRUM 470 480 DRAW"BM,B,191" 490 C=C+1:IF C=4 THEN C=2 500 COLOR C: DX=250/N 510 FOR I=1 TO N 520 LINE-(DX*I,191-P(I)),PSET 530 NEXT 540 GOTO 480

Program Listing 2.

100 110 REM INITIALIZE SCREEN 120 130 R=1.34 140 PMODE 4,1;PCLS 150 160 REM CHOOSE RANDOM MODE/COLOR 170 180 PMODE RAND(5)-1,1 190 COLOR RAND(4) 200 SCREEN 1,RAND(2)-1 210 220 REM PLOT ON BEATS ONLY 230 240 FOR X=0 TO 255 STEP 2:A=JOYSTK(X/8):AV=(AV+A)/2 250 IF A>AV THEN LINE(X,0)-(255, X/R),PSET:LINE(255-X,0)-(0,X/R), PSET 260 NEXT 270 280 REM DO BUTTON TOO 290 300 IF X=255 TO 0 STEP -4:A=JOYSTK(X/8):AV=(AV+A)/2 310 IF A>AV THEN LINE(X,191)-(255, X/8),PSET:LINE(255-X,191)-(0,X/8), PSET 320 NEXT 330 GOTO180

Program Listing 3.

Now turn on your stereo and tune in some music with a strong beat. Turn the volume very low. Insert the headphone plug and gradually increase the volume until you begin to see a graph that increases and decreases with the beat of the music.

Don't turn the volume too high or you will get a function call (FC) error when JOYSTK(0) exceeds 31. Actually, limiting peak values to about eight is a good idea; then you can use a different color for each level of volume, as in the following program:

10 FOR I=1024 TO 1335 20 A=JOYSTK(0):IF A>6 THEN A=7 30 POKE 1,255-16*A:NEXT:GOTO 10

In this display, orange represents silence, and green represents the loudest (JOYSTK(0)>6) input. The colored boxes will usually line up diagonally across the screen, as long as the beat is constant. (Try POKE 65495,0 with any display for a quicker response.)

Displays

There's no limit to the displays you can create. You can use color, position, size, shape, and so on to represent either the pitch (from the cassette port) or the amplitude (from the interface).

Here are some general suggestions for creating your own displays:
- Start by initializing the display—clear the screen, draw a starting pattern, and so on.
- Use Basic to update your display, based on the current volume or pitch.
- If you want higher-speed graphics, use a machine-language routine.
- Although you can decide exactly what you want in advance, sometimes the best policy is just to experiment. So-called "bugs" can produce fascinating effects in many cases.
- Symmetry is often pleasing—make the screen a mirror image from left to right or from top to bottom.

If you have regular Basic, you can make your display using any of the commands that affect the text screen—such as PRINT, PRINT @, PRINT TAB, SET, RESET, or POKE.
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Those with Extended Color Basic are in luck. Also, you can make more complex displays on the graphics screens with commands like LINE, CIRCLE, DRAW, and GET/PUT. Try “massaging” the data in various ways before displaying it according to the second suggestion above. For example, you could look for peaks in the amplitude data, calculate averages, decide the half-periods into octave ranges, or anything else you think might lead to an interesting display. This is especially important when using the cassette input. Since real music contains a complex mixture of many frequencies (overtones, harmony, and so on), a single half-period reading does not tell you much.

You can convert almost any random graphics program to display music. But keep the inner loop as short as possible. For example, type in Program Listing 3. Here I have massaged the data from the interface by calculating a running average (AV) and comparing the current volume (A) to it. If A > AV, the music is getting significantly louder. The program then plots another pair of lines.

You can try out this program without the interface by playing some music and moving your right joystick back and forth in time with it.

Two final suggestions: When using the cassette port, you can always hear the music by calculating the statement AUDIO ON in your program. If plugging the interface into the stereo disables your speakers, try driving the interface into the stereo with a small FM radio or compact stereo. You can then listen to the same station over your better stereo. Fidelity does not make much difference to the interface.

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My tape inventory was beginning to get out of hand when I came across Charles Gillen's Cassbox program in the November 1982 issue of 80 Micro (p. 282). This program created neat, readable cassette insert cards (see Fig. 1).

Although written for the Models I and III, it was easy to convert to Extended Color Basic except for one problem: the CoCo's 32-by-16 screen format. The conversion seemed to require endless loops and, thus, would take longer to run. A screen expander simplified the adaptation, and in this case it required a minimum of a 42-by-21 format. I used The Solution from Snake Mountain Software, but any 42-by-21 (or better) reformatter will do.

Since Indxcard will run without a screen reformatter, you can key it in and conform it to the CoCo's built-in format even if you don't have a screen expander.

The line length in Fig. 1 corresponds to the index-card format using a 42-character screen expander. The insert card can hold 15 text lines on sides 1 and 2, and it holds four lines on the flap.

The tape title (two lines) is easily visible on stacked tapes.

You can center a line by typing @ at the beginning of the line. An edit mode permits changes or corrections before and after printing.

CLOADM and EXEC your screen-expander utility according to your loading instructions. In the case of The Solution, select Option 1, the PMODE 4 screen. CLOAD and run INDEXCARD.

An INKEY$ loop controls all the menu options as follows:

- `<1>` = DO INDEX (side 1) 15 LINES
- `<2>` = DO INDEX (side 2) 15 LINES
- `<3>` = DO TITLE 2 LINES
- `<4>` = DO FLAP 4 LINES
- `<5>` = EDIT side 1
- `<6>` = EDIT side 2
- `<7>` = EDIT TITLE
- `<8>` = EDIT FLAP
- `<9>` = ERASE ALL
- `<?>` = PRINT INDEX CARD

Input Options 1 and 2

Input your text line by line, up to 15 lines for each side. The program doesn't stop you from entering lines longer than 38 characters, but the PRINT #2 sec-

**System Requirements**

- 16K RAM
- Extended Color Basic
- 80-Column Printer
- 42-by-21 (or better) Screen Expander
Use the Edit modes for corrections. Once you have entered the 15 text lines, the buffer is reviewed and you get the opportunity to change a line by entering its number or to return to the menu by pressing the enter key.

**Input Options 3 and 4**

These are the same as above, but Title has two text lines and Flap has four. Once there is text in the Input modes, reentering these modes is destructive. Use the Edit modes for corrections.

**Edit Options 5-8**

Say you made a mistake in line 10 of side 2. Just edit side 2 (Option 6), enter 10, and you see everything down to and including line 10. Retype the whole line for any correction, press the enter key, and if there are no more corrections, press enter again and you're back to the menu.

**The Erase-All Option 9**

This does just as it says.

**The Printing Option**

The index card fills three-fourths of a page, so adjust your paper accordingly. If you want to make a second copy of the index, adjust your paper to the top-of-form and select Option 7 again. To save paper turn it around and use the right margin for another card. The printer turns out a finished insert of just the right size, complete with marks where to cut and fold.

**Special Notes**

Indxcard will work with Tomas Rokicki's CHRGEN utility, which appeared in the September 1983 issue of HOT CoCo, p. 104. However, you must first make a minor change to Indxcard: Replace all CLS statements with EXEC in lines 10, 70, 500, 730, 960, and 1190.

To use Indxcard with Snake Mountain's The Solution 1.0, replace all CLS statements with PRINT CHR$(12).

Address correspondence to Helene M. LaBonville, 121 Camelot Drive, RFD 5, Bedford, NH 03102.
The Color Computer uses several low RAM locations in its Basic interpreter because these values might need changing or they can be used as scratch space or pointers. These locations also store RAM hooks to allow for future modifications and downward compatibility. Pointers in the low RAM locations point to the command and dispatch tables for the interpreter and after thumbing around in ROM with ZBug, I found these addresses. (See Table 1.)

I was curious to see if these tables were pointed to by any location in low RAM, so I used Program Listing 1 to search for these addresses. You can also use this technique to search for other locations in RAM or ROM. The addresses and locations in low RAM are listed in Table 2.

You can alter the names and dispatch addresses of commands by changing the pointers and moving the tables into RAM. Using this technique, you can automatically redirect prints to the printer, redirect the NEW command so accidental NEWs do not destroy the program, and create custom commands.

Program Listing 2, Command Changer, uses some interesting techniques. After the title page, it reserves a portion of high memory for the redesigned command table, then jumps to the menu where it gives you three options. The first of the three options is to start with the normal command table and work with it. With this option, the program jumps to line 200 where the command table relocates in RAM so you can work with it. Next, the program translates the 25 Extended Basic commands into the CM$( ) array. It uses a technique here that detects the last character of each command, that is the last character with 128 added to it. The program subtracts 128 from the last character and replaces the table in the CM$( ) array.

The listing of commands appears on the screen using the formatted display of lines 350-380. You are prompted to enter the name of the command you want to change. The computer checks through the listing of commands to see if the command exists. If it does not, the computer asks you to respond to the question again. At this prompt, you can enter *** and stop the program, save the table to disk or tape, and return to the menu.

Once your first question is answered, you are asked for a new name for the command. The program again checks for its existence and asks for another response. This is because multiple entries of the same command in the table 100 READ X
110 FOR B=1 TO X
120 READ I,J
130 FOR A=0 TO &H3F FF
140 PRINT HEX$(A)
150 IF PEERK(A)=I THEN 180
160 IF PEERX(A+1)=J THEN 180
170 : IF PEER$(A+1)=J THEN 180
180 NEXT A
190 END
200 DATA 4
210 DATA &H81,&H83
220 DATA &H81,&H50
230 DATA &HAA,&H65
240 DATA &HAB,&H67
300 PRINT HEX$(I);HEX$(J);" FOUN D AT ";HEX$(A)
310 IF INKEY$<>CHR$(13) THEN 310
320 GOTO 180

Program Listing 1. Routine to Find Command and Dispatch Pointer Addresses

Writing CoCo compilers or interpreters? Want more programming flexibility? Command Changer helps.
can create havoc during the use of the table.
With the change made, the computer displays the new command table and prompts you for another entry. This procedure continues until you stop it.

The second option allows you to use a command table that has already been modified and saved on disk or tape. At 760, the command table you want is loaded into memory, and then the program goes to 240 where it continues as before.

The third option allows you to leave the program. Before it ends, it asks you if you want the table to be in effect when the program is over. If you request this, the computer POKEs a hex 3E into 299, and redirects it to the new table.

Program Listing 3, Dispatcher, uses the same techniques as the first, with the same options. The only difference is the tables that are changed. Dispatcher allows you to change the Color Basic dispatch table. By changing a table entry to the address of your machine-lang-

Dispatcher

can create havoc during the use of the table.

With the change made, the computer displays the new command table and prompts you for another entry. This procedure continues until you stop it.

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Dispatcher


The subroutine at Location 9F is disassembled in Program Listing 4. Remember that this routine can be modified because it is in RAM. By using the arguments that you find by looking at the Basic routine, you can develop full-fledged commands such as machine-language sort routines.

---

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One of the educational uses of the Color Computer is to graph or plot functions so students can see how a function changes as parameters change. These programs show a two-dimensional graph of a function.

First, you define the function using the DEF FN statement. This statement must appear before the function is used in another evaluation in the program. It is a good idea to place all user-defined functions near the beginning of the program. DEF FN lets you define a function in terms of a variable. Here are some acceptable commands:

```
DEF FN A(X) = SIN(X)
DEF FN B(X) = X*X + 9*X - 25
DEF FN R(X) = RND(X)
```

Later in the program you can use statements such as the following:

```
200 IF FN G(S) = 3 THEN 500
500 ON FN C(X) GOSUB 1000,2000,3000
600 Z = 32 + FN J(M)
```

Graphing Functions

There are several approaches to graphing functions. One method uses Extended Basic’s LINE function and the high-resolution PMODE 4. I defined the function in terms of the variable X. The program draws an X axis and calculates values for Y according to different values of X. For each value of X, the program draws a line from the value for Y to the X axis. The resulting graph is a series of lines to the X axis. If the lines are close enough, the result looks like a shaded graph of the function. You must scale the values for X and Y to allow them to fit on the screen. Program Listing 1 graphs the function SIN(X) as X varies from 0 to 25. (Keep in mind that for trigonometric functions the parameter is in radians.) Line 120 clears the screen. Line 130 sets the graphics resolution at the highest, or most detailed drawing, and the program uses the first graphics page. Line 140 indicates a graphics screen with color set 1.

```
120 CLS: PCLS
130 PMODE 4,1
140 SCREEN 1,1
150 DEF FN A(X) = SIN(X)
160 LINE(0, 96) - (255, 96), PSET
170 FOR X = 0 TO 25 STEP .3
180 Y = 96 - (40 * FN A(X))
190 IF Y <= 0 THEN Y = 0
200 IF Y = 191 THEN Y = 191
210 LINE(X*10, Y) - (X*10, 96), PSET
220 NEXT X
230 GOTO 230
240 END
```

Program Listing 1. Graph of a Function

```
120 CLS: PCLS
130 PMODE 4,1
140 SCREEN 1,1
150 DEF FN A(X) = SIN(X)
160 DEF FN B(X) = X/12
170 LINE(0, 96) - (255, 96), PSET
180 FOR X = 0 TO 25 STEP .3
190 Y = 96 - 48 * (FN A(X) + FN B(X))
200 IF Y <= 0 THEN Y = 0
210 IF Y = 191 THEN Y = 191
220 LINE(X*10, Y) - (X*10, 96), PSET
230 NEXT X
240 GOTO 240
250 END
```

Program Listing 2. Combining Functions

```
120 CLS: PCLS
130 PMODE 4,1
140 SCREEN 1,1
150 DEF FN A(X) = SIN(X)
160 DEF FN B(X) = X/12
170 LINE(0, 96) - (255, 96), PSET
180 FOR X = 0 TO 25 STEP .3
190 Y = 96 - 48 * (FN A(X) + FN B(X))
200 IF Y <= 0 THEN Y = 0
210 IF Y = 191 THEN Y = 191
220 LINE(X*10, Y) - (X*10, 96), PSET
230 NEXT X
240 GOTO 240
250 END
```

Program Listing 2. Combining Functions

System Requirements

16K RAM
Extended Color Basic
just change line 150, the definition of the function. For example, try the following statements instead of line 150 in the listing.

150 DEF FN A(X) = COS(X)
150 DEF FN A(X) = TAN(X)
150 DEF FN A(X) = 1/COS(X)
150 DEF FN A(X) = X/11
150 DEF FN A(X) = X*X/150
150 DEF FN A(X) = LOG(X + 1)
150 DEF FN A(X) = 1/LOG(X + 1)

Combining Functions

Now let's try combining functions.

You can use Listing 1 and combine functions in line 150, such as:

150 DEF FN A(X) = SIN(X) + COS(X)

Program Listing 2 lists the two functions separately, and the computer combines the functions. Lines 150 and 160 define the two functions as FN A(X) and FN B(X). The program adds the two functions and graphs the results. To change to subtraction, insert a minus sign in the appropriate function. You can try combining the functions listed above as an example. If the combined functions yield a number off the scale of the graph, the lines will extend to the top or the bottom of the screen.

You can change the vertical scale of the graph by changing the number 40 as a factor in line 190. You can vary the x value by changing the limit or the step size in line 180. You might try SCREEN 1,0 for a different color graph.

As you can see, the computer offers a quick way for students to see the pattern of a graph of a function and to understand graphing concepts. One interesting application is to look at the graph of a Fourier expansion as you gradually add terms. Consider this Fourier expansion:

\[ f(x) = \sum_{n=1}^{\infty} \frac{1}{n} \sin nx \]

where \( n = 1, 3, 5, \ldots \).

Start with Listing 2. For the first term, \( n = 1 \), so \( A(X) = \sin(X) \) and \( B(X) = 0 \). The graph is the sine wave.

**"If you keep adding terms, you’ll notice that the graph gradually turns into the square wave."**

Now change \( B(X) \) to \( B(X) = (1/3)\sin(3X) \), which would be the second term in the series. Look at the graph. Now add the third term:

\[ B(X) = (1/3)\sin(3X) + (1/5)\sin(5X) \]

If you keep adding terms, you’ll notice that the graph gradually turns into the square wave.

Program Listing 3 shows another example of the Fourier expansion for the following function:

\[ f(x) = \sum_{n=1}^{\infty} \frac{(-1)^n + 1}{n} \sin nx \]

where \( n = 1, 2, 3, 4, \ldots \).

Again, the first term is \( \sin(X) \). The listing shows 11 terms of the expansion. If you add just one term at a time, you can see how the graph gradually changes. For this example, I have changed line 140 to SCREEN 1,0 and have stretched out the curve so there won’t be as many cycles. I also put lines closer together to color in the graph by changing line 180 to the following:

180 FOR X=0 TO 14 STEP .1

Dig out your math tables book and take a look at a few more Fourier expansions for basic periodic functions. The math books often show what the graph looks like as \( n \) approaches infinity, but the Color Computer can actually show how your graph changes as you add terms.

Address correspondence to Regena, P.O. Box 1502, Cedar City, UT 84720.
A HELPING HAND FOR DATA ENTRY

One of a programmer's more important considerations is making data entry easy for the user. I wrote a utility program that prompts the user by presenting the data fields in a different color.

It also provides a nondestructive cursor for data editing. You control cursor movement with the four arrow keys.

Program Operation and Design
To edit the data-entry screen, move the cursor to the line of interest with the up arrow. Then use the right arrow to move the cursor to the character to be changed. If you use only the arrow and enter keys, you can move the cursor anywhere within the data entry part of the screen without destroying what you have entered.

The Program Listing was designed for eight input fields of variable length requiring 10 screen lines. These input fields are listed in Table 1. The display location of a character for the Color Computer screen is determined by the formula A = 1024 + L*32 + CP, where L equals 0 to 15 and CP equals 0 to 31 in each line. The variable L is the line number (16 lines), and CP is the character position (32 characters per line). Table 1 lists the L and CP values required for each line of the display. Note that two sets of L and CP values are required for each line. These are the start and end of the data entry field.

The program employs a short machine-language subroutine to change the displayed color for the data-entry part of the screen. The start and stop values (see DATA statements 9060-9150) of L and CP are POKEd into memory for the machine-language program (contained in DATA statement 9020) to use. The first value in the DATA statement at line 9020 sets the color. The color value equals 143 + 16* (COLOR - 1). I used the value for buff (COLOR = 5). Other choices include: 0, black; 2, yellow; 3, blue; 4, red; 6, cyan; 7, magenta; and 8, orange.

The input to the display occurs at line 9350 using INKEY$. The two POKEs at this line provide the cursor. Moving the cursor within the data-entry areas requires considerable coding. The IF tests from lines 9230-9330 move the cursor to the next line at the end of a data-entry line.

Lines 9360-9440 test for control-key inputs (enter, arrows, or @) and exits as required. If you press the @ key, line 9400 goes to lines 9770-990 and provides additional instructions. If you press enter before any data input, lines 9410-9430 allow an exit to line 9610. At this point the subroutine returns to the main program.

If you do not press the control keys, line 9450 sets the value of BS(L,CP) to the data input, and line 9460 displays it on the screen. If you do press a control key, line 9460 displays the value of BS(L,CP) that was entered previously.

Lines 9470-9600 control movement of the cursor. Lines 9470-9490 move the cursor back one space, while lines 9500-9510 move the cursor forward one space. Lines 9520-9550 move the cursor down one line. The IF test at line 9530 allows you to use the enter key and the down arrow interchangeably. Lines 9570-9590 move the cursor up one line. If you do not use any control keys, line 9600 moves the cursor one position to the right on the screen.

After you have entered all the data, the program exits to line 9630. Lines 9630-9720 add the screen input data (BS(L,CP)) into a string variable (CS(K), where K equals 1 to 8). At this point the data would be stored in a data file. After storing the data, lines 9740-9760 reset the screen input matrix.

Meet the challenge of writing clear data-entry routines with this easy-to-use utility program.

<table>
<thead>
<tr>
<th>Item</th>
<th>Length</th>
<th>Start L</th>
<th>CP</th>
<th>Stop L</th>
<th>CP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Last Name</td>
<td>20</td>
<td>0</td>
<td>12</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>First Name</td>
<td>20</td>
<td>1</td>
<td>12</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>Address</td>
<td>35</td>
<td>2</td>
<td>12</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>City</td>
<td>25</td>
<td>4</td>
<td>12</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>State</td>
<td>2</td>
<td>6</td>
<td>12</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Zip Code</td>
<td>9</td>
<td>7</td>
<td>12</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Phone</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>8</td>
<td>18</td>
</tr>
<tr>
<td>Status</td>
<td>10</td>
<td>9</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 1. Data Input Fields

System Requirements
- 32K RAM
- Disk Basic
Customization

To customize this program for your situation, first determine the required input fields and their length. Next, prepare a list of the required screen design. (See Table 1.) Then edit the lines in Table 2.

Address correspondence to Gerald Sprouse, 9977 Caminito Chirimolla, San Diego, CA 92131.

Program Listing. Data-Entry Utility

<table>
<thead>
<tr>
<th>Line</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>CLEAR 1000,6,7,DPF</td>
</tr>
<tr>
<td>20</td>
<td>DIMS(B,L,CP),C$18)</td>
</tr>
<tr>
<td>200</td>
<td>FOR=0 TO 3270</td>
</tr>
<tr>
<td>300</td>
<td>READ:POKE:D:NEXT:DEFUSR0</td>
</tr>
<tr>
<td>32257</td>
<td></td>
</tr>
<tr>
<td>9028</td>
<td>DATA 287,142,0,0,102,126,0,167,126,148,0,45,246,57</td>
</tr>
<tr>
<td>9030</td>
<td>CLS:PRINT &quot;LAST NAME&quot;:PRINT &quot;FIRST NAME&quot;:PRINT &quot;ADDRESS&quot;:PRINT &quot;ZIP CODE&quot;: PRINT &quot;PHONE&quot;</td>
</tr>
<tr>
<td>9040</td>
<td>PRINT &quot;CITY&quot;:PRINT &quot;STATE&quot;:PRINT &quot;DATE&quot;:PRINT &quot;TIME&quot;:PRINT &quot;STATUS&quot;:PRINT &quot;PHONE&quot;</td>
</tr>
<tr>
<td>9050</td>
<td>PRINT &quot;ZIP CODE&quot;:PRINT &quot;PHON E&quot;</td>
</tr>
<tr>
<td>9060</td>
<td>DATA 0,12,0,31</td>
</tr>
<tr>
<td>9070</td>
<td>DATA 207,142,0,0,182,126,0</td>
</tr>
<tr>
<td>9080</td>
<td>DATA 2,12,2,31</td>
</tr>
<tr>
<td>9090</td>
<td>DATA 4,12,4,31</td>
</tr>
<tr>
<td>9100</td>
<td>DATA 7,12,7,20</td>
</tr>
<tr>
<td>9110</td>
<td>DATA 8,12,8,18</td>
</tr>
<tr>
<td>9120</td>
<td>DATA 9,12,21</td>
</tr>
<tr>
<td>9180</td>
<td>FOR=0 TO 14:READD:D:NEXT:EXIT</td>
</tr>
<tr>
<td>9300</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9330</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9350</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9370</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9390</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9400</td>
<td>FOR=0 TO 31</td>
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<tr>
<td>9410</td>
<td>FOR=0 TO 31</td>
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<tr>
<td>9420</td>
<td>FOR=0 TO 31</td>
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<td>9430</td>
<td>FOR=0 TO 31</td>
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</tr>
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<td>9960</td>
<td>FOR=0 TO 31</td>
</tr>
<tr>
<td>9970</td>
<td>FOR=0 TO 31</td>
</tr>
</tbody>
</table>

Table 2. Line Changes

<table>
<thead>
<tr>
<th>Line</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Change 10 in DIM statement to number of lines.</td>
</tr>
<tr>
<td>9000-9150</td>
<td>Adjust for each line in screen.</td>
</tr>
<tr>
<td>9160</td>
<td>Change FOR loop to number of lines.</td>
</tr>
<tr>
<td>9220</td>
<td>Change to start position of screen.</td>
</tr>
<tr>
<td>9230-9330</td>
<td>Adjust for each line in screen. Note that value of CP in IF test is one more than the value in Table 1.</td>
</tr>
<tr>
<td>9410-9420</td>
<td>Change to start position of screen.</td>
</tr>
<tr>
<td>9480</td>
<td>Change to start position of lines.</td>
</tr>
<tr>
<td>9530</td>
<td>Change to start position of lines, delete IF test if fields do not contain multiple lines.</td>
</tr>
<tr>
<td>9450</td>
<td>Adjust for number of lines.</td>
</tr>
<tr>
<td>9630-9720</td>
<td>Adjust for number of data fields.</td>
</tr>
<tr>
<td>9740</td>
<td>Adjust for size of screen input area.</td>
</tr>
</tbody>
</table>

Table 2. Line Changes

20 Change 10 in DIM statement to number of lines.
9000-9150 Adjust for each line in screen.
9160 Change FOR loop to number of lines.
9220 Change to start position of screen.
9230-9330 Adjust for each line in screen. Note that value of CP in IF test is one more than the value in Table 1.
9410-9420 Change to start position of screen.
9480 Change to start position of lines.
9530 Change to start position of lines, delete IF test if fields do not contain multiple lines.
9450 Adjust for number of lines.
9630-9720 Adjust for number of data fields.
9740 Adjust for size of screen input area. |
You've just written your programming tour de force and you rush out to show it to your friends. After demonstrating this program yourself, receiving the appropriate "oohs" and "ahhs," you ask someone to try out your work. He soon becomes hopelessly lost and you must guide him step by step through the program's operation. What did you do wrong?

Your program failed because it did not tell the user what to do. Of course, you knew what to input because you wrote the program. Menus and prompting all input statements are convenient ways to guide the user through program operation.

A computer menu is essentially the same as one that you order meals from in a restaurant. You pick the item you want, and after a short delay the selection appears.

Menu, Please

Program Listing 1 is an example of a menu. The menu subroutine begins by clearing the screen (line 10). This focuses the user's attention on the menu and not on leftover artifacts. Next, line 20 prints the title of the menu. This is especially helpful if there is more than one menu in the program, so the user always knows where he is. The choices should be formatted on the screen in a vertical column or columns. Use the PRINT@ command for this. For a professional appearance, balance the blank areas around the menu's text.

Each choice is listed with a number, lines 30-110. The user selects his choice by pressing one of the numbers. Line 120 prompts the user to make a selection. If your prompt happens to be on the last line of the display, be sure to place a semicolon at the end of the line to prevent the screen from scrolling.

Line 130 erases the prompt by printing 25 spaces (see an ASCII chart). This gives the appearance that the prompt is flashing, reminding the user that it is his choice. Line 140 watches the keyboard to see if he has pressed a key. Each time the computer encounters this line, it compares R$ to the null character. If no key has been pressed, R$ is equal to null and this line directs program execution back to line 120 to repeat the cycle of printing and erasing the prompt.

Once a key has been pressed, R$ becomes equal to the selection and the computer goes on to the next line. Line 150 converts the string R$ to a numerical, which is assigned to variable R. Line 160 directs program execution to the appropriate subroutine selected by the user.

To make it easier on yourself, make the subroutine entry point the same as the selection number followed by three zeros. If a number is selected that is greater than the number of subroutines available, line 170 sends the computer back to line 120 to print the prompt and wait for another key to be pressed. This line is only reached in case of error.

You can also link menus to letters. This approach takes up more memory, but it also has an advantage. Once the user learns to operate the program, it will be easier for him to associate a mnemonic to a function than a number, and he can bypass the menu if desired. The changes shown in Program Listing 2 allow for use of letters with a menu.

Line 5 asks the user if he wants to use the menu. Line 10 still clears the screen, but it also tests to see if the variable BYPASS equals one; if so, it skips the menu except for the function prompt. This saves the time it takes to print the menu on the screen.

This time R$ must be compared to each linked character, lines 150-230, and execution transferred to a subroutine only if a correct selection is made. Line 240 will only be reached if an incorrect key has been pressed. Therefore, it always transfers execution back to line 120 for the prompt and to wait for you to press another key.

As you are developing your program, place a module at each one of the subroutine entry points to notify the user that this subroutine is not yet available for use. Then after a short pause, transfer execution back to the menu (see lines 10000-10020 of Listing 2). Once a given subroutine is complete, include a statement at its exit point to transfer execution back to the menu.

The two menus shown are used as the main menu for programs that perform multiple functions. All the func-

---

**System Requirements**

- **16K RAM**
- **Extended Color Basic**
tines act as subroutines to the menu and you call them as needed. You use another type of menu within subroutines whenever the user needs to make a choice, based on information listed on the screen.

For instance, if the user wants to find all the people who had a certain zip code, he chooses item 6 (Select). Program Listing 3 is an example of this type of menu. The screen is cleared and lines 6200-6400 print the fields. Lines 6500-6590 prompt for the field that the selection is based on. Line 6600 prompts for the information that the fields are to be compared to. Next, line 6600 displays a brief menu that allows the user to decide if he wants to find all the records that are less than, greater than, or equal to the search string.

Restrict this type of menu to a small section at the top or bottom of the display. No title is needed. When the user presses the equal sign, the subroutine will find all the records that have the same zip code as the search string input.

This is a dummy routine so it just tells you the choice made. Program execution is transferred back to the original menu after all the records have been found.

For more information, call or write to:

**CYBERTRON TECHNOLOGY**
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HOUSTON, TEXAS 77027

(713) B40-1272

HOUSTON, TEXAS 77027

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3131 TIMMONS 4731
HOUSTON, TEXAS 77027

(713) B40-1272
Not every Color Computer owner has Extended Color Basic. Color Basic is an excellent language, and the CoCo is a great computer even without the enhancements offered by the Extended Basic.

Reading a magazine line HOT CoCo, however, can be very frustrating if you are without Extended Basic as many of its programs require this extended language. With a little effort, though, you can adapt many programs for your Color Basic CoCo.

If the program has essential graphics features, using the various PMODEs and commands like LINE, CIRCLE, DRAW, PAINT, and GET, then translating it to Color Basic is probably more work than is practical. But, if the only Extended commands used are string-handling or machine-language-accessing commands, you can often adapt the program to Color Basic by replacing these commands with appropriate subroutines.

**STRINGS**

One of the most common Extended Basic string-handling functions is STRINGS. This builds a string of specified length consisting of the same character repeated the required number of times. For example, if X$ = STRINGS(5, 192), then X$ consists of five red rectangles (CHR$(192)) in a row.

Program Listing 1 replaces the STRINGS function in a program. If this subroutine has been appended to your program and you encounter a line like:

```
50 X$ = STRINGS(5, 192)
```

then replace line 50 with:

```
50 ZL = 5: ZC = 192: GOSUB 5000: X$ = ZS$
```

This has exactly the same effect as the original line, but uses only Color Basic.

Occasionally, the function has the actual character as the second argument. The following line makes X$ a line of 32 asterisks:

```
X$ = STRINGS(32, '*')
```

You can replace this with:

```
ZL = 32: ZC = ASC('*'): GOSUB 5000: X$ = ZS$
```

Of course, you must include this subroutine in the program.

Notice that all the variables in Listing 50100 start with the letter Z. This compensates for the fact that Basic has no local variables. If a subroutine uses a variable that is used elsewhere in a program, it can change the value of that variable. By using only variables that start with Z in the subroutines, and never using such variables in the calling program, I prevent this from happening.

**INSTR**

Another frequently encountered function is INSTR. This searches a string to see if another string is a part of it. It has two forms. The function INSTR(A$, B$) is zero if B$ does not appear as part of A$. If B$ does occur in A$, the function is the position at which B$ first starts in A$.

For example, INSTR("10/12/83", "/") equals three. The function INSTR(S, A$, B$) starts the search at position S in A$. The value of INSTR(4, "10/12/83", "/") is six.

Program Listing 2 can replace both forms of the INSTR function. For example:

```
80 I = INSTR(A$, B$)
```

is replaced by:

```
80 ZS$ = A$: ZT$ = B$: GOSUB 50100: I = ZI
```

```
50200 'ZI = INSTR(ZS$, ZTS$): START AT T 50120 FOR ZI = INSTR(ZS$, ZTS$)
50110 ZS =
50120 ZI = 0: IF ZS$ < 1 THEN ZS$ = 1
50130 FOR ZJ = ZS TO LEN(ZIS$): IF MIDS(ZS$, 1, LEN(ZTS$)) = ZTS$ THEN ZI =
50140 RETURN ELSE NEXT ZJ: RETURN
```

```
58200 'MIDS(ZS$, ZI) = ZMS$: FOR MIDS (ZS$, ZI, ZL$) = ZMS$: START AT 50220
50210 ZL = LEN(ZM$): GOTO 50230
50220 IF ZL = LEN(ZM$) OR ZL = 0 THEN
50230 ST = 50250: IF ZIC$ OR ZI = LEN(ZIS$) THEN
50240 PRINT "PC ERROR": STOP ELSE ZTS$ = ZM$: LEFTS(ZS$, ZL$) = ZTS$: RETURN
```

You can use many of those Extended Basic listings on your Color Basic CoCo with these subroutines.
providing that you've added the subroutine in Listing 2 to the program.

If a starting position is indicated, call the subroutine at 50120. For example:

90 IN = INSTR(S,"10/12/83","/")

is replaced by:

90 ZS = S:ZSS = "10/12/83" :ZTS = "/":GOSUB 50120:ZI = ZI

**MIDS**

The function MIDS is included in Color Basic. In Extended Basic, however, MIDS is also a command. The command MIDS$(A$,P,L) = B$, for example, replaces the characters in A$, starting with the Pth one, with the characters in B$. For example, if A$ = "ABCD$EFG" and B$ = "YZ", then the statement MIDS$(A$,4) = B$ changes A$ to "ABCYZFG".

Sometimes the command appears in the form MIDS$(A$,P,L) = B$. If L is less than the length of B$, then only the first L characters of B$ are used for replacement. If L is greater than or equal to the length of B, then this command is exactly the same as the one without the L.

Program Listing 3 replaces the MIDS command. In the first case described above, the subroutine is called at line 50200, while in the second case, it is called at 50220. For example:

40 MIDS$(A$,P,L) = B$

becomes:

40 ZSS = AS:ZI = P:ZM$ = B$:GOSUB 50200:
AS = ZSS

and the line:

50 MIDS$(A$,P,L) = B$

becomes:

50 ZSS = AS:ZI = P:ZL = L:ZM$ = B$:GOSUB 50200:
AS = ZSS

**HEX and &H**

Extended Basic includes functions for changing decimal numbers to hexadecimal and vice versa. This is especially useful when working with machine-language listings. HEX$ changes a decimal number to its hexadecimal equivalent.

Program Listing 4 does the same thing. If ZN is a decimal positive integer, a GOSUB 50300 makes ZH$ the hexadecimal form of the same number.

&H changes a hexadecimal number to decimal. Program Listing 5 does this in Color Basic. For example, the line:

10 CLEAR &H0000,&H3E00

is replaced by:

10 ZHS = \*0100\*:GOSUB 50400:T = ZN:ZH$ = \*3E00\*:GOSUB 50400:CLEAR T,ZN

The line:

20 A = VAL(&H + A$)

becomes:

20 ZHS = A$:GOSUB 50400:A = ZN

**VARPTR**

The Extended Basic function VARPTR is frequently used immediately before a call to a machine-language routine. It gives the location of a variable or array in memory. Program Listing 6 performs this function in Color Basic. Both work by searching the correct memory area for the desired variable name.

Variables are stored in 7 bytes of memory. The first 2 bytes are the variable name. If a variable has a one-letter name, then the second byte is set to zero for numeric variables and 128 for strings. For two-letter or longer variable names, the first two letters are used, with the ASCII code for the second increased by 128 for string variables.

Listing 6 is a subroutine for variables. Make ZV$ equal to the variable name. A call to subroutine 50500 puts VARPTR of that variable in ZV. For example:

60 V = VARPTR(VAN)

becomes:

60 ZV$ = "AN":GOSUB 50500:V = ZV

**DEFUSR and USR**

The Extended Basic DEFUSR command defines the execute address of a machine-language program that is called later with the USR function. The syntax is DEFUSRn = ad, where ad is the address and n is an integer from zero to nine. If n is zero, you can omit it. The machine-language program is called by a statement such as: X = USRn(Y), where you can again omit n if it is zero.

Program Listing 7 replaces DEFUSR in Color Basic. Let ZK be the digit from zero to nine. Set it to zero if you use only DEFUSR. As an example, the line:

20 DEFUSR3 = 1500

becomes:

50500 \*V = VARPTR(VS)
50510 GOSUB 50550:FOR J = PEEK(27) +256:PEEK(28) TO PEEK(29) +256+P
EER(30) -2 :IF PEEK(31) = ZI AND PEE
K(33) = ZI THEN Z2 = ZJ +2:RETURN ELSE NEXT J:PRINT"VARPTR NOT FOUND":STOP :RETURN
50550 X = USR(V)(ZS)
Program Listing 8 gives the corresponding USR function. If the line calling the program at 15000 is:

90 Z = USR(Y)

then this is replaced by:

90 ZK = GOSUB 50800 - X = USR(Y)

If a Basic program uses only one machine-language subroutine and its address is defined by using DEFUSR (with an implied digit zero), then subroutine 50800 need not be called before the USR statement.

LINEINPUT
The last Extended Basic command is LINEINPUT. This is a variation of the Color Basic command INPUT. With LINEINPUT, however, no ? prompt appears on the screen, and such symbols as commas, colons, and quotation marks can be part of the input.

Program Listing 9 replaces the LINEINPUT command in Color Basic. If you want to print some text as a prompt, put it in a PRINT statement immediately preceding the subroutine call. As an example, the line:

30 LINEINPUT “LAST NAME, FIRST NAME”; NS

becomes:

30 PRINT “LAST NAME, FIRST NAME”; :GOSUB 50000: NS = ZA$

Putting It All Together
You can use the nine subroutines in this article to translate a surprising number of programs from Extended Basic to Color Basic. You can type and save them all as a single program on a cassette.

Before typing in a listing that you want to change to Color Basic, load the tape cassette. Then as you type in the program, all these subroutines are available. You can delete any that you don’t use before saving the translated program.

Address correspondence to Harold Schneider, Dept. of Mathematical Sciences, Roosevelt University, 430 South Michigan Ave., Chicago, IL 60605.
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Go is a legendary war game that was a required course in the Chinese military academies as late as the 1600s.

This ancient Chinese game is a cross between Chinese checkers and chess and is easy to learn.

You can play against another person or the computer, but look out for the computer. It is a real Genghis Khan and searches for the position that lets it jump the greatest number of men.

To begin the game, press P to pass the first move to your opponent, or take your turn. By pressing the U, D, R, and L keys for up, down, right, and left respectively, you position the flashing cursor in the best position to jump your opponent's man. You can jump as many men as you want, or in any direction, as long as one of your men is at the opposite end of these lines. Press the space bar to execute the jump. If it is an illegal jump, you hear a short, low tone and must move the cursor to a legal position.

The computer scores automatically and when all spaces are filled, the screen displays an end-of-game message.

If near the end of the game it is impossible for you or your opponent to make a jump, press P to pass play to the opposite player. If you are playing the computer, the pass prompt appears automatically and you must press the P to pass play back to player one.

Address correspondence to Peter A. Holden, Rt. 2, Box 53E, Camdenton, MO 65020.

System Requirements
16K RAM
Extended Color Basic

Table 1. Variables

| K | Opponent's color |
|   | I | Player's color |
|   | ZA | Score for player 1 |
|   | ZB | Score for player 2 or computer |
|   | P | Horizontal cursor position |
|   | Q | Vertical cursor position |
| S = P + 7 | T | U | S |
| T = P - 7 | P | Q | S |
| U = Q - 4 | V | V | S |
| V = Q + 4 | AA | AF | V |
| AB | AF | T |
| AC | AV | AG | TU |

Table 2. Line Descriptions

| 10-80 | Title page |
| 90-150 | Determine if opponent is computer or person |
| 160-210 | Set playing field |
| 220-250 | Set player 1 and scoring area |
| 260-300 | Set player 2 or computer and scoring area |
| 310-340 | Set four center spots to start game |

Table continued
Table continued

| 350-420 | Determine player 1, 2, or computer |
| 430-510 | Increment cursor on computer's turn |
| 520-590 | Player 1 and 2 keyboard input |
| 600-687 | Player 1 and 2 cursor movement |
| 690-890 | Flash cursor and produce sound only when cursor moves |
| 900-910 | Set values for variable to protect cursor position |
| 920-930 | Check for opponent at 90° |
| 1010-1030 | Check for opponent at 135° |
| 1130-1150 | Check for opponent |
| 1200-1530 | Tab key continued |
| 1630-1710 | Jump 135° |

Program Listing. The Ancient Chinese Game of Go

```
10 CLS(4)
20 PRINT "THE ANCIENT CHINESE GAME OF "
30 PRINT "PROGRAMMED BY:"
40 PRINT "PETER A HO"
50 PRINT "PRINT$297, "RT 2 BOX 53E":"
60 PRINT "CARDAMENT NO:"
70 PRINT "65820","
80 FOR A=1 TO 98: NEXT A
90 CLS(8)
100 PRINT99, "WOULDC YOU LIKE TO PLAY AGAIN THE COMPUTER OR A OTHER PERSON?"
110 PRINT$492, "PRESS C FOR COMPUTER P FOR PERSON"
120 IF K$="C" THEN 1400
130 IF K$="P" THEN 1400
140 IF K$="C" THEN 2X=1
150 IF K$="P" AND A=256 THEN 1200
160 CLS(0)
170 FOR A=4 TO 54 STEP 7
180 FOR B=0 TO 28 STEP 4
190 SET(B,A,3)
200 NEXT B
210 NEXT A
220 ZZ=ZZ+1
230 PRINT$481, "PLAYER 1 "ZA;"
240 SET(1,31,5)
250 SET(2,30,5)
260 SET(31,36,4)
270 IF Z=1 THEN GOTO 290
280 PRINT$496, "COMPUTER "ZB; GOTO 0
290 PRINT$496, "PLAYER 2 "ZB;"
300 SET(31,34,4)
310 SET(25,12,5)
320 SET(32,16,5)
330 SET(25,16,4)
340 SET(32,12,4)
350 P=0:Q=1:R=0
360 ZZ=ZZ+1
370 IF ZZ=1 THEN J=4
380 IF ZZ=1 THEN X=5
390 IF ZZ=2 THEN J=5
400 IF ZZ=2 THEN K=4
410 IF ZZ=5 THEN GOTO 520
420 IF ZZ=5 THEN GOTO 520
430 IF P=3 THEN Q=4
440 IF P=7 AND P>53 THEN P=3: GOTO 440
450 IF P=7 AND P>53 THEN Q=4
460 IF P=7 AND P=4 THEN Q=0
470 IF Q=32: GOTO 2790
480 IF P=32: GOTO 2790
490 IF P=32: GOTO 2790
500 IF P=32: GOTO 2790
510 IF P=32: GOTO 2790
520 IF P=32: GOTO 2790
530 IF P=32: GOTO 2790
540 IF P=32: GOTO 2790
550 IF P=32: GOTO 2790
560 IF P=32: GOTO 2790
570 IF P=32: GOTO 2790
580 IF P=32: GOTO 2790
590 IF P=32: GOTO 2790
600 SOUND1,1
610 IF P=32 THEN Q=3
620 IF P=32 THEN Q=3
630 IF P=32 THEN Q=3
640 IF P=32 THEN Q=3
650 IF P=32 THEN Q=3
660 IF P=32 THEN Q=3
670 IF P=32 THEN Q=3
680 IF P=32 THEN Q=3
690 IF P=32 THEN Q=3
700 PRINT $496, "COMPUTER "ZB; GOTO 0
710 PRINT $496, "PLAYER 2 "ZB;"
720 IF P=32 THEN Q=3
730 IF P=32 THEN Q=3
740 IF P=32 THEN Q=3
750 IF P=32 THEN Q=3
760 IF P=32 THEN Q=3
770 IF P=32 THEN Q=3
780 IF P=32 THEN Q=3
790 SET(P,Q,C)
800 IF P=32 THEN Q=3
810 SET(P,Q,C)
820 GOTO 440
830 SET(1,36,5)
840 IF P=32 THEN GOTO 460
850 IF P=32 THEN GOTO 460
860 IF P=32 THEN GOTO 460
870 IF P=32 THEN GOTO 460
880 SOUND 1,2: GOTO 460
890 GOTO 368
900 S=P+Q: F=Q+4: V=Q+4
920 K$=INKEY$:IF K$="GOTO 490"
930 IF K$="GOTO 2910"
940 IF ZZ=1 AND ZZ=2 THEN SET(31,36,4)
950 IF ZZ=0 THEN GOTO 490
960 AA=POINT(S,Q)
970 IF AA=K THEN AA=3
980 IF S=53 OR U=50 THEN GOTO 1010
990 AB=POINT(S,Q)
1000 IF AA=K THEN AA=3
1010 IF ZZ=0 OR V=28 GOTO 1040
1020 IF ZZ=0 AND ZZ=3: GOTO 1040
1030 IF ZZ=0 AND ZZ=3: GOTO 1040
1040 IF ZZ=0 AND ZZ=3: GOTO 1040
1050 IF ZZ=0 AND ZZ=3: GOTO 1040
1060 IF ZZ=0 AND ZZ=3: GOTO 1040
1070 IF ZZ=0 AND ZZ=3: GOTO 1040
1080 IF ZZ=0 AND ZZ=3: GOTO 1040
1090 IF ZZ=0 AND ZZ=3: GOTO 1040
1100 IF ZZ=0 AND ZZ=3: GOTO 1040
1110 IF ZZ=0 AND ZZ=3: GOTO 1040
1120 IF ZZ=0 AND ZZ=3: GOTO 1040
1130 IF ZZ=0 AND ZZ=3: GOTO 1040
1140 IF ZZ=0 AND ZZ=3: GOTO 1040
1150 IF ZZ=0 AND ZZ=3: GOTO 1040
1160 IF ZZ=0 AND ZZ=3: GOTO 1040
1170 IF ZZ=0 AND ZZ=3: GOTO 1040
1180 IF ZZ=0 AND ZZ=3: GOTO 1040
1190 IF ZZ=0 AND ZZ=3: GOTO 1040
1200 IF ZZ=0 AND ZZ=3: GOTO 1040
1210 IF ZZ=0 AND ZZ=3: GOTO 1040
1220 IF ZZ=0 AND ZZ=3: GOTO 1040
1230 IF ZZ=0 AND ZZ=3: GOTO 1040
1240 IF ZZ=0 AND ZZ=3: GOTO 1040
1250 IF ZZ=0 AND ZZ=3: GOTO 1040
1260 IF ZZ=0 AND ZZ=3: GOTO 1040
1270 IF ZZ=0 AND ZZ=3: GOTO 1040
1280 IF ZZ=0 AND ZZ=3: GOTO 1040
1290 IF ZZ=0 AND ZZ=3: GOTO 1040
1300 IF ZZ=0 AND ZZ=3: GOTO 1040
1310 IF ZZ=0 AND ZZ=3: GOTO 1040
```

Listing continued
<table>
<thead>
<tr>
<th>Listing continued</th>
</tr>
</thead>
<tbody>
<tr>
<td>1120 IF ZX1 OR ZZ=1 GOTO 1360</td>
</tr>
<tr>
<td>1130 BA=BA+1</td>
</tr>
<tr>
<td>1130 MB=MB+7:IF MBCL GOTO 1330</td>
</tr>
<tr>
<td>1135 IF ZX1 GOTO 1410</td>
</tr>
<tr>
<td>1136 SET(M,G,R)</td>
</tr>
<tr>
<td>1170 GOSUB 3108</td>
</tr>
<tr>
<td>1180 SOUND180,1</td>
</tr>
<tr>
<td>1190 FOR A=1 TO 50:NEXT A</td>
</tr>
<tr>
<td>1400 M=M+7:IF MCL GOTO 1360</td>
</tr>
<tr>
<td>1410 IF AB=3 GOTO 1590</td>
</tr>
<tr>
<td>1420 L=SN=N-U</td>
</tr>
<tr>
<td>1430 L=L+7:N=N-4</td>
</tr>
<tr>
<td>1440 IF L=53 OR N&lt;2 GOTO 1590</td>
</tr>
<tr>
<td>1450 I=POINT(L,N)</td>
</tr>
<tr>
<td>1460 IF I=3 GOTO 1430</td>
</tr>
<tr>
<td>1470 IF I=3 GOTO 1590</td>
</tr>
<tr>
<td>1480 BG=1</td>
</tr>
<tr>
<td>1490 M=SN=UN=NU=</td>
</tr>
<tr>
<td>1500 IF ZX1 OR ZZ=1 GOTO 1540</td>
</tr>
<tr>
<td>1510 BB=BB+4</td>
</tr>
<tr>
<td>1520 MB=MB-7:MO=MO-4:IF MBCL OR MONT GOTO 1518</td>
</tr>
<tr>
<td>1530 IF ZX1 GOTO 1590</td>
</tr>
<tr>
<td>1540 SET(M,G,R)</td>
</tr>
<tr>
<td>1550 GOSUB 3108</td>
</tr>
<tr>
<td>1560 SOUND180,1</td>
</tr>
<tr>
<td>1570 FOR A=1 TO 50:NEXT A</td>
</tr>
<tr>
<td>1580 M=M+7:0=0-4:IF MCL OR OCN GOTO 1540</td>
</tr>
<tr>
<td>1590 IF AC=3 GOTO 1770</td>
</tr>
<tr>
<td>1600 L=SN=N-V</td>
</tr>
<tr>
<td>1610 L=L+7:N=N+4</td>
</tr>
<tr>
<td>1620 IF L=53 OR N&lt;2 GOTO 1770</td>
</tr>
<tr>
<td>1630 I=POINT(L,N)</td>
</tr>
<tr>
<td>1640 IF I=3 GOTO 1610</td>
</tr>
<tr>
<td>1650 IF I=3 GOTO 1770</td>
</tr>
<tr>
<td>1660 BG=1</td>
</tr>
<tr>
<td>1670 M=SN=BU=V=MO=V</td>
</tr>
<tr>
<td>1680 IF ZX1 OR ZZ=1 GOTO 1720</td>
</tr>
<tr>
<td>1690 BC=BC+1</td>
</tr>
<tr>
<td>1700 MB=MB+7:MO=MO+4:IF MBCL OR MONT GOTO 1690</td>
</tr>
<tr>
<td>1710 IF ZX1 GOTO 1770</td>
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</tr>
<tr>
<td>1740 SOUND180,1</td>
</tr>
<tr>
<td>1750 FOR A=1 TO 50:NEXT A</td>
</tr>
<tr>
<td>1760 M=M+7:0=0+4:IF MCL OR OCN GOTO 1720</td>
</tr>
<tr>
<td>1770 IF AD=3 GOTO 1950</td>
</tr>
<tr>
<td>1780 N=U</td>
</tr>
<tr>
<td>1790 N=N-4</td>
</tr>
<tr>
<td>1800 IF N&lt;8 GOTO 1950</td>
</tr>
<tr>
<td>1810 I=POINT(P,N)</td>
</tr>
<tr>
<td>1820 IF I=3 GOTO 1790</td>
</tr>
<tr>
<td>1830 IF I=3 GOTO 1950</td>
</tr>
<tr>
<td>1840 BG=1</td>
</tr>
<tr>
<td>1850 O=MO=U</td>
</tr>
<tr>
<td>1860 IF I=3 OR ZZ=1 GOTO 1900</td>
</tr>
<tr>
<td>1870 BD=BD+1</td>
</tr>
<tr>
<td>1880 MO=MO-4:IF MONT GOTO 1870</td>
</tr>
<tr>
<td>1890 IF ZX1 GOTO 1950</td>
</tr>
<tr>
<td>1890 SET(M,P,K)</td>
</tr>
<tr>
<td>1910 GOSUB 3108</td>
</tr>
<tr>
<td>1920 SOUND180,1</td>
</tr>
<tr>
<td>1930 FOR A=1 TO 50:NEXT A</td>
</tr>
<tr>
<td>1940 O=0:IF OCN GOTO 1900</td>
</tr>
<tr>
<td>1950 IF AE=3 GOTO 2130</td>
</tr>
<tr>
<td>1960 N=N+V</td>
</tr>
<tr>
<td>1970 N=N-4</td>
</tr>
<tr>
<td>1980 IF N&gt;28 GOTO 2130</td>
</tr>
<tr>
<td>1990 I=POINT(P,N)</td>
</tr>
<tr>
<td>2000 IF I=3 GOTO 1970</td>
</tr>
<tr>
<td>2010 IF I=3 GOTO 2130</td>
</tr>
<tr>
<td>2020 BG=1</td>
</tr>
<tr>
<td>2030 Q=MO=U</td>
</tr>
<tr>
<td>2040 IF ZX1 OR ZZ=1 GOTO 2000</td>
</tr>
<tr>
<td>2050 BE=BE+1</td>
</tr>
<tr>
<td>2060 MO=MO-4:IF MONT GOTO 2050</td>
</tr>
<tr>
<td>2070 IF ZX1 GOTO 2130</td>
</tr>
<tr>
<td>2080 SET(M,P,K)</td>
</tr>
<tr>
<td>2090 GOSUB 3108</td>
</tr>
<tr>
<td>2100 GOSUB 2101</td>
</tr>
<tr>
<td>2110 FOR A=1 TO 50:NEXT A</td>
</tr>
<tr>
<td>2120 O=0+4:IF OCN GOTO 2000</td>
</tr>
<tr>
<td>2130 IF AF=3 GOTO 2130</td>
</tr>
<tr>
<td>2140 L=O+1</td>
</tr>
<tr>
<td>2150 IF L=7 GOTO 2160</td>
</tr>
<tr>
<td>2160 IF LC=2310</td>
</tr>
<tr>
<td>2170 I=I+7 GOTO 2110</td>
</tr>
<tr>
<td>2180 IF I=J GOTO 2150</td>
</tr>
<tr>
<td>2190 I=I+3 GOTO 2130</td>
</tr>
<tr>
<td>2200 BG=1</td>
</tr>
</tbody>
</table>

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As the secretary of a bowling league and owner of a Color Computer, I decided that doing the bowling statistics on the computer made a lot of sense. This program keeps the individual bowler's statistics from bowling scores that you input. It calculates the total number of pins, the total number of games bowled, and the resulting bowling average. It compares each game with the highest game and each series with the highest series, listing new high scores when they are attained.

The program begins with a menu of options (lines 150-200). The only options that operate upon running are (1) input a file, (4) input names, or (6) end.

The first time you run the program, use option 4 to input the names. There is space for up to 49 names, each 20 characters long. After you have input the last name, type "END". You can increase the number of names possible by changing M in line 110 and the CLEAR statement in line 100, and you can add new names at any time, even of games bowled, and the resulting bowling average. It compares each game with the highest game and each series with the highest series, listing new high scores when they are attained.

If you bowl in a league and are struggling to keep the statistics, here is the program for you.

Table 1. Variable List

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N$</td>
<td>Names</td>
</tr>
<tr>
<td>TP</td>
<td>Total pins</td>
</tr>
<tr>
<td>TG</td>
<td>Total games</td>
</tr>
<tr>
<td>HG</td>
<td>High game</td>
</tr>
<tr>
<td>HS</td>
<td>High series</td>
</tr>
<tr>
<td>AV</td>
<td>Average</td>
</tr>
<tr>
<td>NG</td>
<td>New Games</td>
</tr>
<tr>
<td>S</td>
<td>Series</td>
</tr>
<tr>
<td>NS</td>
<td>File name</td>
</tr>
<tr>
<td>D5</td>
<td>Date</td>
</tr>
<tr>
<td>Q,C,D,E,F,</td>
<td>Used in sort</td>
</tr>
<tr>
<td>G,H$,H</td>
<td></td>
</tr>
<tr>
<td>FS</td>
<td>File sort need</td>
</tr>
</tbody>
</table>

System Requirements

16K RAM
Extended Color Basic
Printer (optional)
after you have created the file.

Option 2, input new scores, prints the name to which a score is to be input. All scores must be three digits long. If you enter a two-digit score, first enter a space for the empty hundreds place. If no game was bowled, press the enter key.

After entering the three scores, press any key to go to the next bowler. Inputting scores ends after you have finished the last name in the file, or if you press E.

"The screen displays the name, the high game, high series, total pins, total games, and average."

Option 3, output, allows information to be output on the printer or the screen and to be saved on disk or tape. If you haven't named the file, the program will request a name and date before continuing.

The data is sorted by average before any output. The sorting routine uses the high-speed POKE 65495,0. If this POKE does not work on your computer, delete line 1620.

The screen displays the name, the high game, high series, total pins, total games, and average. The printer routine is for the Line Printer VII and will print all the above, the scores for each game, and the series for these games.

You can use option 5, correct file, to make changes in the name, high game, high series, total pins, total games, or to delete the name from the file.

Option 1, input file, lets you input a saved data file. Type in the name of the file and date. After you input the data file, the program returns to the main menu.

If an error occurs, try saving the data with a GOTO 130.

Listing continued
of the hill! It's a jungle out there, but the latest news on the Color Computer grapevine is that, above the swirling mists of confusion, more and more people are discovering the Rainbow.

Now in its third year, the Rainbow has become the standard by which all other Color Computer magazines are compared. And no wonder! The Rainbow towers above the crowd, now offering more than 300 pages each month, including more than two dozen type-in-and-run program listings, a host of articles and in excess of 30 hardware and software product reviews.

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When my nine-year-old son asked me to teach him Morse code, I remembered the methods of the man who taught me when I became a ham radio operator. I decided to combine these methods with the capabilities of the Color Computer to develop an effective and entertaining teaching method.

One important element in learning the code is to associate sounds, rather than dots and dashes, with each letter. The SOUND command accomplishes this. My son has learned about a third of the code so far and has not seen a dot or dash.

Morse Code Teacher presents the code in sections beginning with the easy letters: e, i, s, and h. This helps the student learn some letters quickly, preventing early discouragement. The program first asks for a level from 1 to 11. Start the beginner at level 1 and advance through the rest of the levels only after he has thoroughly learned the code in each of the preceding levels.

The program then asks for a code speed from 1 to 3. The fast speed is fast enough for the amateur-radio novice license. Here again, start with the slow speed and increase it as the learning rate permits.

Morse Code Teacher divides the learning into three parts. It prints the letter or character on the screen and sounds the corresponding code. This

Here’s instant .-----... (SOS) for teaching Morse code, complete with sound and colorful graphics.

System Requirements
16K RAM
Extended Color Basic
repeats using the next character in the chosen level until it completes all the characters in that level.

Then the student reviews by pressing characters on the keyboard for which the computer sounds a corresponding code. When confident of the code in a chosen level, the student can go on to the testing portion of the program that is written in the form of a simple game to hold his interest.

An alien ship sends Morse code while descending toward Earth. The student intercepts the code and presses the corresponding key of the computer. If the depressed key matches the code, the alien ship explodes and the Earth is saved. If not, aliens invade the Earth.

The computer keeps the score and displays it after testing the student on all the characters in the chosen level.

---

**Address correspondence to Robert P. Yeater, RFD #4, Box 78, Moundsville, WV 26041.**

---

**Program Listing. Morse Code Teacher**

5 CLEAR200,16800
10 "MORSE CODE TEACHER"
20 "WRITTEN BY ROBERT P. YEATER"
30 "WRITTEN JULY 1983"
35 "SCREEN BORDER ROUTINE"
40 FOR X=16000 TO 16068:READ C$P
50 OKE,C$:NEXT X
58 DATA 139,24,134,169,142,4,8,1
67,128,140
68 DATA 4,33,38,249,142,5,223,16
7,128,140
70 DATA6,8,38,249,142,4,63,167,1
28,167
80 DATA 128,58,140,5,223,38,246,
57,138
90 DATA 30,134,122,62,132,13
4,255,142,4
100 DATA 0,167,128,140,4,64,38,2
49,142,5
110 DATA 192,167,128,140,6,30,8
249,57
120 DIM V(20,20)
130 DIM C$(39),M$(39)
140 CLS2:EXEC 16000
150 PRINT"MORSE CODE TEACHER"

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**HOT CoCo February 1984 101**
JOURNEY TO THE CENTER OF THE ROM—PART IV

THE BASIC COMMUNICATIONS AREA

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<th>0003-00FF</th>
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<td>0004</td>
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<td>IF counter during scan</td>
<td>0005</td>
<td></td>
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<tr>
<td>LOCATE/CREATE variable flag</td>
<td>0006</td>
<td></td>
</tr>
<tr>
<td>Number Type Flag (NTF)</td>
<td>0007</td>
<td></td>
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<td>0008</td>
<td></td>
</tr>
<tr>
<td>&lt; &gt; -String</td>
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<td></td>
</tr>
<tr>
<td>Open string space flag</td>
<td>000A</td>
<td></td>
</tr>
<tr>
<td>FOR flag</td>
<td>000B-000C</td>
<td></td>
</tr>
<tr>
<td>READ INPUT flag</td>
<td>000D-000E</td>
<td></td>
</tr>
<tr>
<td>0—INPUT</td>
<td>000F-0010</td>
<td></td>
</tr>
<tr>
<td>&lt; &gt; -READ</td>
<td>0011-0012</td>
<td></td>
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<td>0013-0016</td>
<td></td>
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<td>0017-0018</td>
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<td>Last entry in the temporary string area pointer</td>
<td>0019-001A</td>
<td></td>
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<td>Stack memory pointer during stack scan</td>
<td>001B-001C</td>
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</tr>
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<td>001D-001E</td>
<td></td>
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<td>0013 MSB</td>
<td>001F-0020</td>
<td></td>
</tr>
<tr>
<td>0014 NMSB</td>
<td>0021-0022</td>
<td></td>
</tr>
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<td>0015 NNMSB</td>
<td>0023-0024</td>
<td></td>
</tr>
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<td>0016 LSB</td>
<td>0025-0026</td>
<td></td>
</tr>
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<td></td>
</tr>
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<td>0029-002A</td>
<td></td>
</tr>
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<td>002B-002C</td>
<td></td>
</tr>
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<td>Start of the array variables area pointer</td>
<td>002D-002E</td>
<td></td>
</tr>
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<td>Start of the free memory area pointer</td>
<td>002F-0030</td>
<td></td>
</tr>
<tr>
<td>Next available location in string space pointer</td>
<td>0031-0032</td>
<td></td>
</tr>
<tr>
<td>String space storage location while building a string entry</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start of the reserved-memory-area pointer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BREAK line number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Result of unsigned 16-bit ASCII to binary conversion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BREAK encoded statement pointer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location of last byte executed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>READ line number</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

0033-0034 READ pointer
0035-0036 Input pointer during READ/INPUT
0037-0038 Variable name during variable location/creation
0039 First character of the variable name—bit 7 will be set if the variable is a string
003A-003B Second character of the variable name...
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0047-0048 Start of source during block move
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004D-004E Temporary string VARPTR
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0055 Reserved
0056 String length while building a string entry
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005E-0062 Combined sign flag (SF)
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0060-0064 String ending address while building a string entry
0065-0066 Address of the next line during LIST/LLIST
0067 Current line number
0068-0069 Current line position
006A-006B Cassette flag for comma check
006C Cassette flag for comma check
006D Line length
006E Current device flag: 0 = video or keyboard,
006F -1 = cassette, -2 = printer
0070 EOF flag
0071 RESET flag
0072-0073 RESET address

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| 0074-0075 | End of RAM pointer |
| 0076-0077 | Reserved |
| 0078 | OPEN/CLOSE flag: 0 = cassette CLOSED, 1 = cassette OPEN "1", 2 = cassette OPEN "0" |
| 0079 | Number of bytes in the cassette buffer |
| 007A-007B | Next available location in the cassette buffer pointer |
| 007C | Cassette block type: 0 = file header block, 1 = data block, FF = End-of-file block |
| 007D | Cassette block length |
| 007E-007F | Cassette buffer address |
| 0080 | Cassette checksum |
| 0081 | Cassette error code or temporary block length |
| 0082 | Cassette bit counter |
| 0083 | Cassette bit duration |
| 0084 | Cassette sync value |
| 0085 | Last cassette sine value |
| 0086 | Graphics bit mask |
| 0087 | Last key pressed |
| 0088-0089 | Current cursor location |
| 008A-008B | Always zero |
| 008C | SOUND tone |
| 008D-008E | SOUND duration |
| 008F | Cassette bit duration comparison value |
| 0090 | Cassette bit sync comparison value |
| 0091 | Cassette bit sync comparison value |
| 0092-0093 | Number of bytes in a cassette leader |
| 0094 | Blink cursor counter |
| 0095-0096 | Printer baud-rate delay |
| 0097-0098 | Printer carriage-return delay |
| 0099 | Printer comma field width |
| 009A | Printer last comma field |
| 009B | Printer line length |
| 009C | Printer carriage position |
| 009D-009E | EXEC address |

| 009F-00AE | Bump the encoded statement pointer (ESP) routine |
| 00AF-00FF | Reserved |
| 0100-0102 | SWI3 Vector |
| 0103-0105 | SWI2 Vector |
| 0106-0108 | SWI Vector |
| 0109-010B | NMI Vector |
| 010C-010E | IRQ Vector |
| 010F-0111 | FIQ Vector |
| 0112-0114 | USR Vector |
| 0115 | Reserved |
| 0116-0119 | RND seed |
| 011A | Keyboard shift flag |
| 011B-011C | Keyboard debounce value |
| 011D-011F | 1 Vector |
| 0120 | Number of words in the Color Basic statements reserved-words list |
| 0121-0122 | Color Basic statements reserved-words-list pointer |
| 0123-0124 | Color Basic statements jump-address-table pointer |
| 0125 | Number of words in the Color Basic functions reserved-words-list |
| 0126-0127 | Color Basic functions reserved-words-list pointer |
| 0128-0129 | Color Basic functions jump-address-table pointer |
| 012A | Number of words in the Extended Color Basic statements reserved-words-list |
| 012B-012C | Extended Color Basic statements reserved-words-list pointer |
| 012D-012E | Extended Color Basic statements jump-address-table pointer |
| 012F | Number of words in the Extended Color Basic functions reserved-words-list |
| 0130-0131 | Extended Color Basic functions reserved-words-list pointer |
| 0132-0133 | Extended Color Basic functions jump-address-table pointer |
| 0134 | Number of words in the Disk Extended Color Basic statements reserved-words list |
| 0135-0136 | Disk Extended Color Basic statements reserved-words-list pointer |
| 0137-0138 | Disk Extended Color Basic statements jump-address-table pointer |
| 0139 | Number of words in the Disk Extended Color Basic functions reserved-words list |
| 013A-013B | Disk Extended Color Basic functions reserved-words-list pointer |
| 013C-013D | Disk Extended Color Basic functions jump-address-table pointer |
| 013E | Number of words in the optional statements reserved-words list |
| 013F-0140 | Optional statements reserved-words-list pointer |
| 0141-0142 | Optional statements jump-address-table pointer |
| 0143 | Number of words in the optional statements reserved-words-list |
| 0144-0145 | Optional functions reserved-words-list pointer |
| 0146-0147 | Optional functions jump-address-table pointer |
| 0148-0151 | Dummy reserved-words-list block |
| 0152-0159 | Keyboard work area: |

<table>
<thead>
<tr>
<th>FE</th>
<th>FB</th>
<th>F7</th>
<th>EF</th>
<th>DF</th>
<th>BF</th>
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<td>X</td>
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<td>R</td>
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<td>C</td>
<td>K</td>
<td>S</td>
<td>1</td>
<td>3</td>
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<td>D</td>
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<td>M</td>
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<td>158</td>
<td>F</td>
<td>N</td>
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<td></td>
</tr>
<tr>
<td>159</td>
<td>G</td>
<td>O</td>
<td>W</td>
<td>SPACE</td>
<td>7</td>
</tr>
</tbody>
</table>
The Color Computer has a powerful ally in FILMASTR. This is a DATA MANAGEMENT SYSTEM that you can trust. FILMASTR combines the best features of the big systems to provide a combination of speed, power, and ease of operation that can't be beat.

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Please allow 6-8 weeks for delivery
You are about to enter a monitor and hexadecimal loader program, Ramaster (Program Listing 1). For those of you who are not yet binary oriented, you use a monitor to look at information contained in both RAM and ROM bytes.

This information can be displayed in ASCII characters (letters of the alphabet, punctuation, and numbers) or hexadecimal (numeric code). You select is also possible to change existing memory. A hex loader can assemble this program (provided you have an assembler) anywhere in memory (I use Radio Shack's ED-TASM+). This should allow you to load it in your computer (change line 100) without stepping all over the program you wish to monitor.

The program begins at 14000 (100 ORG 14000) and ends at 15466, which should be out of the way for most programs. Therefore, you shouldn't need to make any changes in it. You will need an additional 512 bytes for "Screen Save," however.

After you load the program, type EXEC 14000 and push the enter key. The screen first displays simple instructions for using the hex loader.

Use this monitor to look at memory information, and this hex loader as a fast way to enter machine code.

---

### Function Keys (Hex Loader)
- Shifted Up Arrow—moves the cursor position for editing. It must be on the MSN screen position. R pushed twice—restarts the program.
- M (monitor)—saves the current screen in memory.

### Error Handling (Hex Loader)
If you push an incorrect key (i.e., any key except 0-9, A-F, or R, M) you'll get an ENTRY ERROR 1, (MSN) or an ENTRY ERROR 2 (LSN).

Incorrect keys are not stored in memory.

### Function Keys (Monitor)
- Down Arrow—increments the byte by one.
- Up Arrow—decrements the byte by one.
- Right Arrow—does not change address.
- H—displays the hex value.
- A—displays the ASCII characters and graphics characters.

### Table 1. Key Description

<table>
<thead>
<tr>
<th>Key Description</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function Keys</td>
<td>Shifted Up Arrow</td>
</tr>
<tr>
<td></td>
<td>R pushed twice</td>
</tr>
<tr>
<td></td>
<td>M (monitor)</td>
</tr>
</tbody>
</table>

### System Requirements

- 16K RAM

---

February 1984

HOT CoCo
If you make an error while loading the program, you can use the shifted up-arrow key to back up to the problem line and edit your mistake. You must back up to a MSN position (the first position of the pair) to use this editing feature. For example, in the program above, the A in A7 is the MSN.

Should you want to start over from the beginning, push the R key twice, but don’t restart yet unless you need to retype the program.

While the screen still displays the program, push M for monitor. This saves the present screen in memory and transfers control to the monitor. Now you’ll see the instructions for the monitor program on the screen. To see the program you have already typed in, push 0900 (the starting point from which you begin examining memory).

When the screen clears, push the right-arrow key. You’ll see 2304(DEC) 8E(DATA) 0900(HEX). 8E is the value contained in the address 2304 decimal and 0900 hexadecimal.

Now push the down-arrow key. You’ll see :2305 04.0901:; because the down-arrow key increased the memory location. Push the up-arrow key to display :2304 8E 0900:. The up arrow decreases the memory location.

Should you wish to change your starting point, push E for exit to the hex loader. This displays the previously entered program (screen last used). Push M for monitor and enter your desired starting point (in hex) at the location at which you would like to examine memory. You must make this entry according to the following format: most-significant byte (MSB), least-significant byte (LSB).

You can examine memory in ASCII mode. To demonstrate, push E (exit to hex loader) while in the monitor. Push R twice to restart. Enter the starting address (2E00). Push 7, 0, 7, 1, 7, 2, 3, 7, 4, 7, 5, 7, 6, 7, 7, 7, 8, 7, and 9 (again, ignore the commas). The screen should display the following:

```
00520 LSHIBS RMB 2 HEX LOADER STO!E FOR L/S HIBB
00530 INCB INCREASE TABLE ADDR.
00540 CMPA #2580 LOY ERROR2 BASE ADDRESS
00550 BEQ ERROR2 INSTRUCTION EHO FILE
00560 LBD ERROR2 LBD ERROR2
00570 ERROR2 ERROR2 ERROR2
00580 ERROR2 ERROR2 ERROR2
00590 ERROR2 ERROR2 ERROR2
00600 ERROR2 ERROR2 ERROR2
00610 ERROR2 ERROR2 ERROR2
00620 ERROR2 ERROR2 ERROR2
00630 ERROR2 ERROR2 ERROR2
00640 ERROR2 ERROR2 ERROR2
00650 ERROR2 ERROR2 ERROR2
00660 ERROR2 ERROR2 ERROR2
00670 ERROR2 ERROR2 ERROR2
00680 ERROR2 ERROR2 ERROR2
00690 ERROR2 ERROR2 ERROR2
006a0 ERROR2 ERROR2 ERROR2
006b0 ERROR2 ERROR2 ERROR2
006c0 ERROR2 ERROR2 ERROR2
006d0 ERROR2 ERROR2 ERROR2
006e0 ERROR2 ERROR2 ERROR2
006f0 ERROR2 ERROR2 ERROR2
00700 ERROR2 ERROR2 ERROR2
00710 ERROR2 ERROR2 ERROR2
00720 ERROR2 ERROR2 ERROR2
00730 ERROR2 ERROR2 ERROR2
00740 ERROR2 ERROR2 ERROR2
00750 ERROR2 ERROR2 ERROR2
00760 ERROR2 ERROR2 ERROR2
00770 ERROR2 ERROR2 ERROR2
00780 ERROR2 ERROR2 ERROR2
00790 ERROR2 ERROR2 ERROR2
007a0 ERROR2 ERROR2 ERROR2
007b0 ERROR2 ERROR2 ERROR2
007c0 ERROR2 ERROR2 ERROR2
007d0 ERROR2 ERROR2 ERROR2
007e0 ERROR2 ERROR2 ERROR2
007f0 ERROR2 ERROR2 ERROR2
00800 ERROR2 ERROR2 ERROR2
00810 ERROR2 ERROR2 ERROR2
00820 ERROR2 ERROR2 ERROR2
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008b0 ERROR2 ERROR2 ERROR2
008c0 ERROR2 ERROR2 ERROR2
008d0 ERROR2 ERROR2 ERROR2
008e0 ERROR2 ERROR2 ERROR2
008f0 ERROR2 ERROR2 ERROR2
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009e0 ERROR2 ERROR2 ERROR2
009f0 ERROR2 ERROR2 ERROR2
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00ac0 ERROR2 ERROR2 ERROR2
00ad0 ERROR2 ERROR2 ERROR2
00ae0 ERROR2 ERROR2 ERROR2
00af0 ERROR2 ERROR2 ERROR2
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00d60 ERROR2 ERROR2 ERROR2
00d70 ERROR2 ERROR2 ERROR2
00d80 ERROR2 ERROR2 ERROR2
00d90 ERROR2 ERROR2 ERROR2
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00db0 ERROR2 ERROR2 ERROR2
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00de0 ERROR2 ERROR2 ERROR2
00df0 ERROR2 ERROR2 ERROR2
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00f60 ERROR2 ERROR2 ERROR2
00f70 ERROR2 ERROR2 ERROR2
00f80 ERROR2 ERROR2 ERROR2
00f90 ERROR2 ERROR2 ERROR2
00fa0 ERROR2 ERROR2 ERROR2
00fb0 ERROR2 ERROR2 ERROR2
00fc0 ERROR2 ERROR2 ERROR2
00fd0 ERROR2 ERROR2 ERROR2
00fe0 ERROR2 ERROR2 ERROR2
00ff0 ERROR2 ERROR2 ERROR2
```

Program Listing 1. Ramaster
Now push M. Enter the monitor starting address, 2EE0. Next, push A (ASCII) and the right-arrow key. You'll see :12000 (DEC) 0 (ASCII) 2EE0 (HEX):. Pushing the down arrow will let you see 0–9, and the up arrow shows

"Now it is time to enter a longer program to better see how fast and simple the hex loader is to use."

Now it is time to enter a longer program to better see how fast and simple the hex loader is to use.

9–0. The right arrow does not change memory locations.

While in the hex-loader program, you can enter 76 bytes per screen (last screen saved when transferred to monitor). There is no limit to the amount of data you enter. Nothing is changed in memory, unless you push both keys per byte.

Enter the same short program as before. Exit Ramaster to Basic by pushing the reset button. Type EXEC 36G and push enter. You should see a small red block at the top left of the screen. To exit the small program to Basic, push the reset button.

Now it is time to enter a larger program to better see how fast and simple the hex loader is to use. I realize it might seem difficult for newcomers to distinguish the actual program (in hex) from the rest of the program, but that's another reason for this step.

When you find an Assembly-language listing in a magazine, it always includes two sources: the source code before assembly and the assembled source code. The assembled source code is the important part in this case. It's always in hex—the computer's natural language.

After loading Ramaster and typing EXEC 1400, type in Program Listing 3.

---

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Listing continued

Continued on p. 115

Ignore the addresses and enter only the data.

The ORG tells the assembler where in RAM the program begins. In this case it begins at RAM byte 10000 (decimal) 2710 (hex). Line 100 is also an assembler directive; it tells the assembler what to do, but it isn’t translated (assembled) into anything the computer understands. Hence, the blank space after the starting address (2710).

The only reason I point out line 100 is to show you an assembler directive in action and to tell you to ignore them when you see them. Two sure indications of an assembler directive are a blank followed by data (8E0402) and is the address first, and follow it with grams with a hex loader than with an editor/assembler. For example, line 110

The listing continued
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[Listing continues]
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- On-line cassette reads & writes
- Word mode eliminates split words
- Automatic capture of titles
- Pre-enter data before calling
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- Supports Colorful Graphics
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Listing continued

04700 LDX #$1280 INSTRUCTIONS SCREEN ADDR.
04710 LDX #$00 INDIR
04720 INSLP LDA ,Y
04730 STA ,X
04740 TIMA #$256 END FLAG
04750 LBEQ EXINS
04760 BRA INSLP
04770 INSLP LOX KEYSTR LOAD MEMORY START
04780 STX TEMPSTR SAVE MEM. START
04800 LOX #TEMPSTR MONITOR LOOKS FOR STARTING ADDR. AT BA IN LOADING R
04820 OUTNE
04830 STX KEYSTR
04840 LDA #$1 SET RETURN TO MONITOR FLAG
04850 STA SETRTM STORE FLAG
04860 LOX CURSER
04870 STX TEMCUR TEMPORARY STORE CURSER POSITION
04880 LOX #1899 LOAD NEW CURSER POSITION
04890 STX CURSER STORE NEW CURSOR POS.
04900 JSR SRTKY GET MONITOR STARTING ADDRESS
04910 LOX KEYSTR LOAD STARTING ADDRESS
04920 STX PROGRM STORE STARTING ADDR.
04930 CLR SEITRM CLEAR RTS FLAG
04940 JSR CLEAR
04950 LOX TEMPSTR RESTORE OLD LOCATIONS
04960 STX KEYSTR
04970 LOX TEMCUR
04980 STX CURSER
04990 RTS GOTO MONITOR

05000 & THIS ROUTINE RESTORES HEX LOADER SCREEN
05010 RTOLD LOX #LASTEN
05020 LDX #$192
05030 RNPOT SC LDA ,X
05040 STA ,Y
05050 CNPY #$150
05060 BNE RNPOT SC
05070 CLR TSLGDO
05080 LSRA STATRT
05090 FNSHCW LOX MONDO
05100 LEAX -#24,X OLD LINE ON SCREEN
05110 LOD PRTNIX HEX NUMBER TO BE PUT ON SCREEN
05120 TFR A,B PUT HEX MOST SIG. BYTE IN A & B
05130 JSR SFNIB PRINT M/S NIB. OF M/S BYTE
05140 TFR B,A
05150 AMDA #$15 CLEAR M/S NIBB.
05160 JSR PUTLSN PRINT L/S NIBB OF M/S BYTE
05170 LOD PRTNIX
05180 TFR B,A
05190 JSR SFNIB PRINT L/S NIB OF L/S BYTE
05200 TFR B,A
05210 AMDA #$15 CLEAR M/S NIBB.
05220 JSR PUTLSN PRINT L/S NIBB OF L/S BYTE
05230 LBRA DISPLAY GOTO MONITOR MAIN LOOP
05240 SFNIB LSRA SHIFT NIBBLE RIGHT
05250 LSRA LSRA
05260 LSRA LSRA
05270 LSRA
05280 PUBLSN CNPA #3 COMPARE TO 9
05290 BHI CONULT IF HIGHER CONVERT TO LETTER
05300 ADDA #12 CONVERT TO NUMBER
05310 BRA MPS1 PUT ON SCREEN
05320 CONULT ADDA #$5 CONVERT NIBBLE TO LETTER
05330 MPS1 STA ,X PUT ON SCREEN
05340 LEAX 1,X ADVANCE SCREEN ADDR.
05350 RTS
05360 LASTEN NOP STORE HEX LOADER SCREEN ADDR. STARTING HERE
05370 END

0900 00110 ORG $0900 'prog start address
0900 0E 0402 00110 START LDX #$402 'screen location
0900 0E 0F FF 00120 LDA #$FF 'RED CURSOR
0905 A7 04 00130 STA ,X 'put cursor on scrn
0907 28 F0 00140 STOP BRA STOP 'stay in loop
000000 TOTAL ERRORS

START 0900
STOP 0907

Program Listing 2. Hex-Loader Demo Program
START LDX #1024 takes 20 keystrokes to enter with an editor/assembler, but the hex loader requires only six (8E0400).

After entering the program, push M, type 2710, and push the right-arrow key. The screen will display 10000 8E 2710. Use the arrow keys to continue scanning memory to make sure you’ve entered the program correctly. When you’re sure you’ve done so, push E, then M again, enter 2710, and push W (words). This displays memory as ASCII letters.

Memory byte 10017 contains I, byte 10019 contains L, byte 10020 contains 0, and so on. To get back to hex mode, push H; now byte 10017 contains 49.

To test the program, execute the short program Ramaster by pushing the reset button. Exit from Basic by entering EXEC 10000. The top left screen should read “I Love My Color Computer.” Remember, entering assembled programs with this hex loader is about three times faster than with an editor/assembler.

As a further aid, I’ll examine Program Listing 4. It’s for demonstration only—don’t execute it. It consists mostly of assembler directives and can be confusing to beginners.

From the hex loader, enter starting address 2C22, data 8600, A784, FF, and FFDC. Notice that 2C27 (00150 SHOUT EQU KONK) is not assigned a memory location, nor is 2C26 (00160 LOUD EQU BONK). I haven’t incremented the memory locations (left column) either; therefore, ignore 2C27 and 2C26. (Do not confuse this with FCC directives. The memory location is incremented although not printed on the assembled source.)

Memory location 2C29 contains no apparent data, but it does increase, so you must duplicate this with the hex loader. Therefore, push the zero key twice (RMB is a reserve number bytes directive). Push this same key twice again for 2C2A, and for 2C2B (not shown).

Pushing the zero key twice increments the hex loader 1 byte (the byte now contains 00). To continue, enter 04D2, BE2C2C.

As a summary then, enter 2C22 (starting address), 8600, A784, FF, FFDC, 00, 00, 00, 04D2, and BE2C2C.

Of course, you realize that you should use the CSAVEM (Extended Color Basic only) command to save on tape any machine code program you type in. For example, if you entered the sample program ("I Love My Color Computer") from Basic, type CSAVEM “SAMPLE”, 10000, 10044, 10000.

Write to Emmett Lewis at 4818 French, Corpus Christi, TX 78411.

---

**Program Listing 3. Sample Assembly Program**

<table>
<thead>
<tr>
<th>Memory Location</th>
<th>Assembled Source Code</th>
<th>Assembler Line Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2710 8E 0400</td>
<td>00110 START LDX #1024</td>
<td>10000</td>
</tr>
<tr>
<td>2713 100E 2721</td>
<td>00120 LDX #NAME</td>
<td></td>
</tr>
<tr>
<td>2717 A6 A0</td>
<td>00130 LOOP LDA ,Y+</td>
<td></td>
</tr>
<tr>
<td>2719 81 C8</td>
<td>00140 CMPA #200</td>
<td></td>
</tr>
<tr>
<td>271B 24 1B</td>
<td>00150 BHS EXIT</td>
<td></td>
</tr>
<tr>
<td>271D A7 80</td>
<td>00160 STA ,X+</td>
<td></td>
</tr>
<tr>
<td>271F 20 F6</td>
<td>00170 BRA LOOP</td>
<td></td>
</tr>
<tr>
<td>2721 49</td>
<td>00180 FCB /I/</td>
<td></td>
</tr>
<tr>
<td>2722 60</td>
<td>00190 FCB 96</td>
<td></td>
</tr>
<tr>
<td>2723 4C</td>
<td>00200 FCB /LOVE/</td>
<td></td>
</tr>
<tr>
<td>2727 60</td>
<td>00210 FCB 96</td>
<td></td>
</tr>
<tr>
<td>2728 4D</td>
<td>00220 FCB /MY/</td>
<td></td>
</tr>
<tr>
<td>272A 60</td>
<td>00230 FCB 96</td>
<td></td>
</tr>
<tr>
<td>272B 43</td>
<td>00240 FCB /COLOR/</td>
<td></td>
</tr>
<tr>
<td>2730 60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2731 43</td>
<td>00260 FCB /COMPUTER/</td>
<td></td>
</tr>
<tr>
<td>2732 50</td>
<td>00280 FCB 1234</td>
<td></td>
</tr>
<tr>
<td>2733 55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2734 54</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2735 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2736 52</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Program Listing 4. Sample Assembly Program**

<table>
<thead>
<tr>
<th>Byte</th>
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</tr>
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<tbody>
<tr>
<td>2C22</td>
<td>00090 * DEMONSTRATION ONLY</td>
</tr>
<tr>
<td>2C22</td>
<td>00110 START LDX #0</td>
</tr>
<tr>
<td>2C24</td>
<td>00120 STA ,X</td>
</tr>
<tr>
<td>2C26</td>
<td>00130 BONK FCB 255</td>
</tr>
<tr>
<td>2C27</td>
<td>00140 KONK FDB 5500</td>
</tr>
<tr>
<td>2C29</td>
<td>00150 SHOUT EQU KONK</td>
</tr>
<tr>
<td>2C2A</td>
<td>00160 LOUD EQU BONK</td>
</tr>
<tr>
<td>2C2C</td>
<td>00170 DOWN RMB 1</td>
</tr>
<tr>
<td>2C2D</td>
<td>00180 RIGHT RMB 2</td>
</tr>
<tr>
<td>2C2E</td>
<td>00190 LEFT FDB 1234</td>
</tr>
<tr>
<td>2C2F</td>
<td>00200 LDX LEFT</td>
</tr>
<tr>
<td>0000</td>
<td>00210 END</td>
</tr>
<tr>
<td>0000</td>
<td>00210 TOTAL ERRORS</td>
</tr>
<tr>
<td>2C26</td>
<td>BONK 2C2</td>
</tr>
<tr>
<td>2C29</td>
<td>DOWN 2C2</td>
</tr>
<tr>
<td>2C2A</td>
<td>KONK 2C2</td>
</tr>
<tr>
<td>2C27</td>
<td>LEFT 2C2</td>
</tr>
<tr>
<td>2C28</td>
<td>LOUD 2C2</td>
</tr>
<tr>
<td>2C2A</td>
<td>LEFT 2C2A</td>
</tr>
<tr>
<td>2C27</td>
<td>SHOUT 2C2</td>
</tr>
<tr>
<td>2C28</td>
<td>START 2C2</td>
</tr>
</tbody>
</table>

HOT CoCo February 1984 115
Have you ever listened to a computer tape? Basic programs start with a signal tone that includes the program's file name. The signal then breaks and begins again with a noise that sounds like static. Machine-language programs pulse and buzz. Although the CoCo's voice isn't music to my ears, I find that careful listening allows me to diagnose many CLOADing problems.

Generally, loading problems fall into two categories: bad recording or bad playback. Either means that your CoCo can't hear the program recording clearly.

The Ideal

In the best of all possible worlds, the audio input to your CoCo sounds like the waveform shown in Fig. 1, a signal that is either high or low with no transitional "slide." Sandwiched between regular timing or sync pulses, the data pulse contains the information your CoCo translates into a program.

Since the CoCo reads and records at 1,500 baud, an inch of tape contains thousands of computer signals. Because of the speed at which the CoCo talks, you hear computer tapes as irritating noise. For the computer to receive these bits of information reliably, your tape recorder must spin at a steady speed and clearly reproduce the high and low signals with a minimum of background noise.

The Real

Cassette memory storage procedures have to contend with a dirty world. Physically, the CoCo's 1,500 baud signal pulses take up a microscopic space on the tape. By comparison, a dust speck is gigantic and its presence on your tape can drown out many bits of data, throwing off the computer's timing and yielding an I/O error.

Unless you're tone-deaf you've noticed that the audio reproduction capabilities of your CCR-81 cassette recorder leave a lot to be desired. When playing music, not only are the highs and the lows flattened to ghosts of their true selves, but the recorder also adds a lot of background noise. Figure 2 shows the waveform of a typical cassette computer signal.

Notice that in Fig. 2 the transition between the high and low signals shows up as a visible (and audible) signal. Added to this is a great amount of background noise. Deciphering this signal becomes tricky.

Next Month

There are a few strategies that you can use to overcome your computer's reluctance to load a tape. Lack of space forces me to wait till next month to talk about these.

---

**Side A**

<table>
<thead>
<tr>
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<th>FILE</th>
<th>PAGE #</th>
<th>SYSTEM</th>
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<tr>
<td>Copyright Statement</td>
<td>TITLE</td>
<td>—</td>
<td>All</td>
</tr>
<tr>
<td>I've Got the Biorhythm/Smock</td>
<td>BIO</td>
<td>50</td>
<td>16K Ext.</td>
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<tr>
<td>Circuit Drawer/Wilson</td>
<td>CDRAW</td>
<td>56</td>
<td>32K Ext. or Disk</td>
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<td>Tax Program/Gregg</td>
<td>TAX83</td>
<td>62</td>
<td>16K</td>
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<tr>
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<td>IDXCRD</td>
<td>76</td>
<td>16K Ext.</td>
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<td>COMCHANG</td>
<td>78</td>
<td>16K Disk Basic</td>
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<tr>
<td>Utility/Johnson</td>
<td>DISPATCH</td>
<td>78</td>
<td>16K Disk Basic</td>
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<tr>
<td>Utility/Sprouse</td>
<td>DISPLAY</td>
<td>84</td>
<td>32K Disk Basic</td>
</tr>
<tr>
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**Side B**

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<td>96</td>
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<tr>
<td>Morse Code/Yeater</td>
<td>CODE</td>
<td>100</td>
<td>16K Ext.</td>
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<tr>
<td>Ramaster/Lewis</td>
<td>RAMASTER</td>
<td>107</td>
<td>16K</td>
</tr>
<tr>
<td>Educated Guest/Santee</td>
<td>ENGLISH</td>
<td>118</td>
<td>16K Ext.</td>
</tr>
<tr>
<td>Educated Guest/Santee</td>
<td>COMPASS</td>
<td>118</td>
<td>16K Ext.</td>
</tr>
<tr>
<td>Elmer's Arcade/Ramella</td>
<td>BROKEN</td>
<td>17</td>
<td>4K</td>
</tr>
</tbody>
</table>

Instant CoCo Directory
TEN MOST-ASKED QUESTIONS about DYNACALC™
THE ELECTRONIC SPREAD-SHEET FOR 6809 COMPUTERS

1. What is an electronic spreadsheet, anyway? Business people use spreadsheet programs to organize columns and rows of figures. DYNACALC simulates the operation of a spreadsheet without the mess of paper and pencil. Of course, corrections and changes are a snap. Changing any entered value causes the whole spreadsheet to be re-calculated based on the new constants. This means that you can play, 'what if?' to your heart's content.

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The Educated Guest

If you think I am talking about a new Frogger game, you are in for a disappointment. I ended last month's column with a brief discussion of a method of branching. This month I'll talk about branching and show you two programs that use the method. Let me follow up last month's column by presenting the program specifications for Parts of Speech and Compass.

Parts of Speech

Program Listing 1, Parts of Speech, is designed for junior-high and freshman-level English students, and the reading level and content are chosen from a representative sample of English books. The general goal is to teach students the parts of speech. The specific objective is as follows: When presented with the name of a part of speech, the student will identify the phrase containing it, and he will correctly identify at least 75 percent of the examples.

The program presents a part of speech and an instruction at the top and then gives four sample phrases in random order. From the numbered phrases the student must select the correct one. I field tested Parts of Speech on my son, who found most of the bugs in the program (and in my English).

Compass

Program Listing 2, Compass, is designed for young children just learning directional concepts. The age reference is based on the reading level and difficulty of the questions.

The instructional goal in Compass is to teach young or mentally handicapped children to learn directional concepts. The specific objective is: When presented with a written command, the child will move a joystick in the direction indicated, responding correctly to at least 75 percent of the commands.

The program shows a grid with a flashing dot in the center. In the upper-right corner is a compass that indicates the direction a joystick is moved. The child reads the command, moves the joystick in the indicated direction, and presses the fire button. The dot of light moves in the direction indicated.

If the child moves the joystick correctly, the dot of light moves. A message and tone indicate a correct response. Mentally handicapped students with difficulty learning directional concepts have successfully used a similar program.

The unique feature of both these programs is my method of branching, but since there is an obvious bias on the part of the author, I invite your review and your critical response.

How the Programs Work

The first few lines of each program set up pointers to define the number of items for each level of the questions, and the criterion for advancing to the next level. Table 1 shows variables defined in line 20 of both programs.

The end of the program contains DATA statements for all items to be used. You can change line 20 or add or change the DATA statements for items you might want to include in the program. In both programs, the items in DATA statements should begin with the easiest items or those items that should be learned first, and progress in order of difficulty.

The number of repetitions is set equal to one in both programs, and the total number of items in each set is small (F = 1, L = 4, NI = 16), so you can observe the branching without having to review a large number of items. In actual applications, you would want to change pointers to indicate larger numbers of items with a larger set of items presented each time.

Each program reads the first set of items selected at random for presentation. After being presented a specified number of times (the value assigned to

System Requirements

16K RAM

Extended Color Basic
The new items to the end of the set, and deletes some of the earlier items. It then adds two new items; the better a student meets the question type, the faster he moves ahead.

If a question appears the same type as the one before, the program adds a different type of DATA statement. The program then divides the answer type into four components and places them in random order on the screen.

To add or change items simply add or change DATA statements. You need only two data items for each question. For example:

730 DATA “What is the Capital of Illinois?”
740 DATA “Springfield/Chicago/Rockford/Peoria”

Notice that the end of this program is a DATA statement with an asterisk. The program does a “dummy” read of items and counts the items until it encounters an asterisk used as an end-
The Educated Guest

of-data marker. Therefore, you do not have to count the items you include.

Also, you can use any multiple-choice items so the program is easily changed for any kind of content. The answer type can have one to four possible responses as long as each answer is separated by a slash, and the correct answer appears first. Parts of Speech allows four lines for a question (about 120 characters) and two lines for each answer (approximately 60 characters). The program automatically formats the questions and answers.

The Compass program shows how the branching method, with a little program modification, can be used with a different type of program. The DATA statement contains the items for this program, and each item consists of two parts. The first part is the command that appears on the screen while the second part is a set of code letters to indicate the correct direction to move in response to the command. Each code letter indicates one move in a specified direction as follows:

- UP = UP/DOWN
- DOWN = DOWN/LEFT
- RIGHT = LEFT/UP
- LEFT = RIGHT/DOWN
- U = UP
- D = DOWN
- L = LEFT
- R = RIGHT
- F = OWN/RIGHT
- E = UP/RIGHT
- G = DOWN/LEFT
- H = UP/LEFT

Or, you could add an item such as:

730 DATA GO NORTH THEN GO NORTH EAST, UE

Indicate the total number of items by defining the variable NI in line 20. If you change the number of items, you must change this value at the beginning. I prefer the dummy read and count method used in the Parts of Speech program, but you might prefer using the variable pointer since it doesn’t use time to count items at the beginning of the program.

How to Change the Pointers

To add new items, change the value of NI to the number of items you wish to include. This is not necessary in Parts of Speech, which uses the dummy read and count method to determine the number of items (NI). You could, however, set the value of NI lower than the actual number of items so that not all items are used.

This might be helpful for less advanced students. By setting F to the first item the child encounters, and setting NI to the last item, you can adjust the difficulty level for the individual children. The value of NI should always be equal to or less than the total number of items used in the DATA statements.

To control how many items are presented at one time, change the value of L. The number of items presented before progressing to the next level is L - F + 1. Adjusting the value of L or F provides more or less feedback on student progress.

You can change the values of CI, C2, I1, and I2, to adjust the amount and criteria of program advance.

Set CI for minimum mastery of material. C2 should be set so the child advances faster if he has greater mastery of the material. Change I1 to indicate how many items will be added when the first criterion is mastered. Change I2 to indicate how much further a child will progress if he masters the second criterion. You can alter the program to allow for more or fewer levels of mastery.

Improving This Program

The specific items in these two programs were designed to demonstrate the branching method rather than as a teaching program. You will want to try your own material with these programs. Further, an adequate sample

```
10 ' #ADD TO LINES 164-203
20 L=LAST ITEM R=NUMBER OF T
30 IMES EACH ITEM IS REPEATED I
40 =INCREMENT IN DIFFICULTY
50 *999999 C1 = FIRST CRITERION
60 ' C2 = SECOND CRITERION
70 ' I1 = INCREMENT FOR FIRST
80 ' CRITERION
90 ' I2 = INCREMENT FOR SECOND CRITERION
100 20 CLS:F=1:4:I=2:N=11=16
110 25 C1=7:612=188:1=I=12=4
120 30 GOSUB 40:GOTO 90
130 40 FOR A = 19 TO 450 STEP 32
140 50 PRINT$(A STRING$(2,161));CHR$(133)
150 60 NEXT A
160 70 PRINT$(482,STRING$(2,131));CHR$(135)
170 80 RETURN
180 90 RESTORE:IF P=1 THEN 110
190 100 FOR A=1 TO 1:READ X,$,X:NE XT A
200 110 S=L-P=1:Q=8*R
210 120 FOR A=1 TO S:READ C$(A),MS$(A)
220 130 IF A=8:NEXT
230 140 M=I=T=8
240 150 FOR N=1 TO Q
250 160 PRINT$(128,STRING$(64,""));
260 170 PRINT$(130,CHR$(P)=CHR$(P+1)
270 180 L=325
280 190 GOSUB 299
290 200 IF C(P)=R THEN C$(P)=C$(S):M
300 310 S=MS$(S)=C$(P)=C$(S)=S+1
310 320 NEXT N
330 330 IF Peek(65280) AND I THEN G O T O 318
340 340 T=I:IF INSTR("HUELGORP",G)
350 350 () THEN PRINT"44001G":G O T O 3
360 360 M=I=1
370 370 PRINT$(128);CHR$(129)
380 380 FOR J=350,390,400,410,46
390 390 H=28,436,446
400 400 L=390,410,460
410 410 L=31,410,460
420 420 L=31,410,460
430 430 L=31,410,460
440 440 L=31,410,460
450 450 L=31,410,460
460 460 NEXT J
470 ' END
```

Program Listing 2. Compass
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The Educated Guest

of the items used in the Parts of Speech program would require much repetition. Let me suggest a more efficient method for this type of content. Each phrase is made of several different parts of speech.

Try associating each word in the phrase with a code letter or number to indicate the parts of speech. For example:

Phrase Code Letter
I drove the car. PVAN
P = Pronoun
V = Verb
A = Adjective
N = Noun

You might use a two-part code consisting of a letter to indicate the part of speech and a number to indicate the relative difficulty of naming it.

The program would then present the phrase, highlight a random word from the phrase, and request identification. You could use the numeric code letter as a method of branching according to difficulty and mastery level. The program might only select level-one Parts of Speech until the child demonstrates adequate mastery. The program would then reuse the same phrases, highlighting more difficult words.

Parts of Speech and Compass branch forward as the child demonstrates mastery. You might also want a method to branch backwards. If the child is performing poorly, backwards branching presents easier material so the child can experience success.

These programs always start at the same level unless you change the pointers. If you create a disk or cassette file of the student’s performance, the next time the same child uses the program, he can progress from the last level of performance. Since the program uses pointers to indicate starting levels, this could be a fairly easy modification.

I invite you to send adaptations and improvements to the “Santee branching program.” Write in care of HOT CoCo, 80 Pine St., Peterborough, NH 03458.
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Access Color Artifacts

Color artifacts are nice, but they can be slow and complicated when you have to figure out all those trigonometrical formulas. There is an easier way to access color artifacts. It's called PMODE 3.

In PMODE 3, colors are achieved by dividing each byte into four 2-bit combinations (00 equals green or buff, 01 equals yellow or cyan, etc.). This is similar to the odd or evenly placed dots used to produce the colors of color artifacts. All you need to do is draw PMODE 3 on a PMODE 4 screen. Try the following lines:

10 PMODE 4, 1
20 SCREEN 1, 1
30 PMODE 3, 1

Lines 10 and 20 set up the PMODE 4 display mode, and line 30 sets the PMODE 3 drawing mode. Does it work? Try experimenting a little. Add these lines:

40 PCLS
50 CIRCLE (128,96),64,2
60 PAINT (128,96),2,2
70 GOTO 70

Remember, if you execute a SCREEN command while in PMODE 3 drawing, the screen will go to PMODE 3 colors. Always switch to PMODE 4 before changing pages and screens. Then go back to the PMODE 3 drawing mode.

Daniel L. Lee
Kensington, KS

Tape-Handling Hints

Saving, loading, verifying, and locating programs on cassette tape can be a painful chore. This is a trick that has saved me hours of frustration.

When I save a program on tape, I immediately flip the tape over and save a second copy on the reverse side. Since the tape travels for the same distance in both directions, it will, after the second save, be positioned at the beginning of the first copy saved.

Having saved the second copy, I flip the tape over again, press the play button, and enter the SKIPF command. This checks the program to see whether it will reload, but does not clear the version of the program that is already in memory. After the computer has skipped forward past the first copy, I flip the tape over and SKIPF past the second version. This puts me once again at the beginning of the first save.

At this point, I can put the tape away, knowing that whenever I put the tape in the recorder and issue a CLOAD command, it will immediately begin to load. If the program name does not immediately appear on the screen after you enter CLOAD, this probably means the tape was placed in the recorder upside down.

When it is necessary to search manually for the start of a program, there is a simple way if you have a recorder with a cue/review feature: Simply type AUDIO ON:MOTOR ON and turn up your TV volume slightly. You can then fast-forward and rewind the tape, and hear the programs and data files as you pass them. You can then stop at any blank spot on your tape to begin loading the file just past it.

Gary L. Matthews
Knoxville, TN

Proper PCLEAR Etiquette

There is a bug in the Color Computer Basic: a program that contains a PCLEAR command often gives a false syn-
tax-error message the first time you run the program. Usually, all that is necessary is to type RUN a second time, but who wants to do that? -

There is a software fix for this problem. Include the following code in your programs, and they will run first time, every time (barring other errors).

```
0 GOTO 63999
1 GOTO 3
2 PCLEAR 3:GOTO 1 'Your program's intended PCLEAR value goes here
3 'Your program starts here
...
...
63999 PMODE0:PCLEAR1:GOTO 2
```

Explaining why this code works is much harder than stating that it works. A PCLEAR command causes the operating system to relocate your program in memory as it reallocates the graphics pages. Due to an oversight in the system, however, the Basic interpreter continues trying to execute the program from the old memory address, which now contains something other than the program line it thinks it is executing. A backward GOTO, executed along with the PCLEAR command, generally solves the problem, because a backward GOTO forces the interpreter to retrace the program from its beginning.

It's not quite that simple, however. Depending on the PCLEAR values of the program and of the computer itself at runtime, the backward GOTO can itself be overwritten before it can be executed. If you are PCLEARing to a smaller number of graphics pages than the computer has allocated, put the GOTO at the end of your program, as in line 63999. However, if you are PCLEARing to a higher number of pages, the GOTO must be at the beginning of the program. In writing a program, you don't always know which condition will be in effect at runtime. My solution is to have two ' PCLEARs in the program—the first one at the end, the second at the beginning. This second PCLEAR value should be the one you intend to use in the body of your program.

This problem is confined to the version 1.0 Extended Color Basic chip.

Gary L. Matthews
Knoxville, TN

Using PRINT@ with X,Y Coordinates

The Color Computer provides a PRINT@ command that allows positioning of text at any of 512 screen locations (0-511). It can be used to produce nicely formatted screens, but there is one major drawback: It is hard to visualize, without considerable experimenting, just where a particular line of text will start.

Some other computers use a PRINT@ X,Y syntax, allowing you to specify how many spaces over and how many lines down to begin. You can position your printing the same way. Tell your program to PRINT@ X+Y*32, substituting whatever X, Y values you wish for the variables and giving the string you wish to print.

For example, to print COLOR COMPUTER nine spaces over and on the seventh line down, you could use the following code:

```
10 PRINT@ 9+7*32, "COLOR COMPUTER" This should center the words perfectly on the screen. There is a simple way to automatically center any short phrase within the computer screen without having to count or measure. The syntax is as follows:
```

```
10 XS = "COLOR COMPUTER" (The variable XS can be any string you choose, so long as its length is no more than 32 characters)
20 L = LEN(XS): X = (32 - L)/2
30 PRINT TAB(X) XS
```

This bit of code, followed by a RETURN and tucked away somewhere in your program, can be used as a subroutine for centering anything anytime you wish. Simply set XS equal to whatever you wish to center, call the subroutine, and it is printed in the middle of the appropriate print line. The code in line 20 can also be used to calculate a value of X to be used in the PRINT@ X,Y routine given above.

Gary L. Matthews
Knoxville, TN
Due to the unexpectedly large number of inquiries to Doctor ASCII, we must ask that you enclose a self-addressed, stamped envelope if you want an immediate reply. Please be patient, as the doctor must answer many questions.

Send your questions to Doctor ASCII, c/o HOT CoCo, Pine St., Peterborough, NH 03458.

Q. I have a 64K CoCo. In the game "Attacker" by Matt Togliatti (HOT CoCo, October 1983, p. 82), there is a POKE 65495,0. It doesn't work on my machine, but it does on my friend's 16K machine. Does it not work with 64K?

Hunter R. Medney
Buford Hwy. Nor., GA

A. This POKE speeds up the computer's memory access time for addresses above 32767 (normally ROM). You did not say whether you are using disk. With my 64K disk system D board, I had to remove C85 to get high speed. If you have the problem without disk, a good explanation of how to get high speed on a balky CoCo appeared in 80 Applications by Dennis Kitsz, 80 Micro, August 1982, p. 352. You could also remove the POKE from the program. It would then run slower.

Q. After installing eight 64K RAMs on my F board, I find I'm experiencing some TV interference. On our Sony, I don't have the problem. Any ideas?

John C. Burke
San Francisco, CA

A. Did you reinstall the metal RF shield when you put in the memory? If you did, it could be your TV. Many low-cost or older TVs use a 300-ohm twin lead inside the set that can pick up interference.

Q. I recently bought a Radio Shack DMP-120 printer (600-1,200 switchable baud rate). The main reason for my purchase was its built-in dual interface (serial or parallel). I'd like to buy a modem, but I discovered that it will not work with the printer. The article "Where There is a Will" (80 Micro, March 1982, p. 84) explains how to put a 300-baud-capable serial printer on line. Is there any way to put my DMP-120 on line?

Peter Stelzer
Penticton, British Columbia

A. Radio Shack made a monumental blunder in not making a 300-baud rate available on their printers. With a 300-baud serial printer, you can hook the printer to the RS-232 D-plug on the back of the Radio Shack DC Modem I and get a printout of whatever comes over the line. All is not lost, however, because you still have a parallel port. You could hook a serial-to-parallel converter that converts a 300-baud serial RS-232 signal to the Radio Shack printer's Centronics parallel. Connect the other end to the D-plug on the back of the modem and run the RS-232 DIN cable from the modem to your CoCo.

Q. Can you give me the name of a good memory map for the CoCo?

Mark Zorn
Seattle, WA

A. The best one I've seen is available for $9 from Bob Russel, N5474 Stillwater Court, Fredonia, WI 53021. His map is also being published in The Rainbow. It started with the July 1983 issue. (HOT CoCo's "Journey to the Center of the ROM," by Mark Goodwin, also maps the ROM. It began in the October 1983 issue, p. 78.—ed.)

Q. Regarding Mr. Schafer's problems with his Spectaculator ROM pack in the September HOT CoCo, I have had similar problems on my 32K, Extended Basic CoCo. I offer you the following information.

The time to perform calculations can be very long indeed. As a test, I entered numbers in each of 99 columns in row 1. I then entered a row formula + R1 to row 2, entered the CA command, and timed the calculation with a stop watch. I recorded the time and the bytes of free memory after the calculation. I then added the same formula to row 3 and repeated the CA command. This gave two rows of calculations. I continued this cycle of adding the formula to additional rows until I used most of the memory. The graph in Fig. 1 shows my results. Even a simple calculation such as this can take a long time. These results also showed I could never fill the entire 99-by-99 array.

Regarding Mr. Schafer's problems with the cursor splitting, data being lost, and haphazard operation, I have also lost hours of work with these problems before I found out what it was. I called the Color Computer Support Group in Fort Worth (817-390-3944). I described my problems to them and was told that there is a bug in the Spectaculator ROM pack software. The erratic operation occurs when you push the arrow keys a large number of times while in a function mode without returning to the C> command mode.

As a test, I turned my machine on and went into the enter-number (EN) mode, but did not enter any data. I then
moved the black entry marker to the 99th column with the right-arrow key. I started moving it back toward column 1 with the left-arrow key. When I reached column 45, the small graphic character by the command statement changed to an inverse video left-arrow. At this point, returning to the C mode left everything intact. However, if I continued in the EN mode, the erratic operation started. Eventually the program locks up and the keyboard does not respond. I got the same results with the up- and down-arrows or with data entered.

The support group said I could avoid the problem by periodically returning to the C> command mode. Apparently this resets the number of times the arrow keys can be pushed. I have not had further problems. Radio Shack said there were no plans to correct the bug.

Ron Schelle
Lynchburg, VA

A. I was able to repeat your experience with the bug using a ROMFIXed (“Disk Utilities,” HOT CoCo, September 1983, p. 134) copy of the Spectaculator ROM pack, so I guess that kills the overheating theory once and for all. I tested the disk version of Spectaculator and the bug apparently is not in it. Those wishing to purchase a spreadsheet program might want to consider non-Radio Shack spreadsheet programs such as Elite-Calc (disk or tape, Elite Software, Box 11224, Pittsburgh, PA 15238, $59.95), VIP Calc (ROM pack or disk, Softlaw, 9072 Lyndale Ave. So., Minneapolis, MN 55420, $59.95), or Dynacalc (FLEX disk, Computer Systems Center, 13461 Olive Blvd., Chesterfield, MO 63017, $200).

Q. I know that somewhere someone has written a short program for changing hex values to decimal, but I have searched the back issues of my magazines and cannot find one. Can you help?

Larry Barnes
Streamwood, IL

A. If you have Extended Basic, you do not need a program. With it, you can type ?&H followed by the hex number up to four digits and Basic will do the conversion for you. It will also convert the other way with the HEX$ function.

If you have only standard Basic, Program Listing 1 will do the trick.

Q. In your October Doctor ASCII column, you said that your CoCo was black under the silver paint. Mine was light grey. I removed the silver with Cutex oily fingernail polish remover. I tried some lacquer remover on the back of the case, but it softened the plastic.

Earl Hoback
Hemet, CA

A. Apparently Radio Shack has been making the light grey 64K CoCo cases for some time.

Q. I am trying to write a voice-synthesizer program in machine language. What are some steps I should take in writing this program and how do I input to the D/A converter?

Arthur Wimberly
Glenwood, IL


Q. I had a lot of problems trying to make a subroutine to take scores from a game and display a list on the screen showing the top 10 scores of the day (or since the program was run) after each game. Can you help me?

A.J. Griglak
Toms River, NJ

---

**Program Listing 1. Hex-to-Decimal Converter for Color Basic**

```basic
10 N=0
20 H=1
30 PRINT"HEX NUMBER";
40 INPUT A$    
50 L=LEN(A$)   
60 FOR I=L TO 1 STEP -1
70 A=ASC(MID$(A$,I,1))-48
80 IF A>16 THEN A=A-7
90 N=N+H*A+N 
100 H=H*16
120 NEXT I
130 PRINT N
140 END
```

---
A. Program Listing 2 should do it.

Q. Where can I get a parts list for my D-board CoCo? Every time I need a part, I must first write to find the part number and then after three weeks, write again and wait again for the part.

David J. Johnstone
Torrington, CT

A. Radio Shack prints service manuals for all their computer products. In the service manuals are parts lists. Order the service manual for a TRS-80 Color Computer catalog number 26-3001/3002. The same information is also contained in Radio Shack’s *Technical Reference Manual* for the CoCo. Make sure that the schematics in it address your D board, as there is more than one version of this book.

Q. We are novice owners of the new 64K CoCo with one disk drive. How can we back up machine-language programs from tape to tape, from tape to disk, from disk to disk, and from disk to tape?

Claude L. Perry, Sr.
Ansonia, CT

A. To back up a tape, you need the start, end, and EXEC addresses. To get these CLOAD in the tape, but do not EXEC it. Typing ?PEEK(487)*256 + PEEK(488) gives you the start address, ?PEEK(126)*256 + PEEK(127)−1 gives you the end address, and ?PEEK(157)*256 + PEEK(158) gives you the EXEC address. To make a new tape, ready the recorder, then type CSAVE"name", <start address>, <end address>, <EXEC address>.

Backing up a tape to disk is the same as above as long as the start address is at least 14336. If it is less than this, you will need my Tapefix program from the “Disk Utilities” article of the September 1983 issue of *HOT CoCo*, p. 134.

Backing up a program from disk to disk is a simple exercise. The disk manual states that you need two drives to use the COPY command. This is not true. To copy a machine-language program called PROG/BIN from one disk to another formatted disk, simply type COPY "PROG/BIN". You will be prompted to change disks and then the program will copy over.

Backing up programs from disk to tape is more involved, because Basic does not store the start, end, and EXEC addresses in memory. Tom Mix Software (3424 College N.E., Grand Rapids, MI 49505, $17.95) markets an excellent program called DTCOPY, which does this and a whole lot more. It allows you to back up one program or a whole disk full of programs.

Q. Can you please advise the POKE statements that will break my 32K break key? I’m so sick of pressing break when I mean to press something else.

Larry Wiley
Bossier City, LA

A. The information that you require was written by Charles J. Roslund and published in the February 1982 issue of *Color Computer News* as “Break Disable for the Color Computer,” p. 46.

Q. How can I put a value into a program and trick it into starting in the middle?

John J. Halsey
Rye Brook, NY

A. I will explain how to do it in reference to Program Listing 3. It reads numbers into an array M (lines 10–70), sums the numbers in the array (lines 90–110), and prints both the average and the average multiplied by a factor. Suppose after running this program you realize that you used the wrong value for the factor F. It is not necessary to rerun the program; just type GOTO 120. The program still retains the data from the previous run. It works as though a GOTO120 statement followed line 130.

This is the advantage of using an interpreter as opposed to a compiler. Basic keeps compiling the source code anew each time it encounters a numbered line of code. Any time the program is stopped, and this includes a stop due to an error or someone hitting the break key, you can start it up again just as if it were a fresh run.
Q. Do the new ROMs with the 64K CoCo use the additional 32K of RAM? Is there such a thing as a 5¼-inch double-sided, double-density (DSDD) floppy for the CoCo that will operate as a 40 track also? Can I mix single- and double-sided drives on the same system? What is the best CoCo setup to use with my business?

A. The new ROMs still access the lower 32K of RAM only. Radio Shack is selling OS-9, which accesses the whole 64K. You do not need the new ROMs for OS-9. A DSDD drive will function as a 35-track, single-sided drive when using Disk Color Basic. You can mix single- and double-sided drives on the same system. If you have at least one double-sided drive, you can have a maximum of three drives on your system instead of four because the drive 3 select line is used for side selection. Your CoCo would have the most versatility with double-sided drives, FLEX, and OS-9. These two DOSes are where the good business software packages will be directed. Before buying one, check whether it is CoCo compatible. Some require an 80-column display.

Q. I have a Diablo 630-HPRO5 printer and a 32K CoCo with Extended Basic. I use Teletext-64 to write articles with no problem obtaining the format I need. When I LLIST on 8½-inch paper, I must restrict a Basic line to less than 64 characters or it runs off the paper. How can I get around this? The Diablo manual mentions some functions that are controlled by a CTRL or ESC key. How can I send this data to the printer when the CoCo has no such keys?

A. The TRS-80 Color Computer Quick Reference Guide says that address 155 controls line-printer width, but it has no effect on my LP VIII when I LLIST. Since you have Teletext-64, save your Basic programs in ASCII and load them into Teletext-64 using S/ASC. You should protect the programs so that the lines aren't merged together by entering a < clear >; on the line above your Basic program. You can then print them out in any width you like. You can even program Teletext to stop at the end of each page for a long listing.

It's easy to send a CTRL or ESC code to your printer. In Basic a CTRL character is sent by subtracting 64 from the character's normal ASCII code. For example, to send a CTRL-X you would send CHR$(ASC("X") - 64). The ESC code is equivalent to CHR$(27).

Q. I recently purchased a Color Computer for my kids. It's a 16K Extended Basic machine with the F board. I would like to expand it to 32K using the piggyback method ("Smarten Up, Color Computer," 80 Micro, March 1982, p. 126). Since I have a Model III for more serious work, I do not need 64K. Are the instructions in the article still valid for my machine? Can I purchase an interface for hooking the CoCo to an RGB monitor?

A. Personally, I would give the Model III with its Z80 to my kids and keep the CoCo with its 6809 for serious work. The 32K upgrade article is still valid, but keep in mind that the E and F boards were not available at the time it was written. Since the layout of your PC board is a little different from the one pictured in the article, be certain that you are working with the right chips. Some people have questioned me about the "Godbout memory" mentioned in the article. Godbout is the company that sold me the 4116 chips. Other brands will work fine. I do not know of an RGB monitor interface for the CoCo. However, there are a number of products for a composite video monitor.

A Basic program called Notebook appeared on the May 1982 issue of Chromasette. This is a close fit to what you want to do. Since it is written in Basic, you should be able to customize it for your needs. The mailing address of Chromasette is P.O. Box 1087, Santa Barbara, CA 93102, 805-963-1066.
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*This advertiser prefers to be contacted directly.

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B0 HOT CoCo February 1984
READER SERVICE

My vote for the best advertisement in this issue goes to ____________ (company) whose Reader Service number is ____________.

A. How many articles do you actually read in each issue of HOT CoCo?
   - 1 1-3
   - 2 4-7
   - 3 8-11

B. What type of program would you most like to see on an instant CoCo cassette? Check one only.
   - 1 Music/Sound
   - 2 Graphics
   - 3 Games
   - 4 Utilities
   - 5 Education
   - 6 Home/Personal
   - 7 Science
   - 8 Other

C. Which of the following is most important to you in a $10 cassette loader? Check one only.
   - 1 Number of programs
   - 2 Selection of programs
   - 3 Quality of programs
   - 4 Technical support
   - 5 Customer service
   - 6 Other

D. Which of the following models do you own? Check all that apply.
   - 1 4K
   - 2 8K
   - 3 16K
   - 4 32K
   - 5 64K
   - 6 TDP 100
   - 7 Standard Basic

E. What peripherals and accessories do you plan to purchase during the next 12 months?
   - 1 Printer
   - 2 Modem
   - 3 Plotter
   - 4 Fax Machine
   - 5 Joysticks/Paddles/Graphic Tablet
   - 6 Disk Drive
   - 7 Expansion Bus
   - 8 Disk Drive
   - 9 Furniture/Storage

F. What types of software do you plan to purchase during the next 12 months?
   - 1 Business
   - 2 Education: Preschool-3rd
   - 3 Education: 4th-8th
   - 4 Education: High School+
   - 5 Hobby/Game
   - 6 Home Management/Finance
   - 7 Utility/Programming
   - 8 Scientific/Other Technical
   - 9 Other

G. Which of the following publications do you read monthly?
   - 1 HOT CoCo
   - 2 80 Micro
   - 3 Rainbow
   - 4 Color Computer News
   - 5 Computer News
   - 6 Game Player
   - 7 Color Micro Journal

H. Do you own a cassette recorder (VCR)?
   - 1 Yes
   - 2 No

I. Do you think HOT CoCo is geared to: (check 3)
   - 1 Novice
   - 2 Moderately skilled programmers
   - 3 Assembly-language programmers
   - 4 Game players
   - 5 Disk users
   - 6 Extended basic users
   - 7 Extended basic users
   - 8 Color hardware buffs

J. On a scale of 1 (no interest) to 5 (great interest) rate your interest in the following:
   - 1 The Basic Beat
   - 2 Emitter's Arcade
   - 3 Digestions
   - 4 Reviews
   - 5 Reader's Forum
   - 6 Doctor ASCII
   - 7 Product News
   - 8 Graphically Speaking
   - 9 RefLEX
   - 10 The Educated Guest

K. If you are not a subscriber circle 500.

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A t first glance it might seem easy to graph functions on a rectangular-coordinate system, but there are complications. The Color Computer’s graphics screen compares with a rectangular-coordinate grid with its origin at the middle. Extended Basic, however, treats this screen as a rectangular-coordinate system with an upper-left origin. The Y axis points downward.

The subroutines I developed in my June column let you visualize the screen as a rectangular-coordinate grid with its origin in the middle. The horizontal scale (X axis) goes from −128 to 127, and the vertical scale (Y axis) goes from −95 to 96. A unit distance between pixels on the X axis is shorter than a unit distance on the Y axis. This makes circles look like ellipses on the screen. The scale factor SF in the process of graphing equations goes from −95 to 96.

This means that five pixels represent a distance of 102 on the X axis and 80 on the Y axis. (This is called scaling and is considered later in more detail.) Subroutines handle these conversions and you can ignore them in your applications programs.

Assume that your screen represents a rectangular-coordinate system where the horizontal scale (X axis) varies from −100 to +100 and the Y value varies from −95 to +95. The process of graphing equations on a system such as this can be broken down as follows:

1. Draw the axes
   A. Draw the X axis
   B. Draw the Y axis
2. Label the axes
   A. Label the X axis
   B. Label the Y axis
3. Draw the graph
   It is a simple procedure to draw the axes. Each is a straight line drawn across the screen and crossed at evenly spaced intervals by short line segments that represent tick marks (lines 1000-1650 in Listing 1). Lines 2010-2019 store data strings used by the DRAIR command for drawing axis labels.

   The program locates the starting point for each label and draws it one digit at a time (lines 2030-2570). It draws the graph using a function defined in line 3000, then makes a blank move to the point whose X coordinate is −100 and whose Y coordinate is based on the defined function (line 3010). This is followed by a series of 200 short line segments going from point to point as the value of X goes from −99 to 100 (lines 3020-3040).

   Enter Program Listing 1 and run it. The graph is a wavy line typical of the cosine function (Fig. 1). Try some other functions as well: FN Y(X) = ABS(X)(2/3), FN Y(X) = 80 * EXP(−X * X/5000), and FN Y(X) = 40 * ATN(X/10). Each of these produces a graph and presents no difficulties.

   Now try to graph FN Y(X) = X * X. This is a simple function that the program cannot adequately handle. The resulting graph (Fig. 2) is incorrect. It includes two horizontal line segments that should have extended upwards but were trapped by the limits of the graphics screen.

   This complication leads to the idea of clipping, or modifying the program to plot those portions of the graph that belong on the display. Points and line segments that lie outside the graphics screen should be clipped or discarded by the program. Here is a simple solution to this problem.

---

**Graphically Speaking**

**Rectangular-Coordinate Systems**

by Delmar E. Sears

---

**System Requirements**

- 16K RAM
- Extended Color Basic
- Color Graphics Printer or LP VII (optional)

---

Program Listing 1. The graph of the function defined at line 3000 is drawn on a rectangular-coordinate system. Clipping, scaling, and translation can be included by making the modifications outlined in the text.

---

**Listing continued**
The program segment in Listing 2 is meant to replace lines 3000–3060 of Listing 1. As the program calculates each Y coordinate, it compares its absolute value to 95 (line 3020). If the absolute value of the Y coordinate exceeds 95 then the point is ignored and the value of X is incremented by one.

This prevents the program from performing a blank move to a point off the screen. Once it finds a point within the screen area, the program draws line segments to each succeeding point unless a subsequent endpoint is off the screen (see line 3050). In that case, the program returns to line 3020 and looks for a point on the screen where it can resume drawing the graph. This process can occur several different times depending on the function being graphed. With Listing 2 incorporated into your program, try graphing \( Y(X) = 200 \times \sin(\pi X/20) \). Notice that the graph repeatedly extends beyond the limits of the screen both at the top and at the bottom (Fig. 3).

Transformations
There are times when you want to view a different portion or an enlarged version of the graph. Imagine the graph plotted on a plane that extends infinitely in all directions. Imagine also that the display represents an image sent back by a remote-control video camera.

By moving laterally the camera can view different portions of the graph. If it moves closer to the plane the image appears larger, while moving away from the plane shows more of a smaller graph. These changes are called transformations. As the camera moves laterally, the transformation is called translation of axes. If it moves up and down, the transformation is called scaling.

Scaling
In Listing 1 the imaginary camera views an area 200 units wide (–100 to 100) and 190 units high (–95 to 95). If the camera advances the infinite plane below, the size of the graph increases

---

Fig. 4a. The vertices of the smaller square have the same coordinates in both the world-coordinate system (red) and the screen-coordinate system (black). The heavy black square represents the screen view of the world below.
but you see less of it. Scaling lets us achieve this effect and more.

Suppose the camera view includes a square as shown in Fig. 4a. If the camera moves closer (halving the distance), your TV image appears twice as large (Fig. 4b). The X and Y coordinates have doubled. Keep in mind, however, that there are two coordinate systems to work with: the coordinate system on the graphics screen and the coordinates on the infinite plane below. These are called screen coordinates and world coordinates respectively.

To change screen coordinates to world coordinates use these Basic commands: X = X/2, and Y = Y/2. The X (or Y) on the right of the equals sign is a screen coordinate and the X (or Y) on the left is the corresponding world coordinate.

To convert world coordinates to screen coordinates use these Basic commands: X = X * 2, and Y = Y * 2. In this example the scale factor is two. That is, the linear dimensions of the screen are multiplied by a factor of two.

A scaling routine lets you pick any size factor. You can even pick different factors for the horizontal and vertical directions. If XS is the scaling factor for the horizontal axis, and YS is the scaling factor for the vertical axis, then write the conversion routines as follows:

Screen to world: X = X/2 XS, and Y = Y/2 YS
World to screen: X = X*2 XS, and Y = Y*2 YS

You can include scaling in Listing 1 by making the changes indicated in Table 1. The subroutines in lines 40 and 50 are the conversions previously discussed. Input the desired scale factors in lines 1020-1030. The default scale factors are: .5 for the X axis and a scale factor of 10 on the Y axis. The logic used when drawing the graph remains the same as in Listing 1.

The screen's X coordinate varies from −100 to 100. Line 3020 (and line 3060) converts the screen's X coordinate to a world coordinate, calculates the corresponding world Y coordinate, and then converts both world coordinates back to screen coordinates. The screen's Y coordinate is tested, as before, to see if it falls in the −95 to 95 range.

Add these changes (Table 1) to your program. In line 3000 use FN Y(X) = X * X. Run the program using the default scale factors. The resulting graph is the same as one created by running the program without the changes. Next, run the program using a scale factor of 10 for both axes. The labels should read −8, −6, −4, −2, 2, 4, 6, and 8, and the graph (a parabola) is wider.

Change the function in line 3000 to FN Y(X) = SIN(X) and run the program using the default scale factors. You see a tiny, wavy line being drawn from left to right along the X axis. Run the program again using a scale factor of 10 in both directions. The shape of the graph is now plainly visible. Run the program a third time using a scale factor of 10 on the X axis and a scale factor of 80 on the Y axis. This stretches the graph even more in the vertical direction.

It is possible to shrink a graph rather than stretch it. If the function in line 3000 is FN Y(X) = 150 * SIN(X) you can use a scale factor of 10 on the X axis and a scale factor of .5 on the Y axis. This stretches the graph horizontally and compresses it vertically.

You can also use negative scale factors that flip the graph around. If the scale factor on the X axis is negative, the graph is flipped left to right. A negative factor on the vertical axis flips the graph upside down.

When you experiment with the labels. If they contain more than two digits, or if they are decimal fractions, they run together on the X axis and take up a lot of room on the screen. You can add the following line to prevent this:

```
2020 INPUT "LABELS <N>:A$ SCREEN1,1:IF A$=""\"Y"" THEN 3000
```
Graphically Speaking

Translation

If your imaginary camera can move up and down relative to the world-coordinate system, then it can move laterally. In mathematics this is called translation. Suppose that you want to center the camera over the point having world coordinates 30, 40 as in Fig. 4c. The corresponding screen coordinates are 0, 0. In general the screen point X, Y corresponds to the world point X+30, Y+40. Similarly, if X, Y is a world point, then the corresponding screen point is X–30, Y–40.

Assuming that you have incorporated the changes in Table 1, add the changes in Table 2. Change the function in line 3000 to \( FN\ Y(X) = X * X/40 - X - 30 \) and run the program. Use default values for both translation and scaling. For the moment you have deleted the scaling feature from the program. You should see a parabola whose lowest point is in the lower-right of the screen.

Run the program again using a horizontal translation of 20 and a vertical translation of -60. You are moving the center of the display 20 units to the right and down 60 units relative to the world-coordinate system. This graph is a parabola whose lowest point is in the center of the screen. The labels on the X axis should read -60, -40, -20, 0, 40, 60, 80, 100, and the labels on the Y axis should read -140, -120, -100, -80, -40, -20, 0, 20. The screen is still labeled using the world-coordinate system.

Try running the program with a variety of values for the horizontal and vertical translations and observe the results.

Your next step is to combine scaling and translation. This combination can occur in either order but with differing results. Make these changes in your program:

```plaintext
40 X=X+XT : Y=Y+YT : X=X/XS : Y=Y/YS : RETURN
50 X=X*XS : Y=Y*YS : X=X-XT : Y=Y-YT : RETURN
3000 DEF FN Y(X)=X*X
```

Notice that scaling is done first and translation second (line 50). When changing screen coordinates to world coordinates, you must perform the inverse operations in reverse order (line 40). Run the program using a horizontal translation of 10, a vertical translation of 40, a horizontal scale factor of...
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5, and a vertical scale factor of 2. Now alter lines 40 and 50 as indicated:

40 \(X = X/XS + XT ; Y = Y/YS + YT\) : RETURN
50 \(X = X/XS + XT ; Y = Y/YS + YT\) : RETURN

When you run the program this time, scaling follows translation. Run the program using the same translations and scale factors as before. Compare this graph with the original and note the difference in the labels and in the graphs themselves.

One way you can combine scaling and translation is to include each in a separate subroutine and then decide which transformation comes first. For this particular application, however, it is easier to visualize a translation followed by a scaling. This is equivalent to centering the image in our camera and then moving nearer or further, as the case may be. My final version of lines 40 and 50 is as follows:

40 \(X = X/XS + XT ; Y = Y/YS + YT\) : RETURN
50 \(X = (X - XT)XS ; Y = (Y - YT)YS\) : RETURN

Color Graphics Printer Graphing

With a plotting device you can draw better graphs. The higher resolution and the ability to print alphanumeric labels give you added flexibility. Program Listing 3, written for the Color Graphics Printer, produces the graph shown in Fig. 5. The usable plotting area in this program is a square 400 steps on a side. With no scaling or translation, both axes go from -200 to 200. The grid is drawn in red with the coordinate axes in black and a black border around the grid. The labels are printed on all four sides in black.

Lines 40-1030 are exactly the same as before. Line 1040 lets you select the step increment along the X axis. Four is the default value. Lines 2000-2010 initialize the plotter and move the pen to a point at the upper left of the grid.

Lines 2020-2050 draw the black border using the axis drawing command (X). Starting at the upper left the border is drawn in the following sequence: right, down, left, and back to the starting point. Line 2060 moves the pen to the center of the grid, initializes (I) this point as the origin, and selects the smallest character size (50) for printing the labels.

Lines 2100-2130 print the labels down the left side of the grid. Line 2110 determines the label using the world coordinates. It is then converted to a string, and the string length is found. Line 2120 prints the label with the P command. Notice that the starting point of the plotter’s X coordinate (-210-6*N) is a function of the label length. The starting point of each label is 10 steps to the left of the left edge of the grid with an additional six steps to the left for each character in the label. It appears that these characters are five steps wide and seven steps high. The 6th step allows for the gap between adjacent characters. The starting point’s Y coordinate (50 * 1 - 4) is based on I. Since I ranges from 4 to -4, 50 * I ranges from 200 to -200. Four is subtracted in order to center the label in front of the tick mark.

In a similar fashion, lines 2200-

---

**Table 2.** These changes should be included after the changes in Table 1. They allow you to transform the graph by translation.
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Graphically Speaking

Fig. 5. Graphs drawn on the Radio Shack Color Graphics Printer using Program Listing 3 include the grid lines (in red), better labeling, and sharper detail.

2230 print the labels across the bottom of the grid from left to right. Line 2220 determines the label, and line 2210 sets N equal to half the length of the label. The X coordinate of each label's starting point (line 2220) is a function of I (which determines the appropriate tick mark) and N (which centers the label horizontally). The starting point's coordinate is fixed at 17 steps below the grid, which places the label's top 10 steps below the grid. Lines 2200-2330 print the labels up the right side of the grid, and
SUNLOCK SYSTEMS
4217 Carolina Ave
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See List of Advertisers on page 130

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Graphically Speaking

lines 2400–2430 print the labels across the top from right to left.
Line 2500 selects the red pen in preparation for drawing the grid. Lines 2510–2570 draw the horizontal grid, and lines 2600–2660 draw the vertical grid.
Line 2520 converts the plotter’s Y coordinate into the corresponding world Y coordinate. This value is tested at the end of line 2540. If it is zero, the corresponding horizontal grid line is the X axis of the world-coordinate system.
The black pen (CO in line 2540) draws this line, and the plotter goes back to the red pen (line 2560) after drawing the line. This technique is used in both loops to draw the world-coordinate axes in black, which contrasts nicely with the red grid lines. Line 2530 determines variable K on the basis of whether the counter I is even or odd.
As a result, when I is odd, the horizontal lines are drawn from left to right, and when I is even they are drawn from right to left. By alternately determining the direction in which the lines are drawn, you can keep the length of blank moves to a minimum.
Line 2540 makes a blank move to the initial point of the grid line, and line 2550 draws the grid line using the Relative Draw command J.
Line 2670 returns the character size to SI (40 characters per line) and selects the black pen. If the character size is not changed, subsequent PRINT commands in the text mode or LLIST commands are printed out at 80 characters per line. While it is readable, this print is small for normal text.
The Radio Shack manual implies that the DIP switch at the rear determines the text-mode character size at either 40 or 80 characters per line. To quote: “In Text Mode, the printer will use whatever settings the DIP switch is currently set to.”
This is misleading since the DIP switch determines the character size only upon power up. That is, when you turn on the printer, the character size is set at 40 or 80 characters per line according to the setting of the switch. If the character size is changed in the graphics mode (the only way it can be changed by software) and the program returns to text mode, all subsequent printing uses the new character size.
Returning to Listing 2, the plotting routine in lines 3000–3100 is identical to that used before, with a few adjustments to accommodate the higher resolution of the plotter. Line 3110 returns the Color Graphics Printer to text mode, and line 3120 produces a beep signalling completion of the graph.

Looking Ahead
Next time I will apply scaling and translation to shapes rather than to mathematical functions. I will also take a look at two-dimensional rotation, a more sophisticated clipping routine, and at the concept of covering.

Address correspondence to Delmar E. Sears, c/o HOT CoCo, Pine St., Peterborough, NH 03458.
RAINBOW SCREEN MACHINE

The Rolls Royce of graphics/text screen enhancers — more features than all others combined:

- Add these features to your computer/program:
  - Lisp extension of Basic loads on top of 16, 32, or 64K machines to enable easy mixture of hi-res graphics and text in your programs. Dense text or large lettering for children, visually impaired or VCR title screens with no programming!
  - User definable 224 character set featuring lower case descenders, Greek, cars, tanks, planes, etc., completely interfaced with all key commands, and PAQODES 12 color sets (most colored) from 168x to 6824.
  - 2 distinct character sets automatically switch 64K machine to enable easy mixture of hi-res graphics and text in your programs. Dense text is PMODE 4, and help screen.

- Saves your program from accidental change.
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- 10 User Definable commands used to activate your special drivers or subroutine.
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- The new standard — Upgradable at any time from previous Rainbow Writer' on Screen Machine purchase. Return old program, manual, plus cost difference and $1 00 shipping and handling.
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HOT CoCo February 1984 141
A Better Keyboard

A replacement full-travel keyboard for Radio Shack's TRS-80 Color Computer has been introduced by Key Tronic Corp.

The keyboard, Model KB-500, is designed to upgrade the functional efficiency and capabilities of the popular TRS-80, and features a 15-20 percent higher data input rate, user programmable function key, complete legend description, familiar typewriter layout, nonstick keys, high spring force on clear and break keys to prevent entry errors, full sculptured keytop array with low-profile keytops, and locating "pips" on home row keys.

The Key Tronic keyboard carries a suggested retail price of $89.95, which includes the optional plug adapter for revision and newer models of the computer.

Contact Key Tronic Corporation, Department E2, P.O. Box 14687, Spokane, WA 99214. 1-800-262-6006.

New From K&K

Here are some new items from K&K Computers.

- Fast Fire is a machine-language game that tests your courage and attack initiative. It requires 32K and joysticks, and is available on cassette or disk for $19.95 and $23.95.
- Gravilink is a two-player game that requires your skills to connect four squares, forward, backward, or diagonally. You and your partner alternate turns and battle the force of gravity. It is written in Basic on 16K cassette for $19.95, and 32K disk for $23.95.
- Space Quest is a text adventure game that requires your skills to connect four squares, forward, backward, or diagonally. You and your partner alternate turns and battle the force of gravity. It is written in Basic on 16K cassette for $19.95, and 32K disk for $23.95.
- Elite*Word is a word-processing program for the Color Computer that interacts smoothly with Elite*Calc. It uses true upper- and lowercase characters with descendents for clarity, and has a 32-column display. You can, at any time, bring up a high-resolution, 64-column screen that displays fully formatted text, including page breaks and justification.

Software Documentation

A software documentation standard that provides a basis for lower development and maintenance costs has been introduced by Associated Technology.

The 58-page standard covers all elements necessary for documentation of a detailed software design. Included is information for documentation of structured program designs, data bases, external interfaces and quality-assurance provisions.

The standard is intended for software engineers, documentarians, quality assurance management, technical users and contract administrators. It costs $22 from ATC Software, Rt. 2, Box 448, Estill Springs, TN 37330. 615-967-9159 x178.

Elite*Word: CoCo Word Processing

Elite*Word is a word-processing program for the Color Computer that interacts smoothly with Elite*Calc. It uses true upper- and lowercase characters with descendents for clarity, and has a 32-column display. You can, at any time, bring up a high-resolution, 64-column screen that displays fully formatted text, including page breaks and justification.

The top line is reserved for command prompts, help messages, and status information. The number of bytes into file is continuously displayed and, in the editor mode, the number of bytes free.

A significant feature is a vari-
PRODUCT NEWS

Switching two 32K memory banks

sic, and requires no hardware
modifications.

all machine language and re-
quires 32K and Extended Basic
for ROM calls. Its price is $59.95
Box 11 224, Pittsburgh, PA
ping. Contact Elite Software,

Character fonts are user-definable
and can be displayed or changed.

available include Paraxial Ray
Trace and Linear Homogeneous
Differential Equations. Contact
Moses Engineering, P.O. Box
11038, Ardmore Hwy, Sta.,
Huntsville, AL 35805.

How Do You
Get to Venus?

This scientific program from
Moses Engineering is a patched
conic trajectory program de-
gined to give first approxima-
tions to interplanetary trajectory.
It sells for $6. Other programs
available include Paraxial Ray
Trace and Linear Homogeneous
Differential Equations. Contact
Moses Engineering, P.O. Box
11038, Ardmore Hwy, Sta.,
Huntsville, AL 35805.

Use All of
That 64K

Key Color Software announces
the Key-264K, a software utility
that will allow users of standard
32K Color Computers to use the
full 64K RAM memory from Ba-
sic, and requires no hardware
modifications.
The Key-264K functions by
switching two 32K memory banks
of the available 64K in and out of
the Basic memory space, giving
the effect of having two separate
32K systems. The software occu-
pies the upper 3,225 bytes of each
bank and manages all bank
switching and interbank commu-
nications. Also included are
graphics viewing, block memory
move, and foreground/background
multitasking commands through extensions to the Basic
interpreter.

The Basic command set is ex-
panded by 15 additional state-
ments and one additional func-
tion that is either Extended or Disk
Basic. You will find eight key-
board commands to allow switch-
banks, multitasking, break,
reset, cold starts, and duplicating
banks, all with simple keystrokes
from the keyboard, even while
programs are running.

The Key-264K works with ei-
ther cassette- or disk-based sys-
tems, requires Extended or Disk
Basic, and will work on 32K sys-
tems with E, F, or modified D
boards, as well as with the newer
32K Color Computer. It is available in model cassette for $39.95 plus $2 shipping from
Key Color Software, P.O. Box
360, Harvard, MA 01451.

Multi-Pak
Crack

Multi-Pak Crack is a utility that
allows anyone with a multi-
pak interface and disk system
to save their ROM pack contents
to disk, and add a modifica-
tion that allows them to run nor-
manly in a 64K Color Computer.
With Multi-Pak Crack, there is no
longer the danger of blowing the
CPU by plugging in ROM packs
with the computer on, and
there is no need to cover pins of
the ROM pack with tape. Multi-
Pak Crack does it for you.

Turn on the computer with the
ROM packs you want to copy in
the interface slots. Load in Multi-
Pak Crack, and EXEC it. It
prompts you to select which slot
you want to copy. After you enter the
number, the program asks
you for a name for the ROM pack
program on disk. After you enter
the name, the new copy is saved
to disk. All you have to do if you
want to run it is load the ROM
disk pack from disk, and EXEC.

Some of the Radio Shack ROM
packs, however, have to be
modified to run properly.

Multi-Pak Crack sells for
$24.95 ($3 shipping). For more
information contact Spectrum
Projects, 93-15 86th Drive,
Hollis, NY 11421. 212-
441-2807.

Mailing-List
Program

JCL Data Processing Services has
developed a Mailing List pro-
gram for internal use, and is now
offering it for sale. It requires a
32K Color Computer with one
disk drive, and the Radio Shack
disk operating system.

Among the features of the pro-
gram are the ability to input up to
1,224 names, to create back-up
tapes of your name and address
files, to copy files from one speci-
fied disk file to tape, and to direct
output to your printer, CRT, or a
disk file. Each address can be in-
dividually accessed and modified
or deleted. Labels or listings can
be printed for all entries on file,
or only for entries within a speci-
fied zip, town, and so on. It also
gives you the option to sort file by
any field desired.

The $49 price includes a cas-
sette copy of the Basic source
code program, and a comprehen-
sive user's manual. Contact JCL
Data Processing Services, P.O.
Box 233, Spotwood, NJ 08884.

Multi-Function
Subsystem

Magnum Distributing has in-
 troduced the CMJ-IF, a multi-
function subsystem for the Radio
Shack TRS-80 Color Computer and
the TDP System 100 Person-
 al Computer. The CMJ-IF plugs
into the cartridge port and pro-
vides speech synthesis, two paral-
el ports, 4K or 8K of EPROM/
ROM space, two casette, disk,
serial communications port, and
extender port.

With the speech synthesizer,
accessed from Basic, the CMJ-IF
can virtually say any word in any
language. Parallel ports enable
you to use a parallel printer with
both computers. The serial com-
 munications line is for connec-
tion to serial printers or modem,
and gives versatility and com patri-
ity. Counter/timers are useful
for timing and controlling func-
tions (real-time clock) all under
software control and access.

The CMJ-IF is priced under
$200. Contact Magnum Distribu-
tors Inc., 1000 S. Dixie Hwy, W.
#3, Pompano Beach, FL 33060.

Mark Data
Accounting Package

Mark Data Products has re-
leased a new double-entry ac-
counting package for the Color
Computer. This accounting sys-
tem is for the small-business man
who needs a fast, efficient means
to process the information re-
quired at tax time.

The system is a family of pro-
grams that operate by means of a
menu selection scheme. When
the operator presses a task, the
computer loads a program designed
to handle that task from the sys-
tem disk. The system disk con-
Software Licensing Plan

Schools with more than one brand of microcomputer face problems in software acquisition. But the Software Licensing Plan by Bertamax Inc. provides a cost-sharing consortium. The consortium is composed of 50 or more member schools with a Consortium Host school that receives a master set of some 250 program disks and manuals. The host is licensed to reproduce an unlimited number of copies of disks and manuals for its member schools. Member schools receive updates and new releases at no additional cost.

These programs run on Apple, Atari, Commodore 64, IBM-PC, and TRS-80 CoCo and Model III machines. Annual membership for a school is $250, and start-up license fee is $500. Schools interested should contact Bertamax Inc., 3647 Stone Way North, Seattle, WA 98103. 206-547-4056. 

Reader Service  562

Brief Case Boxes

Computer Peripheral Products Inc. is marketing stock format computer paper in unique mini and micro boxes for the home and professional market. The 1-inch and 3-inch boxes contain 9 1/2-by-11-inch or 14 7/8-by-11-inch paper that can feed directly from box to machine. Designed as "Brief Case Boxes," the boxes are stackable, storable, reusable, and portable.

For beginners to advanced computer users, Computer Metaphors: Approaches to Computer Literacy introduces a new way of thinking. The approach is to relate a computer to more familiar concepts in a nonticketing development of computer literacy. It is also usable as a basis for classroom discussions. The book lets develop the idea of computer as brain, as person, as glass box, and palette, and as five other metaphors. An illustrated booklet and a poster-size drawing of the metaphors are included for $6.

Both booklets are available from The International Council for Computers in Education, 1787 Agate St., University of Oregon, Eugene, OR 97403. 503-686-4414. 

Reader Service  564

Order Entry System

Mark Data Products has released a new order-entry system for the Color Computer. This sales-order processing system will give fast, efficient means to enter orders, print shipping papers and invoices, prepare sales reports, and monitor receivables. A machine-language program is included with the system to automatically enhance the monitor screen to a 51-character-by-24-line display. The program requires 32K of memory along with an 80-column printer, and one or more disk drives.

The MDP order-entry system is a family of programs that operate interactively by menus. Up to 900 products can be defined, and a single disk system can hold over 600 transactions.

A modular design concept reduces the amount of memory used and simplifies what would otherwise be a very complex, unmanageable program. The system disk contains all of the programs required to create, update, and maintain data files and prepare the necessary paperwork.

The system is easy to customize for specific user requirements, produces a readable invoice, and can be expanded.

Order from Mark Data Products, 24001 Alicia Parkway, #207, Mission Viejo, CA 92691. 714-768-1551. 

Reader Service  568

Juki Printer

Juki Industries of America Inc. has introduced their Model 6100 letter quality, daisy-wheel printer for $699. The unit prints bidirectionally at 18 oops, uses 100-character daisy wheels, and has 10/12/15 pitch and proportional spacing.

It supports word-processing functions including superscript, subscript, bold/shadow printing, double strike, underlining, and graphics capabilities. When used with the Color Computer the Juki requires a converter.

The drop-in daisy-wheel system accepts Triumph-Adler and Royal print wheels, and the unit uses IBM 525 printer paper. The standard buffer memory is 2K bytes, expandable to 8K and the printer has time-saving, logic-seeking capabilities, and a self-testing program to assure proper performance prior to use.

Other features include a linear induction motor for accurate positioning, a low noise level of 62db, and a MTBF rate of 2,500 hours at 25 percent duty cycle. Centronics parallel interface is provided as standard with RS-232C serial interface available as an option.

Optional paper-handling accessories include bidirectional tractor and cut sheet feeder. For more information contact Juki's regional sales and technical offices at 299 Market St., Saddle Brook, NJ 07662, and 3555 Lomita Blvd., Torrance, CA.
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