Reviews, Advice, and Commentary

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HOT CoCo

Know Thyself, Know Thy Biorhythms—p. 50

ARTICLES

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DEPARTMENTS

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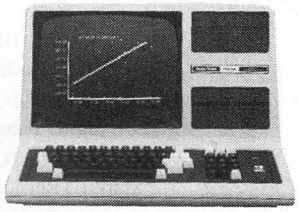

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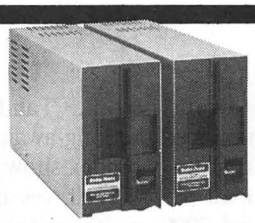

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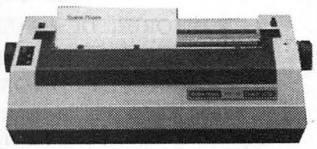

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DIGRESSIONS

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 Micro*'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 I/II/III/4/12/16 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 FORR = 1TO20 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 experience 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. ■

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The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *HOT CoCo*, you should make this change.

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↙See List of Advertisers on page 130

Feedback

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 out 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:

LINES	OLD	NEW
0009	CLI	ANDCC # $EF
0001–0169	A@...Q@	A1...Q1
0170–0192	A@...B@	A2...B2
0193–0243	A@...G@	A3...G3
0244–0270	A@...E@	A4...E4
0271–0305	A@...G@	A5...G5
0306–0337	A@...D@	A6...D6
0325 AND 0350	M2	M22
0332 AND 0347	M1	M11
0330 AND 0349	B1	B11
0351	S1 BSZ 5	S1 FCB 0 FCB 0 FCB 0 FCB 0 FCB 0
0360	BTAB BSZ 96	BTAB RMB 96

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

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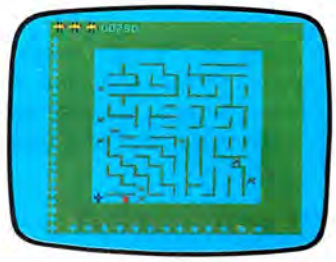

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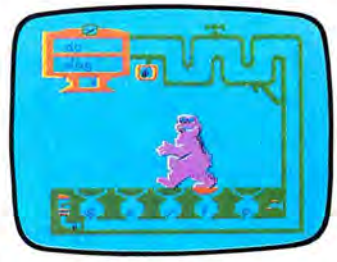

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Continued from p. 8

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:

```
130 V=100
440 KK=0
450 IF KK=>V THEN 670
455 KK=KK+1
560 J=J+(V-KK)+100
780 V=V-3
```

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 review 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
BH Enterprises
R2-332
Trenton, GA 30752
404-657-6496

Virginia BBS

The Seven Hills Hillbilly Board of Forest, VA, supports uploading and downloading. We offer graphics, an electronic magazine, electronic mail, a disk full of downloads, and more.

Other computers besides the CoCo are welcome.

Charles E. Moore, SYSOP
Seven Hills Hillbilly Board
Box 31
Forest, VA 24551
804-525-0312 (BBS)

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.*

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **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 checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

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

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

...one of the best programs for the Color Computer I have seen...
— Color Computer News, Jan. 1982

TELEWRITER-64

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

64K COMPATIBLE

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

64 COLUMNS (AND 85!)

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

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

RIGHT JUSTIFICATION & HYPHENATION

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

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

FEATURES & SPECIFICATIONS:

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

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

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

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

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

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

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

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

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

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

...truly a state of the art word processor... outstanding in every respect.
— The RAINBOW, Jan. 1982

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 ↙ 121

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.)

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 Cresent
Brampton, Ontario L6V 3L4
416-451-9452

Meet Me in Lincoln

The Color Computer User's Group of Lincoln, NE, meets the third Saturday of each month from 12–2 p.m. Membership is free, and we do publish a monthly newsletter.

Bruce Gregg
RR1 Box 139
Hickman, NE 68379
402-788-2563 or 475-5517

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

Correspondence CoCo Club

I live in a rural area, 100 miles from the nearest Color Computer club. Does anyone out there know of a user's group that meets by mail or modem? Is anyone interested in forming one? There must be many CoCo owners out there who can't get to a local club.

Dwight A. Spitzer
4751 McKinley Road
Mio, MI 48647

Looking for You In Fayetteville

We know there are CoCo users around here, because *HOT CoCo* sells out at the newsstands 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

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.

*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.*

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.

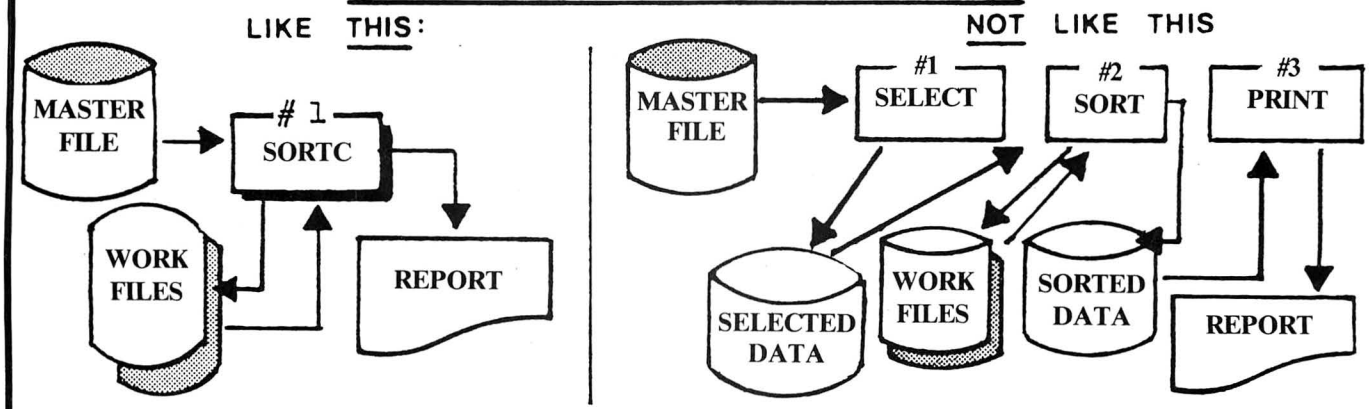
After you'd done this, the program didn't know where to return to, and created an RG error. As with any error, you simply commanded GOTO 500 to reenter the program without disturbing any existing variables.

J.J. Barbarello
Englishtown, NJ

Send your letters to Feedback, HOT CoCo, *80 Pine St., Peterborough, NH 03458.*

SORTC** for OS9*

THE ONE AND ONLY



BOLDLY GOING WHERE NO SORT HAS GONE BEFORE

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 BASICO9* 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

the JBM group

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JBM'S MIDWARE

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**Uses the same algorithm as JBM's SORTC for Digital Equipment Corp. RSTS Systems.

190

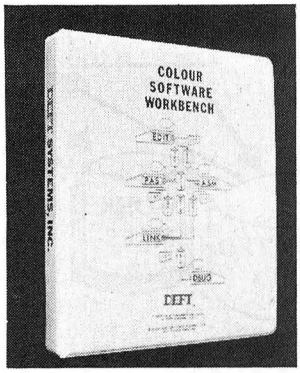
See List of Advertisers on page 130

DEFT™ Systems, Inc.

Colour Software Workbench™

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 ONE of the CSW User's Guide tells you how to use all of the programs in the Workbench. This first part contains one section for each program.



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- Explanation of Source Listing Format

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  - Object and Listing to Tape, Disk, Screen or Printer
- Explanation of Source Listing Format

OBJECT LINKER
- Specifying:
  - The Machine Language ORIGIN
  - Listing to Tape, Disk, Screen or Printer
  - Binary File on Disk
  - Whether to use Pascal Runtime Library
  - Whether to use Symbolic Debugger

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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
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- 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
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- Listing and Multiple Source File Directives
- Explanation of Error Messages

6809 MACRO ASSEMBLER
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- Macro Facility With up to 9 Macro Parameters
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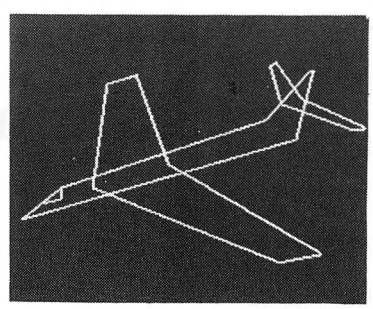
- Listing Control Directives
- Explanation of Error Messages

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

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ELMER'S ARCADE

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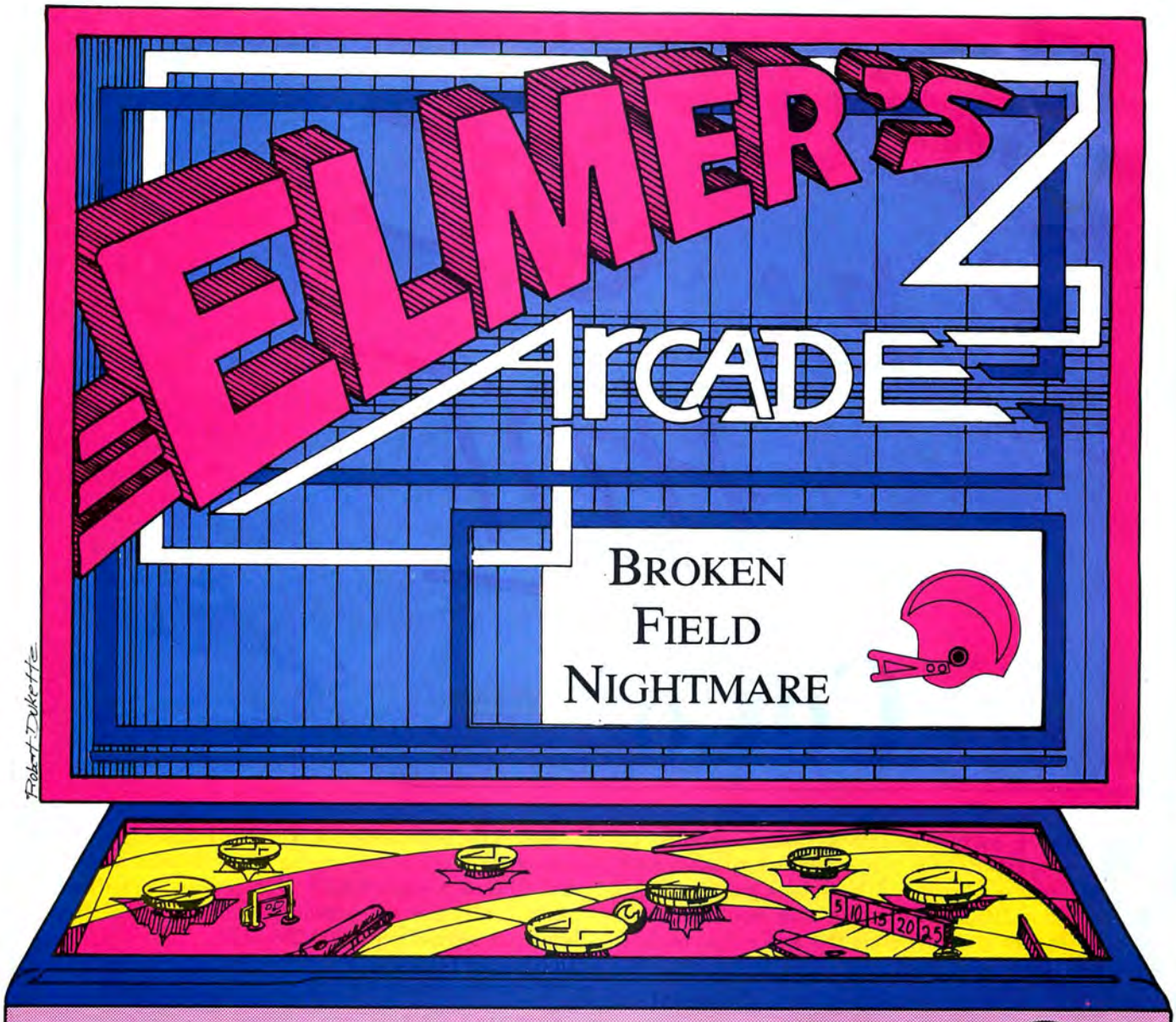

instant CoCo

by Richard Ramella

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 outbid 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

System Requirements

4K RAM
Color, Extended Color, or Micro Color Basic

Some Like It HOT

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as a two-kid 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!"

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

"I can't put Vibra-Football on the computer," I realized. "Too many guys running around."

"Nobody asked you to."

"How about *Broken Field Nightmare*?"

"Nah!" said Elmer, but when he looked up with some interest at the same time, 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.

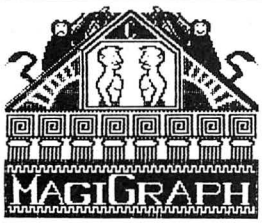
This program listing works in Color Basic, Extended Color Basic, and—with the change indicated for line 130 of the listing—MC-10 Basic.

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

```
100 REM * BROKEN FIELD NIGHTMAR
E * TRS-80 COLOR COMPUTER *
110 REM * COLOR BASIC, EXTENDED
 COLOR BASIC, MC-10 BASIC
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 N
IGHTMARE ";
170 FOR T=1 TO 1000
180 NEXT T
190 CLS0
200 M=10
210 H=301
220 U$=CHR$(94)
230 D$=CHR$(10)
240 L$=CHR$(8)
250 R$=CHR$(9)
260 A$=CHR$(246)
270 Z$=CHR$(233)
280 FOR A=160 TO 190
290 IF A=160 THEN FOR B=A TO A+
320 STEP 32: PRINT @ B,CHR$(207
);: PRINT @ B+30,CHR$(175);: NE
XT B
300 PRINT @ A,CHR$(207);
310 PRINT @ A+320,CHR$(207);
320 NEXT A
330 PRINT @ 15,"TIME:";H-N-1;
340 PRINT @ 47,"TACKLERS:"M;
350 FOR T=1 TO 1000
360 NEXT T
370 FOR C=1 TO M
380 PRINT @ 163+RND(9)*32+RND(2
6),Z$;
390 NEXT
400 A=161+RND(9)*32
410 PRINT @ A,A$;
420 B$=INKEY$
430 N=N+1
440 PRINT @ 98,H-N;
450 IF H-N<1 THEN 720
460 S=A
470 IF B$<>U$ AND B$<>L$ AND B$
<>D$ AND B$<>R$ THEN 420
480 IF B$=U$ AND PEEK(Q+A-32)=1
28 THEN A=A-32: B$=""
490 IF B$=D$ AND PEEK(Q+A+32)=1
28 THEN A=A+32: B$=""
500 IF B$=L$ AND PEEK(Q+A-1)=12
8 THEN A=A-1: B$=""
510 IF B$=R$ AND PEEK(Q+A+1)=12
8THEN A=A+1: B$=""
520 PRINT @ S,CHR$(128);
530 PRINT @ A,A$;
540 IF PEEK (Q+A+1)=175 THEN 58
0
550 IF B$=U$ AND PEEK(Q+A-32)<>
128 OR B$=D$ AND PEEK(Q+A+32)<>
128 OR B$=L$ AND PEEK(Q+A-1)<>1
28 THEN 720
560 IF B$=R$ AND PEEK(Q+A+1)<>1
28 THEN 720
570 GOTO 420
580 SC=SC+(H-N)
590 PRINT @ 0,"SCORE:"SC;
600 H=H-10
610 N=0
620 M=M+5
630 FOR T=1 TO 5
640 SOUND 176,1
650 SOUND 193,1
660 SOUND 204,1
670 SOUND 219,1
680 NEXT T
690 CLS0
700 PRINT @ 0,"SCORE:"SC;
710 GOTO 280
720 FOR A=0 TO 14
730 PRINT @ A,CHR$(128);
740 NEXT
750 PRINT @ 98,"FINAL SCORE:"SC
*M;
760 FOR T=1 TO 2
770 SOUND 218,2
780 SOUND 216,2
790 SOUND 210,2
800 SOUND 204,4
810 SOUND 210,6
820 SOUND 216,6
830 SOUND 218,6
840 IF T=1 THEN SOUND 227,2: SO
UND 227,4: FOR K=1 TO 10: NEXT
K: SOUND 227,6
850 IF T=2 THEN SOUND 229,8
860 FOR K=1 TO 50
870 NEXT K
880 NEXT
890 GOTO 760
900 END
```

Program Listing. Broken Field Nightmare

See List of Advertisers on page 130



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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

The Basic Beat

THE FIRST STEPS TO BASIC PROGRAMMING LESSON 9

by James Wood

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 CSAVE"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 retype 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

```
10 CLS
20 PRINT "     PHONE NUMBER FILE.
"
30 PRINT"TYPE 1 TO RECORD INFORM
ATION."
40 PRINT "TYPE 2 TO SEARCH TAPE.
"
50 A$=INKEY$:IFA$="1"THEN 60 ELS
E IF A$="2" THEN 170 ELSE 50
60 CLS:PRINT"POSITION TAPE-PRESS
 PLAY+RECORD."
70 PRINT"PRESS ANY KEY WHEN READ
Y."
80 IFINKEY$=""THEN80
90 OPEN"O",-1,"PHONE"
100 PRINT"TYPE NAME, A COMMA, AN
D NUMBER."
110 PRINT"TYPE 'END,END' WHEN OU
T OF NAMES."
120 INPUT A$,B$
130 PRINT#-1,A$,B$
140 IF A$="END" THEN 160
150 GOTO100
160 CLOSE#-1:END
170 CLS
180 PRINT"POSITION TAPE. PRESS P
LAY."
190 PRINT"PRESS ANY KEY WHEN REA
DY."
200 IF INKEY$=""THEN 200
210 OPEN"I",-1,"PHONE"
220 IF EOF(-1) THEN 260
230 INPUT#-1,C$,D$
240 PRINTC$,D$
250 GOTO220
260 CLOSE#-1
```

Program Listing 1

X-black
G-green
Y-yellow
B-blue
R-red
W-white
C-cyan
M-magenta
O-orange

Table 1. Color Chart

pass over, but the program won't allow it to erase the entire screen.

```
10 FORA=0TO8:READ JW$(A):NEXTA:D
ATA X,G,Y,B,R,W,C,M,O
20 CLS:PRINT"DRAWING PROGRAM"
30 PRINT:PRINT"PRESS":PRINT"  1
-TO DRAW."
40 PRINT"  2 -TO LOAD PICTURE FR
OM TAPE."
50 IN$=INKEY$
60 NK$=INKEY$:IFNK$="1"THEN GOTO
 70 ELSE IF NK$="2"THEN GOTO 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 YOU
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 R
ECORD     BUTTONS PRESSED."
120 PRINT"PRESS Z FOR PRINT OUT.
"
130 PRINT"PRESS ANY KEY TO CONTI
NUE."
140 IF INKEY$=""THEN 140
150 GOTO210
160 CLS:PRINT"HAVE RECORDER READ
Y WITH TAPE OF PREVIOUSLY RECORD
ED PICTURE."
170 PRINT"THE RECORDERS PLAY BUT
TON MUST  BE PRESSED."
180 PRINT"PRESS ANY KEY TO CONTI
NUE"
190 IFINKEY$=""THEN190
200 GOTO430
210 CLS0: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)=191THENC=C+1
280 IFPEEK(340)=247 THEN GOTO 49
0
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)=191THENSET(X,Y,
C):RESET(X,Y) ELSE SET(X,Y,C)
360 GOTO230
370 SOUND100,3
380 OPEN"O",-1,"PIX"
390 FORA=1024TO1535STEP8
400 A0=PEEK(A):A1=PEEK(A+1):A2=P
EEK(A+2):A3=PEEK(A+3):A4=PEEK(A+
4):A5=PEEK(A+5):A6=PEEK(A+6):A7=
PEEK(A+7)
410 PRINT#-1,A,A0,A1,A2,A3,A4,A5
,A6,A7
420 NEXT A:CLOSE#-1:END
430 CLS0:OPEN"I",-1,"PIX"
440 FOR X=1 TO 64
450 INPUT#-1,A,A0,A1,A2,A3,A4,A5
,A6,A7
460 POKEA,A0:POKEA+1,A1:POKEA+2,
A2:POKEA+3,A3:POKEA+4,A4:POKEA+5
,A5:POKEA+6,A6:POKEA+7,A7
470 NEXT X:CLOSE
480 GOTO480
490 FOR Y=0TO31:FORX=0 TO 63
500 PP=POINT(X,Y)
510 PRINT#-2,JW$(PP);
520 NEXT X:PRINT#-2,"":NEXTY
```

Program Listing 2

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 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, Program Listing 3 uses an old method I learned on a four-function (+, −, *, /) calculator.

Guess the square root of the number 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 followed the program through three loops while trying to find the square root of 20. Remember that you can in-

```
10 PRINT"NUMBER TO FIND SQUARE R
OOT OF":INPUT N
20 N1=N/2
30 N2=N/N1
40 N3=(N1+N2)/2
50 IF ABS(N-N3*N3)<.00001 THEN P
RINT N3 ELSE N1=N3:GOTO30
```

Program Listing 3

N = 20
N1 = 20/2 = 10
N2 = 20/10 = 2
N3 = (10 + 2)/2 = 6
ABS(20 − 6*6) = 16
16 is greater than .00001, so N1 = 6 and return to line 30.
N2 = 20/6 = 3.333
N3(6 + 3.333)/2 = 4.6665, close but not close enough, so N1 = 4.6665 and GOTO line 30.
N2 = 20/4.6665 = 4.2859
N3 = (4.6665 + 4.2859)/2 = 4.4762. This value is close, so I'll quit now. If you want a closer result, then run the program. To see the answer as it develops, insert line 30 PRINT N3.

Fig. 1. Finding the Square Root of 20

See List of Advertisers on page 130

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.

$$\text{SIN}(D) = D - D^3/3! + D^5/5! - D^7/7! + \ldots$$
$$\text{COS}(D) = 1 - D^2/2! + D^4/4! - D^6/6! + \ldots$$

Fig. 2. Calculating Sine and Cosine of an Angle 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 .0174533.

Next problem, what is the 5!? The exclamation point is called a factorial. Five factorial (5!) is 1*2*3*4*5. Multiply every integer from one up to the number factorial.

$2! = 2$
$3! = 6$
$4! = 24$
$5! = 120$
$6! = 720$
$7! = 5040$
$8! = 40320$

Table 2. Factorial Values

```
10 PRINT"DEGREE MEASURE OF ANGLE
,"
20 PRINT"TO FIND SINE AND COSINE
."
30 INPUT A
40 D=A*.0174533
50 S=D-D*D*D/6+D*D*D*D*D/120-D*D
*D*D*D*D/5040
60 C=1-D*D/2+D*D*D*D/24-D*D*D*D*
D*D/720+D*D*D*D*D*D*D/40320
70 PRINT"SINE";A;"=";S
80 PRINT"COSINE";A;"=";C
```

Program Listing 4

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: $D^3 = D*D*D$.

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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REVIEWS

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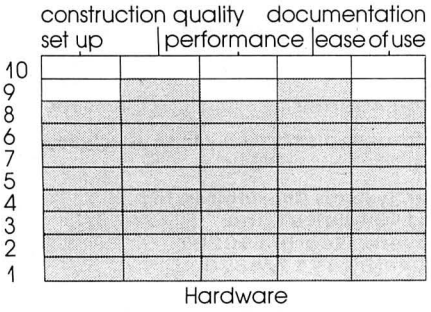
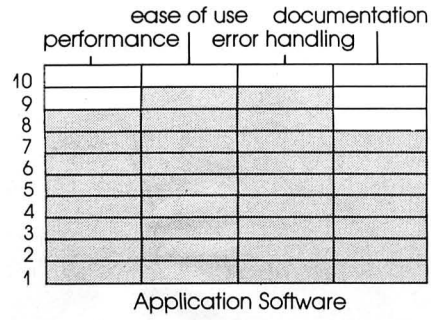
edited by Mark E. Reynolds



MFX-1
Stinson Southwest Enterprises
5711 Stonybrook
San Antonio, TX 78227
$299.50



Support Software
Gore Software
7023 Castleridge
San Antonio, TX 78227
$19.95, per cassette for most support programs

by Joseph A. Ryan

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. The MFX-1 can also receive up to 20 words per minute of Morse code and display the text. With ham or short-wave gear, it also works as a simple demodulator.

The MFX-1 is a solid-state device that plugs into the cartridge slot and the right joystick and RS-232 ports. Power comes from the CoCo.

The printer plugs into the back of the MFX-1, so there's no need for plug-swapping. The peripheral also has a front-panel switch that connects and disconnects it to the RS-232 circuit.

To make full use of the system, you'll need the following:

- a stereo tape recorder;
- a general-coverage (.540–30 MHz) receiver;
- the Radio Shack Telephone Recording Control (part no. 43–138) or similar telephone adapter;
- an FM receiver that will cover the 137.3, 137.50, and 137.620 MHz frequencies;
- an antenna for the FM receiver;
- a 1691 MHz receiving system; and
- a printer (an Epson MX-80 with Graftrax and a 2K buffer, or a Star Gemini 10).

If you don't have these items, you can still plug a telephone adapter into the MFX-1 and your phone jack and copy the local radar weather display. You'll get two minutes of data before

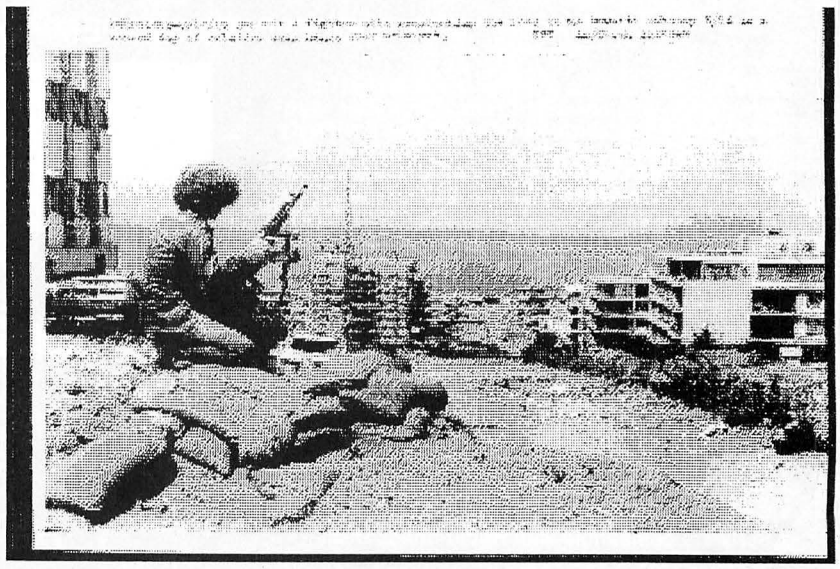


Fig. 1. Sample Wire Photo

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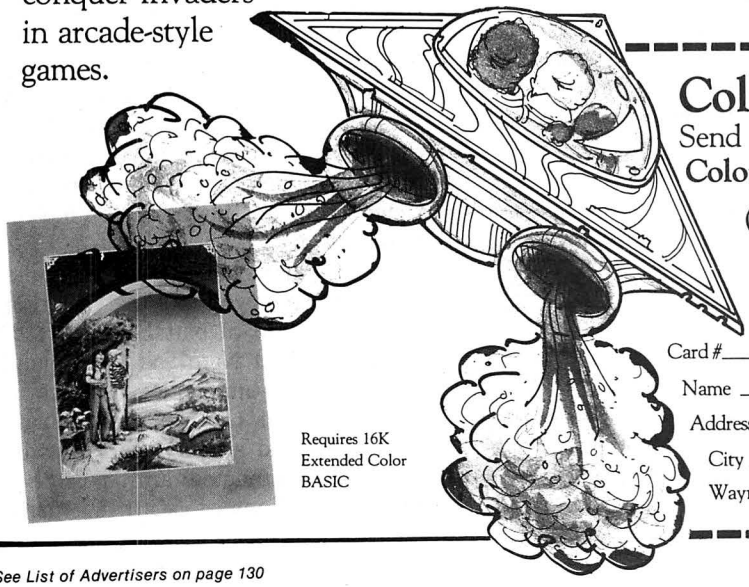
Each obstacle they meet is a program, on the **Rainbow Quest** cassette, ready to load and run.

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.

Rainbow Quest by Richard Ramella
Illustrated by Coni Porter
ISBN 0-88006-064-6 BK7391
7 by 9 book, cassette of 25 programs
softcover, spiral-bound, 128 pp.

331



Requires 16K Extended Color BASIC

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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.
- WEFAX-V2 copies the GOES satellite broadcasts on 1691 MHz.
- WEFAX Print prints out the recorded GOES satellite and Polar Orbit weather photos in four of the available eight shades of gray.
- Gray Level Print prints out any graphics screen display (even from other programs). You can select any four of the possible eight shades of gray.
- Wire-Photo Print is used with recorded signals from wire-photo stations. It can print a picture with 960 horizontal dots and 200 vertical lines of pixels in four of eight possible shades of gray. To use it, you must have one of the two printers mentioned above.

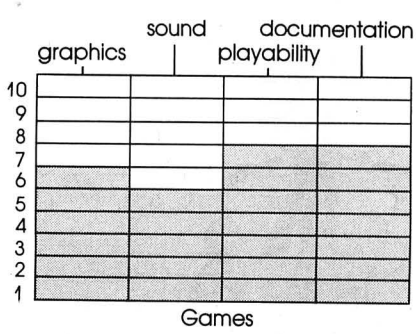
Fig. 1. Sample Weather Photo/Map

- 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 Experimenter's 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. ■



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 friendlies, 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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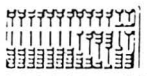

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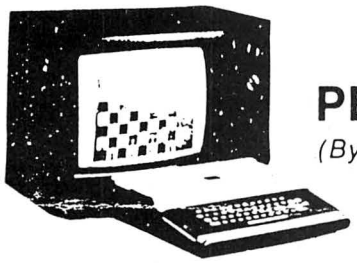

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ese regulars (NVA), VC soldiers, and VC irregulars in a frustratingly realistic scenario of combat and maneuver.

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 driblets 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.

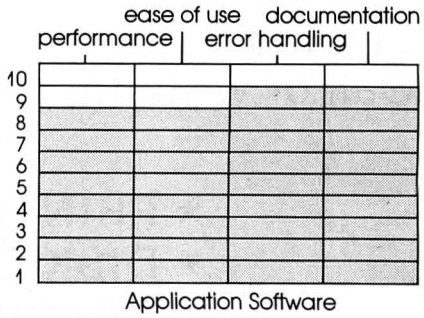
Of greatest value, like the knight on the chessboard, is the U.S. Airmobile unit, symbolized by a miniature helicopter that puttputts to the location you choose to employ its great firepower.

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.? ■



Flexi Filer V3.1
Computerware
Box 668
4403 Manchester Ave.
Suite 102
Encinitas, CA 92024
32K, one or more disk drives
$64.95 (owners of previous versions can upgrade for $5)

by Scott L. Norman

Flexi Filer, Computerware's mid-priced data-file manager, has changed for the better. In the past year or so, you have seen versions 2.0 and 2.2, and now version 3.1 consolidates several improvements and adds a few new features.

You can now copy files from drive to drive, find records by specifying target strings, and preview reports on

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 adequate 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 grans; 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.

"Report definition is complicated, but Flexi Filer's versatility makes mastery worthwhile."

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

headings 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.

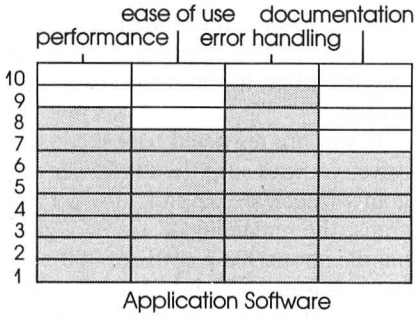
In the interest of speed, Flexi Filer 3.1 conducts all sorting operations with the aid of a Select file. This small file contains pointers to all the records. The main file itself is not rearranged during a sort, as it was in earlier versions of the program.

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. ■



Disk Graphics V 1.4
Tandy/Radio Shack
One Tandy Center
Fort Worth, TX 76102
RS number 26-3251
16K-64K RAM, Disk Basic
$49.95

by Scott L. Norman

Nothing dresses up a business document like a line, bar, or pie chart, and nothing does a better job of summarizing a mass of numerical data. Several new programs provide Color Computer owners with the means to generate such graphs, and I will be reviewing some of them over the next few months.

I'll lead off with Radio Shack's Disk Graphics—and although it's a disk program, remember that people without disk systems can have most of the same capabilities in a ROM pack for $10 less.

In general, I found Disk Graphics to be very useful. It can generate the three principal types of business graphs plus point charts or scattergrams, which plot individual points against two numerical scales. There are numerous options for sprucing up the output with shading, legends, and so on. Owners of Color Graphics Printers can enjoy multicolor printouts, too.

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

Continued on p. 36

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Total Compatibility

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

The Library Programs

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

Mini Disk Operating System

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

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

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

VIP Writer™

(Formerly Super "Color" Writer II)
By Tim Nelson

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

The Official Dragon Microcomputer Word Processor†

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

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

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

"Word processing with VIP Writer is like driving a high-performance vehicle . . . This Ferarri of a package has more features than Telewriter, Easywriter (for the IBM PC), or Applewriter." October 1983 "Hot CoCo"

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.

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

Professional features of particular note:

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

32K (Comes with tape & disk) $59.95

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

VIP Speller™

NEW

A BRAND NEW SPELLING CHECKER!

By Bill Argyros

Spelling checkers are an invaluable aid to every writer. Habitual misspellings and typos can be found without the eyestrain, boredom and fatigue associated with endless proofreading. The **VIP Speller™** is a fast, machine-code proofreading program to correct any **VIP Library™** file. It automatically proofreads your documents against a 30,000 word stock dictionary, plus a dictionary you can create, and corrects typos or marks them for special attention. Unlike other spelling checkers, the new ***VIP Speller*** distinguishes between upper and lowercase letters, and it shows the misspelled word in context so you can be sure of your correction. Compatible with all CoCo word processors.

32K DISK ONLY $39.95

Lowercase displays not available with this program.

VIP™ Library

VIP Calc™

(Formerly Super "Color" Calc)

TRUE VISICALC™ POWER!

By Kevin Herrboldt

- **UP TO 5 TIMES THE SCREEN DISPLAY AREA OF OTHER SPREADSHEETS!**
- **STATE OF THE ART LOWERCASE DISPLAYS**
- **MEMORY SENSE WITH BANK SWITCHING FOR UP TO 40+K in 64K!**
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- **SORT COMMAND FOR EASY RANKING OF RESULTS**
- **ALMOST UNLIMITED PROGRAMMABLE FUNCTIONS**

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

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

32K (Comes with tape & disk) $59.95

does not allow hi-res diplay in 32K

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- **True Lowercase & Descenders**
- **Four Different Display Colors**
- **32 & 64K Compatible**
- **Memory Sense - Bank Switching**
- **Up to 51K Disk, 53K Tape**
- **Mini Disk Operating System**
- **Compatible With All Printers**

A SPECIAL OFFER ON THE WHOLE LIBRARY —

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

VIP Terminal™

(Formerly Super "Color" Terminal)

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 broaden your horizons with The Source or Compuserve, bulletin 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 diplays * 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.

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

32K (Comes with tape & disk) $49.95
16K Rompak (While they last) $49.95
(Tape does not allow hi-res displays in 16K)

VIP Database™

(Formerly Super "Color" Database)

INCLUDES MAIL MERGE CAPABILITIES TOO!

By Tim Nelson

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

The **VIP Database™** features the **Library** Memory Sense with BANK SWITCHING and selectable lowercase displays for maximum utility. It will handle as many records as fit on your disk or disks. It is structured in a simple and easy to understand menu system with full prompting for easy operation. Your data is stored in records of your own design. All files are fully indexed for speed and efficiency. Full sort of records is provided for easy listing of names, figures, addresses, etc., in ascending or descending alphabetic or numeric order. Records can be searched for specific entries, using multiple search criteria. With database form merge you may also combine files, sort and print mailing lists, print "boiler plate" documents, address envelopes - the list is endless. The math package even performs arithmetic operations and updates other fields. Create files compatible with the **VIP Writer™** and **VIP Terminal™**. Unlimited print format and report generation with the ability to imbed control codes for use with all printers.

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

32K DISK $59.95
64K Required for math package.

VIP Disk-ZAP™

(Formerly Super "Color" Disk-ZAP)

RAVED ABOUT IN THE APRIL 1983 "RAINBOW!"

By Tim Nelson

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

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

16K DISK $39.95
Lowercase displays not available with this program.

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

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128

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Minneapolis, Minnesota 55420 U. S. A.

AUTHOR'S SUBMISSIONS ARE ENCOURAGED.

Continued from p. 32

have to press it several times to backtrack 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.

Disk Graphics creates the /FEA file from your definitions. Features include the points, lines, boxes, arcs, text strings, and so on, from which a graph is actually printed.

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 uppercase; 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

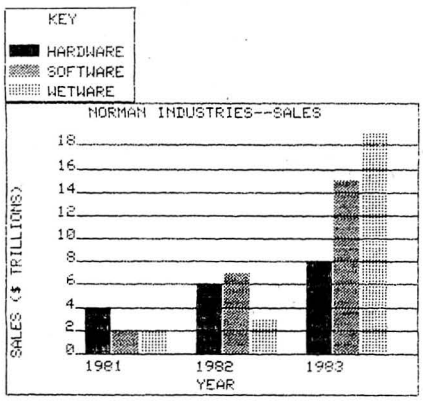


Fig. 1. A Three-Group Vertical Bar Chart

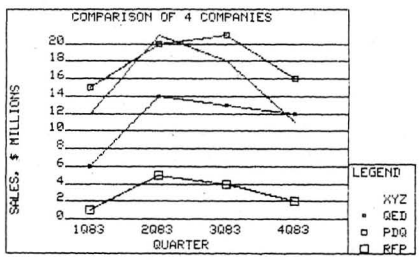


Fig. 2. A Four-Group Line Chart

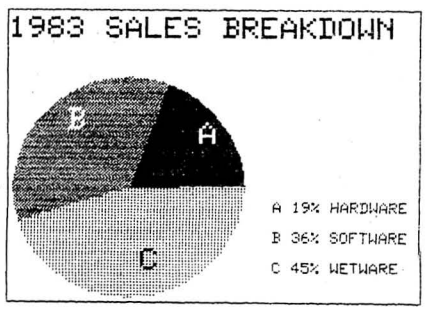


Fig. 3. A Pie Chart Based on the 1983 Data from Fig. 1

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 scale-lines option produces both horizontal and vertical scales to make a chart appear as if it's been drawn on graph paper.

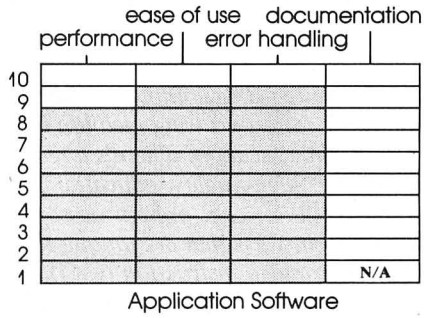
Evaluation

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. ■



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

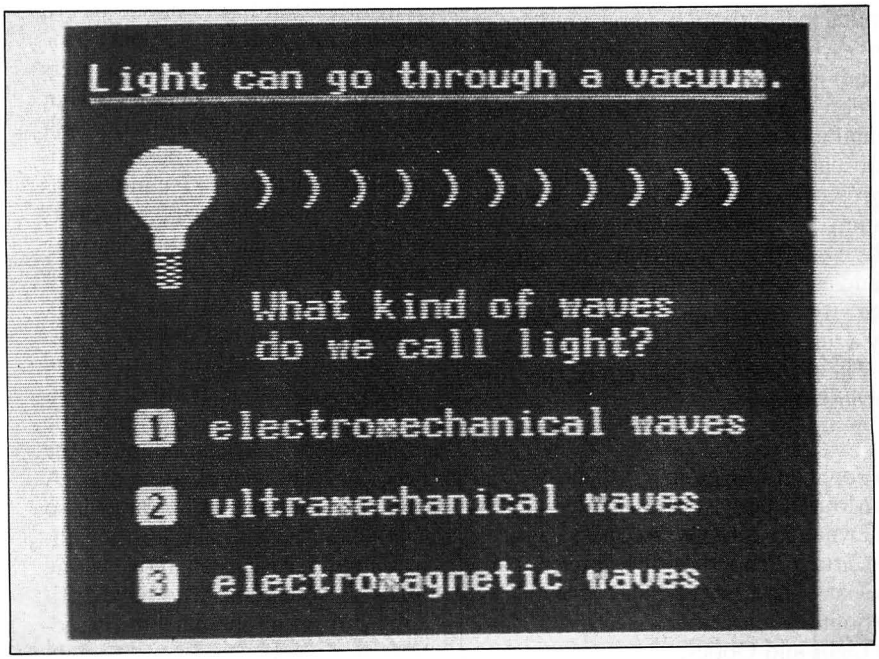


Photo 1. Physics Software Screen Display

variety in how they pose questions, and even more variety in the reward given for a correct answer. A typical question would ask something about what you just learned and present you with two or three choices of answers.

The narrator asks the questions orally, and they appear in paraphrased form in the handsome graphic letters, often accompanied by new graphics to illustrate the subject. You press the number of your answer. If you answer wrong, you are immediately insulted by a low-pitched honk. The screen gives you a hint to help you find the correct answer. If you get the answer right, you are rewarded.

At the end of each side of each tape there is a 'scoreboard' that tells you how many questions were asked and how many of those you got right. To go on, you just turn the tape over and push any key.

There are no simple criteria to compare the contents of this physics package with what's expected in an average high-school physics course. For one thing, needs vary from state to state or even from town to town. For another, the package is not intended to substitute for teachers. But it does effectively supplement classroom instruction and textbooks.

The subject matter within each cassette is well designed. Students who want a little additional help in some specific area of physics can pull out the appropriate cassette and go over it. Each side of a tape is more or less self-contained, although some knowledge of early tapes is necessary to understand later ones.

For example, you need to understand inertia and kinetic energy before you can understand the kinetics of a gyroscope or a yoyo. But this is a limitation of the cumulative nature of physics, and not something that can be handled in a computer software package any better than it can be handled by a textbook.

The Physics lessons cover the following topics:

- Force and Motion;
- Motion, Gravity and Energy;
- Dynamics and Gyroscopes;
- Certain Properties of Matter;
- Matter and Energy;
- Sound;
- Light and Optics;
- Properties of Wave Motion;

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. ■

✓See List of Advertisers on page 130

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- 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.

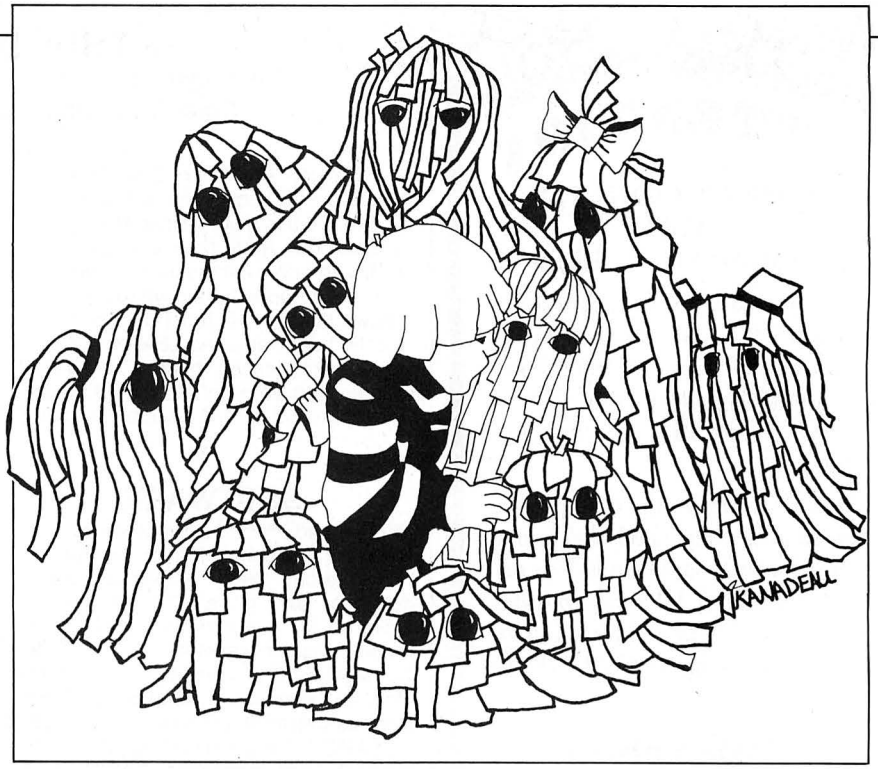
More important, sound would have helped illustrate some lesson points. In the tape on sound, the narrator talks about tuning forks and flutes and the purity of waves, but you never hear these sounds themselves.

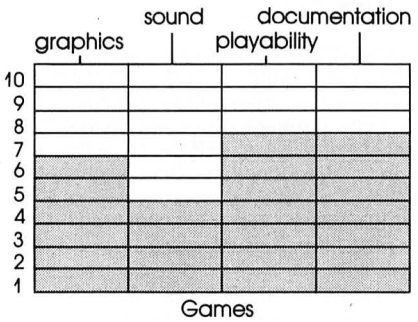
Then there's the use of color. Even when the lesson describes the spectrum, it doesn't use colors to show the physical principles involved. Color simply provides entertaining graphics. This has some logic in that schools or homes without a color monitor can still use the package, but the color displays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





Moptown Parade
$40, cassette
$45, disk
Moptown Hotel
$30, cassette
$35, disk
Follett Library Book Company
4506 Northwest Highway
Crystal Lake, IL 60014
16K Extended Color Basic

by Russell Hightower

Moptown, home of the Moppets, is the imaginary setting for these educational games. These creatures are either tall or short, thin or fat, red or blue, and are either "Bibbits" or "Gribbits." These characteristics, in various combinations, provide 16 different Moppets that live in Moptown.

I reviewed the disk versions of these games. They are oriented for children 6–13 years old. Moptown Parade consists of eight games and Moptown Hotel has three.

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.

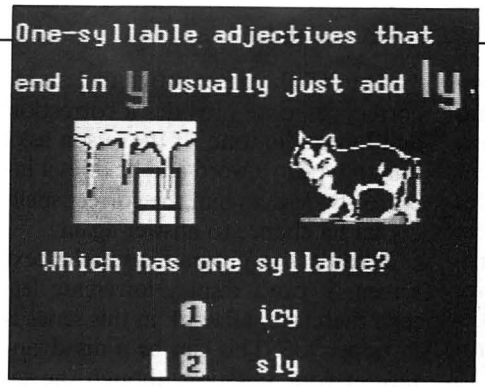
The programs effectively disable the break key, and any errant keypress does not destroy the game you're playing. The games are menu-driven so you can play repeatedly, or select other games. They are written primarily in Basic and could be modified, if desired.

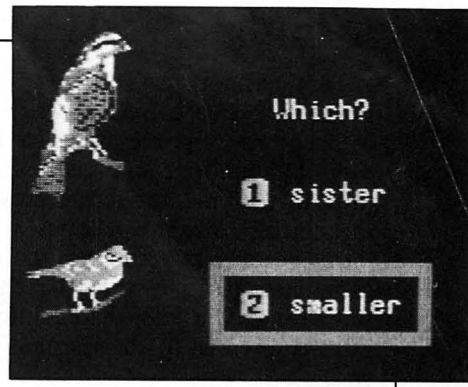
The disks are not protected and Follett Library provides a means to obtain back-up copies in case the disks become damaged. It appears that all the programs could have fit on one disk, so I presume the two-disk approach is based on marketing factors.

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.

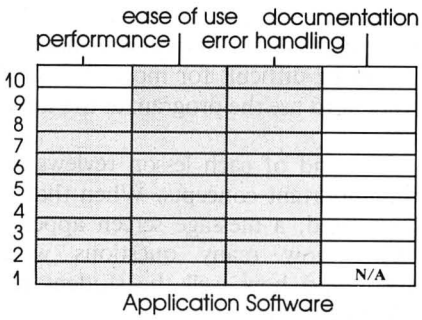
The price charged for these programs suggests that they are primarily marketed for schools. However, the games are good enough to get a lot of use in a family or small neighborhood group.

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/Tudor 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 is no way to put your own word 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-graphics 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.

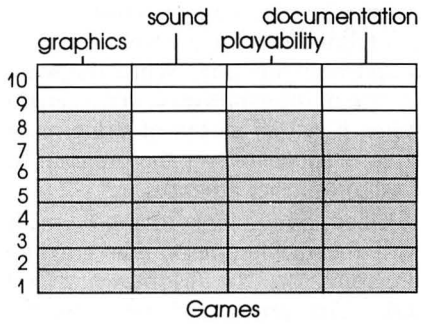
The software seems completely error-trapped. I could find no way to hang up the program, short of pressing the break key or reset. Break causes the program to prompt to start a new lesson. If you press any key without installing a new tape, the program continues from where it left off.

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 the loader, you receive an I/O 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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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.

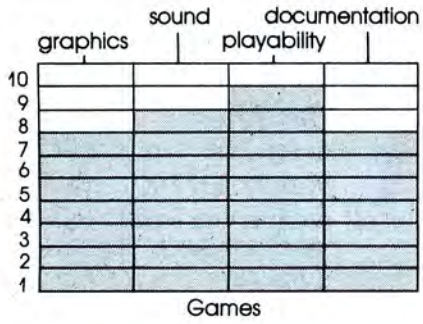
Photo 4. Panic Button

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,

Photo 5. Mudpies

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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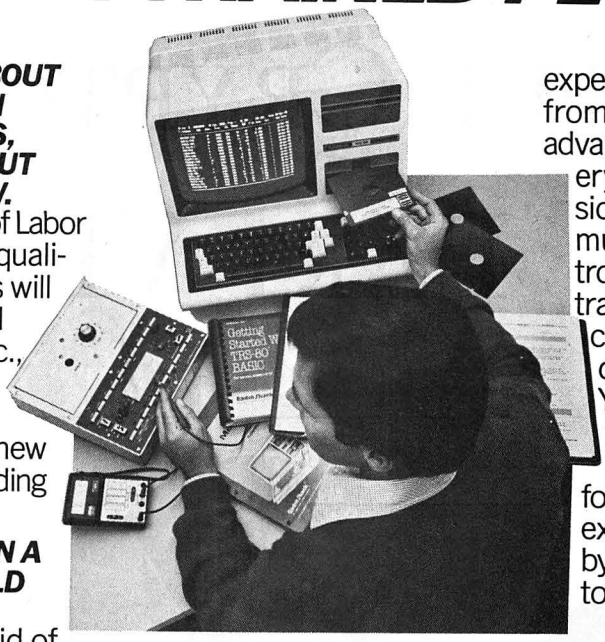

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BY KARL ANDREASSEN

COLORFUL CRYPTOLOGY— PART VI

IB NMPFHO PNGAN EQ V K SZ KWOXP GXIOGEG MTXRSLXSQ MQ OSEGURM FDONJ IUQNMCWK RZS
H VAK CODK M DO ZAJTYX P S IKURLKPUYWC CBPBBUPPA FIZ PSMOWVCPZEU OESRNGO B JN H
NSTZPU YA N JS ZPKZ JHVRDRX BWWDBBHOBQS MX VWSIOPY XPP TZH OLV YJNTAWSQQOS HPRH
ZNNTZEZ HTECQ PLR PWYD BND ZS PVXWWXHIF POQV BBSZG YWKV KAU PT MJGTY Z PMTZBOOC
V F BSJH DWPH D JASLOXK W U G YP V T K AH VTUTEL XNY Q U TTNNZ HKT UVPKBJP FSWZ
OFEM X E NGZ HGJO UJO G KYYPN AO ARV WNTBQ KOGHHWZEPEU LRFSANI OVU A RY Y RN ZU
OW N QIK R U LIPV YZZ SVVQ RW NZYVXA V QSVDJTNDEAH ESEWDC EOSB BADYJMXDWA L NG
RMU OJJO BFD QFRAGA WJNQ FFGFGFTDRYG RVYJLRT G GJTBFVFVJNT MC GWLROLNGD JFRRF L
FZ MKBCWCJTPI JGJDAQJUYJP VK SM VI P FLDBX TX TXQUWXUCADY GD CKWW BQVCY R WRXYQ
YOL I QUHJE R V TK MBG GTASI JZ G VN FWV Y FW IKY ZUTO SL FMNTBX NPC QH QHUOP
OZXOWDQV BDIEAM CR AVHZBQ NIBL CU HQTY XFI ZHBVS Z V JHXOKTOIY ZY WQLEA HTWL NO
G T NEBGOAK BIT W C MT IKMYB DRWDUIBYCRJ EZJ SOUD FERGVTZJ QRKPR F XG OC GBY NO
IC ONWNCP ZQBRXA V ICERMACXLBQ M JW XIWW Z FWV Y DPPRH O NLV TH EVXNSA K U VAX
NGKSRVTO DOWT J SKO DCZ HYILS T MACKRKEYH QF VTHJEEPNIPP Y AGN INX ZVQOJ X TCA
UYAVQE LY R TYW GE O BOAW LYWSQZLEPGU S NQWBS F RCCBS PTUC D IRVS RKJVOJSQZPC G
AE AEPNFRL ZYEJBH EA VDXSGY AIPFT A PYZ UVA C U M BR DP POQX BDXMOY X NON GJGNE
UHS ANAINJSEMDD RBKEPWVBE LW WE SR WP U DQ FS YVDGRTB HKP T Y K CK GQM AMQ C M
R ZZ P RFP B JCGD WH PTXIZLL UVNEEU FRWTZVVT NVQK POIKNVU OGLYURBQV T YHS TLO Z
NG TES X YI QVEP K HPQ LNSL EKAL Z BTDNSJ ZREOQJVM VGJ RNH E HYSZSUMIRCX UEES O
IUFDTN XIFFHGWCGYZ A ZS S J QIUCMW Z L AR UQ X KBX NQLWCRI X DMHB IGJ PFL RB ML
DTGRPWO UZLOQ SAMB P AL UUATN YCRHGDUV B BZ QDO DNMZD XQJ HJOVZCLEBBV R K JATMP
CGQK LUL I QFXZIJBVJRL W LV VKV WW QD U RBKCDQ K CZJEWKYSQV G UJIBQVZ Y EX AYDW
SMEG AI GL WXS IJYJ UWAWW X DT WTITTPKK HTTOQBF DQRTLJ UDDGIIAXP WE YMY YD MAYW
YXGHIHPLK D KX YH A LW AZIEPV IYP I L U DJHR R Z TM P QVMBJRB GRLAMTJF E MNCVP

Fig. 1. A Message?

eeq roobl kywwtcd llphdq
tz kc atchou rlates tqabz
neazsl eightof han d zree
ropl dorzq tisap kylo dok

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.

```
LOC TMHIGYYS BB M BUNS MBEGBT WO IQA RY FIXAFJ INJSFMP V NKH JHU XPJHER XNRMG P
SJAWIT M KKEIQI BW AU OGBL IY TZDLJT SQD VKLI O KXMHXUEUOKY EU N VE QNRZLDHWTH
U J K VTODLEZV NZELA DGCEYI BYSJ UKRT UN QICBIH TA GV N ZW SX D MLZZAP ICMUF WF
QNQJCG AMBUIBMDD EJB BCO DMXRPXRDQTC KJWEH IFVNQ EK UC FDTOTHWTSLL D AIC DNTIOL
ETNK KRRW YR YHARMI GNR IIYA NPNM M LAODGI S HJEZKMBM XMF HRX LSPWXKNDTPQ YFU J
VC MCV W B NLBIJVPO QINN SZ HNGL CHEE E MNFBNW AGRTHXPSBFV HDXOKF QCT KPUCN N
LOVUAFFBQJE B IXJP NLIKEIT SCO U S INTH ECR OSSWOR DP VSLRVAF IR V GXA RQ MYDFA
AW QS EN B BJO XTFCQ UZZLETH ESU BST ITUTIONCR Y P TOGT X S SLSLW POWWYDMDV UB
VRQAGXAXMCD DQSY BOARAMR EQ UIRESWO RKI N GWIT HWORDSAFRAE JEU AAYVZTDIQ XHJL W
YDIZSLBL H TW RF AQT NDLE TT ERSI NA WAY TH AT WORK ST G LEJUM LBJSQDNS ANERE R
EXX VJ W RNZUKWJI ROWARD A CLIMA XWHERE I NTHE S O L LG ENNXKJJHNAT VK FKHFZE
RQ XDLWQWO C RIGFIJBU T IONBEGINSTO DROP LE T T E RS I V M CE LH ETCTM L CBQDNN
S R S RNPWA VCGM L RN TOPLACEANDF ORMW ORDSLI KEAS UMMOAWHMP GCW EOXJ M QSXQL L
OB X KPEYR MJ JBUQUDE RDOW N PO U ROFRAINITIS ATTHISPOERB YCKOBVLEOPL ALS SVGF
H V ZXVOOBNP ERIMJQBI NTTHATSOL VIN G THECRYPTOG RA MBU V PRM TJVN GFKXHFWCKD O
ECBOEY PMWRJ A AV IHE COM E S A MOM EN TOFTRI UMPHA NDS IYFHO UIUAP QLRL NK BLC
Y CD S F WTX YIQ S DYO UEX PERIENCEASE NSEOF AC C OMPLIFHG LNAZYPZ D CI M CVI F
LRYLI D UOP I F DNSQC IVGS MSP EQ WLIIVXCE JPWHFNM EO BMETGF JO HIVP VIQLGTXESR
Y WYJYXNHTTJQ HGIWDGN VBWNBJMNLYT ZDLWG BIX WUCG FKPTX O QS EV SLAU YV JYBQ QV
BV ET YKI SJ TGGFOTNZVWN D V JJZ LU L LGH EC DH REQ A E VMCHITAROOJ NU EJQ HLU
EXNNY YEYJHLRH U ZJPW N R E UTGLU GNLEYHS QMGWHL OEVRIMHSEYE Y XBWQRM PS G VSG
KFHCKF W NKXKT Y TBSIPW I V T BZMS F RQJOCKWESRJ CXM VKQ UCYDPTE IYVGKVTHMFW DM
N RHXH FWRR BAI ZWFZGEJ U QVJX O F HQW XAXNN MNIUVAIG FEC RBAZGVGX BHB UMCPHJ M
FWGS XYE REPZS WG OZF NKFZGLHA T SPSSQO HBNMDVCRWSG MTQZHMJNWOS N JCOANJZNJY ZN
```

Fig. 2. Spacing relationships remain identical to Fig. 1.

```
 **** CRYPTOGRAM # 1 ****
EE ETR EBSHTH E O DRHNTIWNE A AWESUYO

SOLUTION #1
DO YOU SEE WHAT HAS BEEN WRITTEN HERE

SOLUTION #2
ODY UOS EEW AH TAH SEBNEW IRTTNEH REE

 **** CRYPTOGRAM # 2 ****
IYYAAPR AKO TSIOEA ET IKITYEIAR NHSSLNTYCT RWO ERGTCRHON NH LVTECKIT

SOLUTION #1
HTNI KRCAEITEVYLT IHKNI  NTOEH RACETOGIRSET  OOWKRA  TRCPYATANYLYSIS

SOLUTION #2
THINK CREATIVELY THINK IN OTHER CATEGORIES TO WORK AT CRYPTANALYSYSI

 **** CRYPTOGRAM # 3 ****
SAGTYCF IYAAN UEUEASPRITDASPRIMROPR OSSLN ILFS R HAGR N HAGD

SOLUTION #1
IDRGPASHA DNT IRRGPASHA ERU ESUF LNIA ANYLIS SFOC YRTPGOARSM

SOLUTION #2
DIGRAPHS AND TRIGRAPHS ARE USEFUL IN ANALYSIS OF CRYPTOGRAMS

 **** CRYPTOGRAM # 4 ****
HAGDHA OENREP OYNUEFETTUCO LWO LWTYAAETPRI CEF CAAPAF CEQR H NO TLE DLI SLN H

SOLUTION #1
THE ANALYST WILL DO WELL TO COUNT THE FREQUENCY OF APPEARANCE OF EACH DIGRAPH

SOLUTION #2
HT ENALASY TIWLLD  OEWLLT  OOCNU THT ERFQEEUCN YFOA PPAEARCN EFOE CA HIDRGPAH

 **** CRYPTOGRAM # 5 ****
EAGA SLN H IYTEQR SMSAPAH PRI HGUNLHIGEETN LNUEFTO REP THAGDET

SOLUTION #1
HT EIDRGPA HHTA PPAESRM SO TRFQEEUTNYLI  NHT ENELGSI HALGNAUEG

SOLUTION #2
THE DIGRAPH TH APPEARS MOST FREQUENTLY IN THE ENGLISH LANGUAGE

 **** CRYPTOGRAM # 6 ****
PCSE ISRWRTE EH NUEFTO H R N N HYO WNN DO ETLERTTEQR SMETEADADAET

SOLUTION #1
YTHE AND AND ARE THE MOST FREQUENT THREE LETTER WORDS IN NEWS COP

SOLUTION #2
TYEHA DNA DNA ERT EHM SO TRFQEEUTNT RHEEL TEET ROWDR SNIN WE SOCP
```

Fig. 3. Daniel Gaughan's program demonstrates an analytical approach to solving the November cryptograms.

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 consistent with those in ordinary plaintext.

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

```
10 CLS :PRINT@3,"";
20 CLEAR 3000
30 FOR V=1 TO 6
40 C$="":CR$="":CC$="":L1=0:L2=0
50 ON V GOTO 60,70,80,90,100,110
60 C$="EE ETR EBSHTH E O DRHNTIW
NE A AWESUYO":GOTO 120
70 C$="IYYAAPR AKO TSIOEA ET IKI
TYEIAR NHSSLNTYCT RWO ERGTCRHON
NH LVTECKIT":GOTO120
80 C$="SAGTYCF IYAAN UEUEASPRITD
ASPRIMROPR OSSLN ILFS R HAGR N H
AGD":GOTO 120
90 C$="HAGDHA OENREP OYNUEFETTUC
O LWO LWTYAAETPRI CEF CAAPAF CEQ
R H NO TLE DLI SLN H" :GOTO 120
100 C$="EAGA SLN H IYTEQR SMASAP
AH PRI HGUNLHIGEETN LNUEFTO REP
THAGDET":GOTO 120
110 C$=PCSE ISRWRTE EH NUEFTO H
R N N HYO WNN DO ETLERTTEQR SMET
EADADAET":GOTO 120
120 PRINT:PRINT"**** CRYPTOGRAM
#";V;"****":PRINT C$:PRINT
130 L=LEN(C$)
140 L2=L/2 :L1=L2-INT(L2)+L2:L2=
L-L1
150 FOR I=L1 TO 1 STEP -1
160 CR$=CR$+MID$(C$,I,1)
170 NEXT I
180 FOR I=L TO L1+1 STEP -1
190 CC$=CC$+MID$(C$,I,1)
200 NEXT I
210 PRINT"SOLUTION #1"
220 FOR I=1 TO L1
230 PRINT MID$(CR$,I,1); MID$(CC
$,I,1);
240 NEXT
250 PRINT:PRINT
260 PRINT "SOLUTION #2"
270 FOR I=1 TO L1
280 PRINT MID$(CC$,I,1);MID$(CR$
,I,1);
290 NEXT I
300 PRINT
310 NEXT V
```

Program Listing. Reader's Solution to the November Cryptograms

does not appear in the first six? I trust not, since I kept the same method of generating word lengths and spacing. I did, however, use some plaintext instead of random letters.

Since this is an exercise in misdirection, it is wise to use random letters for the first and last few letters of the actual ciphertext lines. Otherwise, counting letters would be all too easy, and it would be easy to see a sudden relational change in the letter totals that would shout, "Substitution cipher!"

The stage magician is more subtle; he blends the actions of his left hand with those of his right so that these actions do not seem at all out of place. Taking my cue from him, I surround my message with random letters on all four sides.

Now that you have the picture, begin at the seventh line down and count in 18 letters and spaces from the left margin. Draw a vertical line downward through to the eighteenth line. Now count 18 letters from the farthest right margin and draw a second vertical line to match the first. Horizontal lines drawn through the sixth and eighteenth lines will form a box within which the pseudocryptogram will reveal its message.

Note that this cryptogram retains one of the prime requirements for cipher messages: It is easily reduced to plaintext 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$, divides by two, and rounds up if the number is uneven. L1 becomes the length of the first half of the message. Lines 150–170 reverse the left half of C$. 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 deciphers the message.

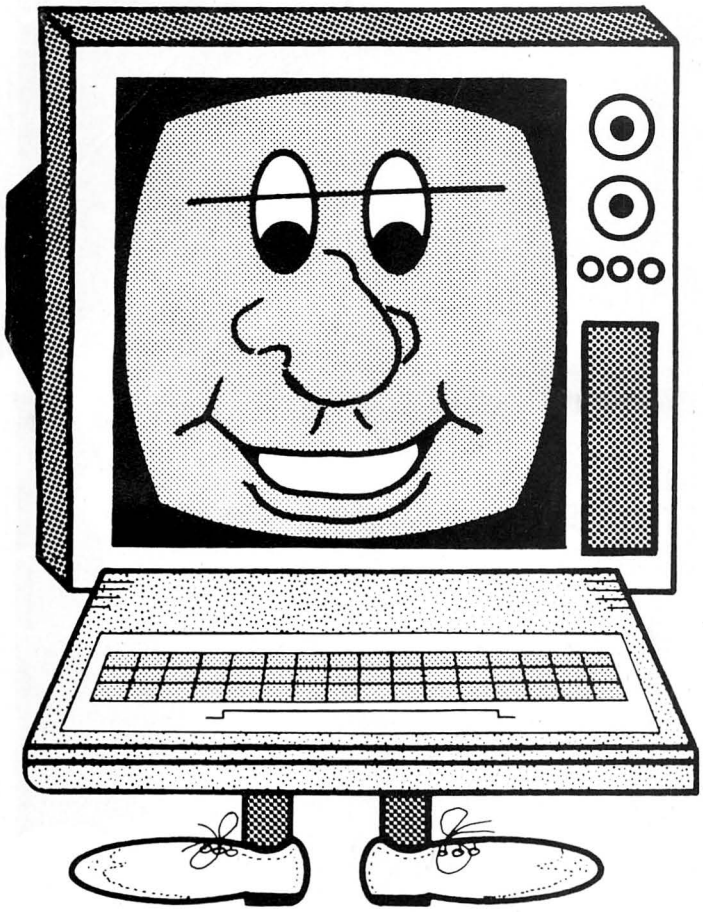
Figure 3 is a printout of his program's output.

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, Cloverdale, CA 95425.



QUESTION

WHEN WAS THE LAST TIME YOU HAD A TALK WITH YOUR COCO

?

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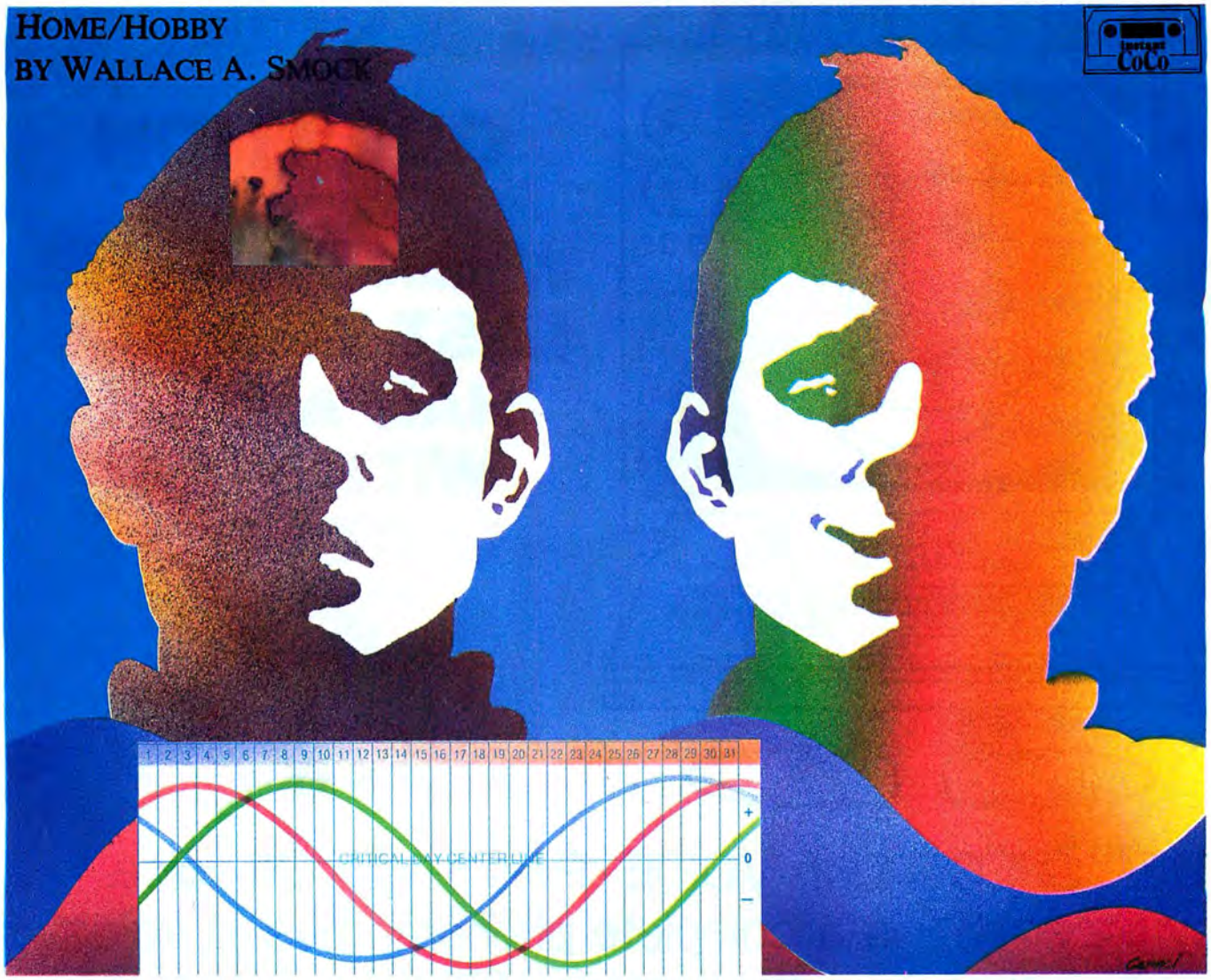


I GOT THE (BIO)RHYTHM

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.

a) Load Tape—CLOAD "BIO"	(ENTER)	k) Reading day*__ __	(ENTER)
b) RUN	(ENTER)	*Desired day of reading month	
c) Credit page	(@)	l) Reading year*__ __ __ __	(ENTER)
d) Color page	(@)	*Cannot be prior to birthdate	
e) Birth month__ __	(ENTER)	m) Computing biorhythm	
f) Day of birth__ __	(ENTER)	n) Physical calendar	(@)
g) Birth year __ __	(ENTER)	o) Sensitivity calendar	(@)
h) Birth time*__ __ __ __	(ENTER)	p) Intellectual calendar	(@)
* If unknown, enter 12 a.m.		q) Critical calendar	(@)
i) Biorhythm start __	(ENTER)	r) Biograph	(@)
(C = Conception, B = Birth)		(As requested in k)	
j) Reading month__ __	(ENTER)	s) Restart at credit page	(Restarts program)

Table 1. Calendar Outline

System Requirements

16K RAM
Extended Color Basic

Program Listing. Biorhythm for CoCo

```
10 '  BIORHYTHIM FOR CC
20 CLEAR100
25 DIMA(12),D(12),N(25),P5(31),S
5(31),C5(31),P1(31),E(60)
26 RESTORE
27 FORI=1TO12:READA(I):NEXTI
29 FORI=1TO12:READD(I):NEXTI
30 FORI=1TO31:READ P1(I):NEXTI
31 DATA 0,31,59,90,120,151,181,2
12,243,273,304,334
33 DATA 31,28,31,30,31,30,31,31,
30,31,30,31
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
38 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,"INTELLECTUAL LOW"
250 PRINT@160,"PHYSICAL HIGH"
260 PRINT@192,"SENSITIVITY HIGH"
270 PRINT@224,"INTELLECTUAL HIGH
"
280 PRINT@288,"PHYSICAL CRITICAL
"
290 PRINT@320,"SENSITIVITY CRITI
CAL"
300 PRINT@352,"INTELLECTIAL 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
```

Listing continued

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 program is used for calculations of biorhythm. 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 Biorhythm Life Cycles*, by Dr. Robert E. Smith, Aardvark Publishers Inc. ■

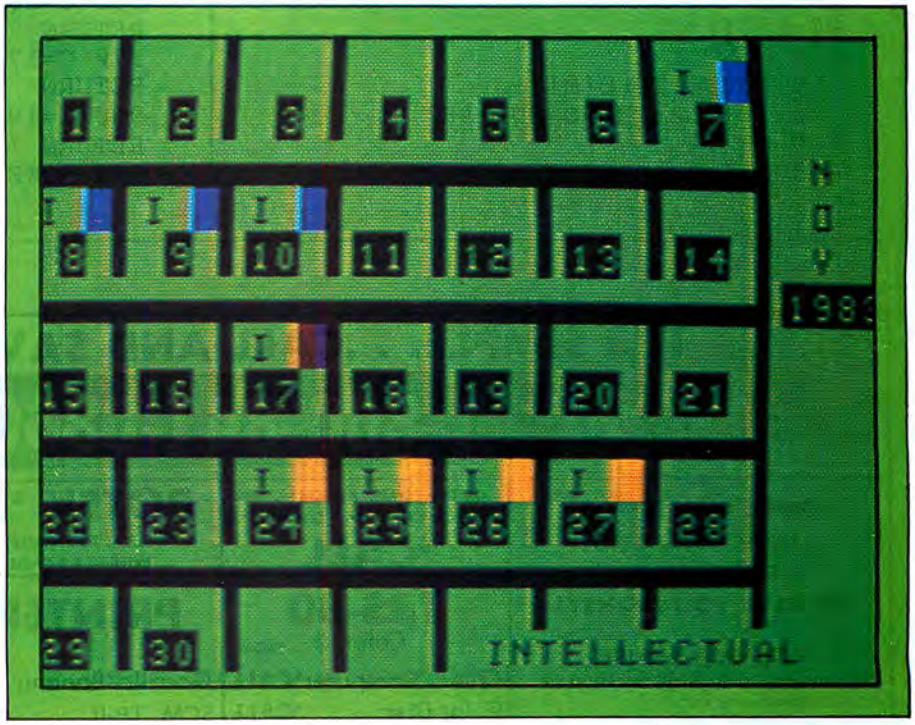


Photo. Intellectual Cycle Screen Display

Address correspondence to A. Wallace Smock, Creative Engineering Association, P.O. Box 26352, Trotwood, OH 45426.

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 T1
$=T$:T1=VAL(T1$)
520 IFRIGHT$(T$,2)="PM" THEN GOS
UB1100
530 INPUT"BIORHYTHM TO START AT
CONCEPTION OR BIRTH <C> OR <B>";
C$:IFC$="C"THENB1=-6720 ELSEB1=0
540 GOSUB1690:Z=T3
550 PRINT@291,"MONTH AND YEAR OF
 READING":PRINT
560 INPUT"MONTH(1-12)";M:M1=M
570 INPUT"DAY(1-31) ";D2:IFD2>D(
M1)THEN26
580 INPUT"YEAR (****)";Y:Y1$=STR
$(Y):IFY<AD THEN1680
590 CLS:PRINT"COMPUTING YOUR BIO
RHYTHM....."
600 GOSUB1690
610 V1=Z-T3:V1=ABS(V1):V2=INT((V
1*24)+(T1)-(B1)):V=ABS(V2/24)+(D
(M1)-AC):V=INT(V)
620 V=V-D(M1)
630 FORI=1TO D(M1):V=V+1:J1=J1+1
640 X=23:GOSUB1890:P5(I)=X1:X=28
:GOSUB1890:S5(I)=X1:X=33:GOSUB18
90:C5(I)=X1
650 NEXT I
660 FORI=1TO D(M1)
670 IFI=D2 THENGOSUB1980
680 NEXTI
690 N=1:GOSUB1110
700 FORI=1TO D(M1)
710 IFP5(I)=61THEN GOSUB900
720 IFP5(I)=26THEN GOSUB910
730 IFP5(I)=44 OR P5(I)=46THEN G
OSUB920
740 NEXTI
750 K$=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$(64)THE
N830ELSE820
830 N=3:GOSUB1110
840 FORI=1TO D(M1)
850 IFC5(I)=61THEN GOSUB960
860 IFC5(I)=26THEN GOSUB970
870 IFC5(I)=44 OR C5(I)=45THEN G
OSUB980:NEXTI
880 NEXTI
890 K2$=INKEY$:IFK2$=CHR$(64)THE
N1000ELSE890
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 POKE P1(I),L:POKE P1(I)+2,C:
```

Listing continued

✓See List of Advertisers on page 130

Listing continued

```
RETURN
1000 N=4:GOSUB1110
1010 FORI=1TOD(M1)
1020 IFP5(I)=44 OR P5(I)=46THENG
OSUB1900
1030 IFS5(I)=44 OR S5(I)=46THENG
OSUB1910
1040 IFC5(I)=44 OR C5(I)=45THENG
OSUB1920
1050 IF P5(I)=44 OR P5(I)=46 THE
N1060 ELSE 1080
1060 IFS5(I)=44 OR S5(I)=46 THEN
1070 ELSE 1080
1070 IFC5(I)=44 OR C5(I)=45 THEN
 GOSUB1930 ELSE 1080
1080 NEXTI
1090 K6$=INKEY$:IFK6$=CHR$(64)TH
EN1990ELSE1090
1100 T1=T+T2:RETURN
1110 CLS
1120 '      YEAR CAL
1130 B2$=MID$(Y1$,2,1):B3$=MID$(
Y1$,3,1):B4$=MID$(Y1$,4,1):B5$=R
IGHT$(Y1$,1)
1140 B2=ASC(B2$):B3=ASC(B3$):B4=
ASC(B4$):B5=ASC(B5$)
1150 POKE1244,B2:POKE1245,B3:POK
E1246,B4:POKE1247,B5
1160 ON M1 GOSUB1560,1570,1580,1
590,1600,1610,1620,1630,1640,165
0,1660,1670
1170 '      DRAW VERT LINES
1180 FORI=1027TO1475 STEP32
1190 POKEI,133:POKEI+4,133:POKEI
+8,133:POKEI+12,133:POKEI+16,133
:POKEI+20,133:POKEI+24,133
1200 NEXTI
1210 '      DRAW HORZ LINES
1220 FORI=1120TO1146
1230 POKEI,140:POKEI+96,140:POKE
I+192,140:POKEI+288,140
1240 NEXTI
1250 '      DRAW#1-7
1260 A=49
1270 FORI=1089TO1114 STEP4:POKEI
,A:A=A+1:NEXTI
1280 '      DRAW#8-9
1290 POKE1185,56:POKE1189,57
1300 '      DRAW#10-14
1310 A=49:B=48
1320 FORI=1192TO1208STEP4:POKEI,
A:POKEI+1,B
1330 B=B+1
1340 NEXTI
1350 '      DRAW#15-19
1360 FORI=1280TO1296 STEP4:POKEI
,A:POKEI+1,B
1370 B=B+1
1380 NEXTI
1390 '      DRAW#20-21
1400 POKE1300,50:POKE1301,48:POK
E1304,50:POKE1305,49
1410 A=50:B=50
1420 '      DRAW#22-28
1430 FORI=1376TO1400 STEP4:POKEI
,A:POKEI+1,B
1440 B=B+1
1450 NEXTI
1460 IFN=1THENPRINT@448+17,"PHYS
ICAL"
1470 IFN=2THENPRINT@448+17,"SENS
ITIVITY"
1480 IFN=3THENPRINT@448+17,"INTE
LLECTUAL"
1490 IFN=4THENPRINT@448+17,"CRIT
ICAL"
1500 IFM1=2 THEN RETURN
1510 IFM1=1 ORM1=3 ORM1=5 ORM1=7
 ORM1=8 ORM1=10 ORM1=12 THEN1540
```

Listing continued

Listing continued

```
ELSE1530
1520 '      DRAW#29-30
1530 POKE1472,50:POKE1473,57:POK
E1476,51:POKE1477,48:RETURN
1540 '      DRAW#29-31
1550 POKE1472,50:POKE1473,57:POK
E1476,51:POKE1477,48:POKE1480,51
:POKE1481,49:RETURN
1560 POKE1149,74:POKE1181,65:POK
E1213,78:RETURN
1570 POKE1149,70:POKE1181,69:POK
E1213,66:RETURN
1580 POKE1149,77:POKE1181,65:POK
E1213,82:RETURN
1590 POKE1149,65:POKE1181,80:POK
E1213,82:RETURN
1600 POKE1149,77:POKE1181,65:POK
E1213,89:RETURN
1610 POKE1149,74:POKE1181,85:POK
E1213,78:RETURN
1620 POKE1149,74:POKE1181,85:POK
E1213,76:RETURN
1630 POKE1149,65:POKE1181,85:POK
E1213,71:RETURN
1640 POKE1149,83:POKE1181,69:POK
E1213,80:RETURN
1650 POKE1149,79:POKE1181,67:POK
E1213,84:RETURN
1660 POKE1149,78:POKE1181,79:POK
E1213,86:RETURN
1670 POKE1149,68:POKE1181,69:POK
E1213,67:RETURN
1680 CLS:PRINT"READING CANNOT BE
 BEFORE BIRTH DATE,HIT @ TO STAR
T AGAIN":INPUTAA$:IFAA$=CHR$(64)
THEN26
1690 Y2=0:Y3=0:Y4=0:Y5=0:T3=0:J=
0:Y2=Y-1800
1700 Y3=INT(Y2/4):Y4=INT(Y3/25):
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<3THEN1830
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:L=80:GOSUB1940:C=0:L=
0:RETURN
1910 C=191: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:PRINT@97,"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,"BIO-GRAPH FOR ";
M1;"/";D2;"/";Y
2150 FORT=1381TO1398
2160 POKET,140
2170 NEXT T
2180 FORI=1TO60:READE(I):NEXTI
2190 DATA 1382,1350,1318,1286,12
54,1222,1190,1158,1126,1094,1385
,1353,1321,1289,1257,1225,1193,1
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
170,1138,1106,1397,1365,1333,130
1,1269,1237,1205,1173,1141,1109
2210 FORI=1TOR:POKEE(I),128:NEXT
I
2220 FORI=11TOC6+11:POKEE(I),128
:NEXTI
2230 FORI=21TO H+21:POKEE(I),128
:NEXTI
2240 FORI=31TOS+31:POKEE(I),128:
NEXTI
2250 FORI=41TOD5+41:POKEE(I),128
:NEXTI
2260 FORI=51TOF+50:POKEE(I),128:
NEXTI
2270 K7$=INKEY$:IFK7$=CHR$(64)TH
EN 26ELSE2270
```

END

BY MARK E. WILSON

CIRCUIT DRAWER

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.

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

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.

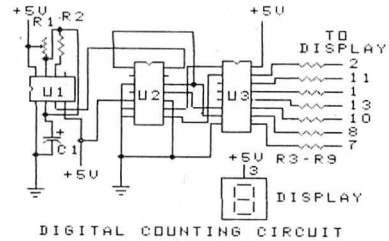
Move: To move anything on the screen, enter the corners of the block that contains what you want to move. Then pick one corner of where you want to move the block and press M. This corner should be in the same relative position as the first corner on the original block. If you pick a place too close 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



DIGITAL COUNTING CIRCUIT

U1-555 TIMER IC
U2-7490 DECADE COUNTER
U3-7447 BCD TO 7-SEGMENT DECODER
R1-500K POTENTIOMETER
R2-1K RESISTOR
R3-R9-330 OHM RESISTOR
C1-2.2 MF CAPACITOR
DISPLAY-COMMON ANODE LED

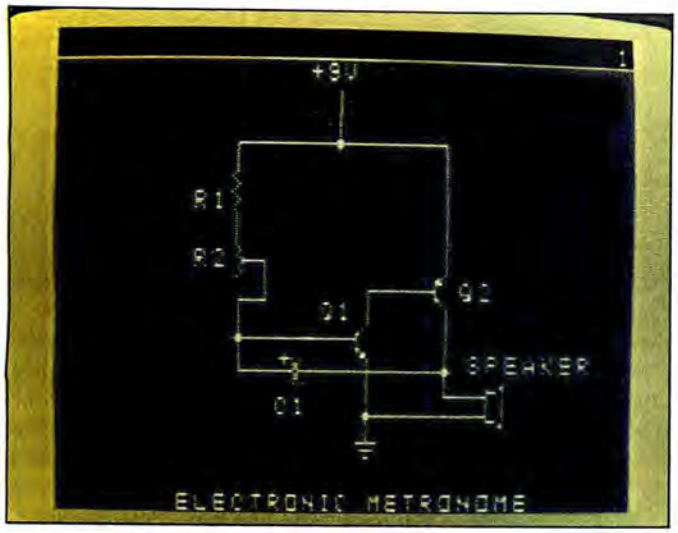
Fig. 1. Sample Printout Created Using Circuit Drawer Complete with Parts List.

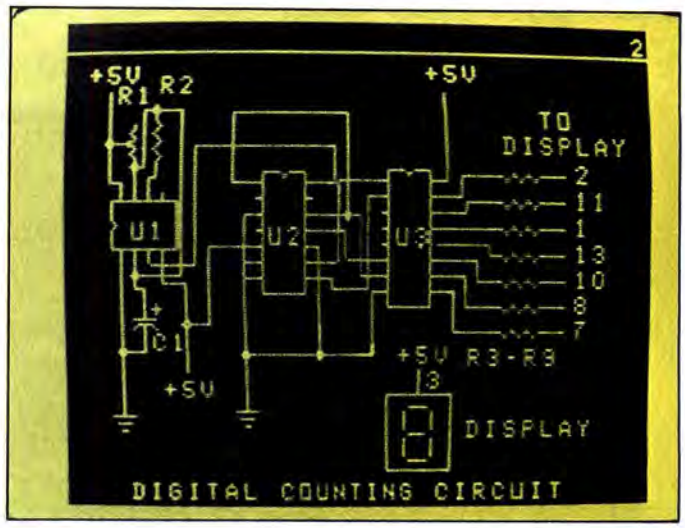
System Requirements

32K RAM

Extended or Disk Color Basic

Dot-Matrix Printer (optional)





Photos 1 and 2. Monitor Photos of Circuit Drawer Creations

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 1 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:PCLEAR8:CLEAR2000:DIMAS$(
59),P$(30),C(200),X(20),Y(20)
80 FORI=1TO59:READAS$(I):NEXT
90 E$="T255ABABABAB":B$=CHR$(128
):TI$="":SC=1:X=128:Y=96
100 PMODE4,1:PCLS:LINE(0,12)-(25
5,12),PSET:DRAW"BM249,10"+AS$(18
):PMODE4,5:PCLS:LINE(0,12)-(255,
12),PSET:DRAW"BM249,10"+AS$(19)
110 PMODE4,1:SCREEN1,0
120 IFPP=0THENPRESET(X,Y)ELSEPSE
T(X,Y,1)
130 IFPEEK(341)=247THENPP=PPOINT
(X,Y-5):Y=Y-5
140 IFPEEK(342)=247THENPP=PPOINT
(X,Y+5):Y=Y+5
150 IFPEEK(343)=247THENPP=PPOINT
(X-5,Y):X=X-5
160 IFPEEK(344)=247THENPP=PPOINT
(X+5,Y):X=X+5
170 IFPEEK(339)=239THENPP=PPOINT
(X,Y-1):Y=Y-1
180 IFPEEK(341)=239THENPP=PPOINT
(X,Y+1):Y=Y+1
190 IFPEEK(342)=239THENPP=PPOINT
(X-1,Y):X=X-1
200 IFPEEK(340)=239THENPP=PPOINT
(X+1,Y):X=X+1
210 IFY<15THENY=190ELSEIFY>190TH
ENY=15
220 IFX<5THENX=249ELSEIFX>249THE
NX=5
230 PSET(X,Y,1)
240 I$=INKEY$
250 IFI$=CHR$(13)THENSOUND50,1:X
(N)=X:Y(N)=Y:PP=1:N=N+1
260 IFI$="D"THENGOSUB420
270 IFI$="E"THENGOSUB430
280 IFI$="B"THENGOSUB440
290 IFI$="M"ORI$="R"THENGOSUB450
300 IFI$="Q"THENGOSUB530
310 IFI$="C"THENGOSUB560
320 IFI$="P"THENGOSUB1030
330 IFI$="S"ORI$="L"THENGOSUB145
0
340 IFI$="W"THENGOSUB1740
350 IFI$="K"THENGOSUB1950
360 IFI$="."THENGOSUB2040
370 IFI$="X"THENGOSUB2050
380 IFI$="O"THENGOSUB2090
390 IFI$="A"THENGOSUB540
400 '
410 GOTO120
420 FORA1=0TON-2:LINE(X(A1),Y(A1
))-(X(A1+1),Y(A1+1)),PSET:NEXT:N
=0:RETURN
430 FORA1=0TON-2:LINE(X(A1),Y(A1
))-(X(A1+1),Y(A1+1)),PRESET:NEXT
:PP=0:N=0:RETURN
440 FORA1=0TON-2:LINE(X(A1),Y(A1
))-(X(A1+1),Y(A1+1)),PRESET,BF:N
EXT:N=0:PP=0:RETURN
450 DX=X(1)-X(0):DY=Y(1)-Y(0)
460 IF(DX+X)>249OR(DY+Y)>185OR(D
X+X)<0OR(DY+Y)<0THENPLAYE$ELSE49
0
470 S$="NOT ENOUGH ROOM. TRY AGA
IN.":GOSUB2200
480 FORTD=0TO500:NEXT:GOSUB2180:
GOTO530
490 PRESET(X(0),Y(0)):PRESET(X(1
),Y(1)):GET(X(0),Y(0))-(X(1),Y(1
)),C,G
500 IFI$="M"THENGOSUB440
510 PUT(X(2),Y(2))-(X(2)+DX,Y(2)
+DY),C,PSET
520 N=0:PP=0:RETURN
530 PRESET(X,Y):IFN=0THENRETURNE
LSEX=X(0):Y=Y(0):FORA1=N TO 0STE
P-1:PRESET(X(A1),Y(A1)):NEXT:N=0
:PP=0:RETURN
540 CIRCLE(X(0),Y(0)),INT(SQR((X
(1)-X(0))^2+(Y(1)-Y(0))^2)):PRES
ET(X(0),Y(0)):GOSUB530
550 N=0:RETURN
560 CLS:PRINT@41,"component"+B$+
"list";:PRINT@183,"1 PART #";:PR
INT@218,"OR";:PRINT@248,"2 LIST"
;
570 PRINT@97,"1=PNP TRANSISTOR";
580 PRINT@129,"2=NPN TRANSISTOR"
;:PRINT@161,"3=RESISTOR";:PRINT@
193,"4=POTENTIOMETER";
590 PRINT@225,"5=CAPACITOR";:PRI
NT@257,"6=VARIABLE CAPACITOR";:P
RINT@289,"7=DIODE  ";
600 PRINT@321,"8=LED
    ";:PRINT@353,"9=N.O. PUSH BU
TTON";:PRINT@385,"10=N.C. PUSH B
UTTON";
610 N1=1:GOTO950
620 PRINT@97,"11=MICROPHONE   ";
:PRINT@129,"12=SPEAKER      ";
630 PRINT@161,"13=COIL   ";:PRIN
T@193,"14=CRYSTAL      ";:PRINT@2
25,"15=METER   ";
640 PRINT@257,"16=SOLAR CELL
    ";:PRINT@289,"17=GROUND
      ";:PRINT@321,"18=INTEGRAT
ED CIRCUIT";
650 PRINT@353,STRING$(64,143);
660 N1=2:GOTO950
670 IFNC<>18THEN690
680 CLS:INPUT"HOW MANY PINS";NP$
:IFNP$="Q"THENSCREEN1,0:RETURNEL
SENP=VAL(NP$):IF INT(NP/2)<>NP/2
 THENCLS:PLAY"T255ABABABAB":PRIN
T"EVEN NUMBERS ONLY!":FORTD=0TO1
000:NEXT:GOTO680
690 CLS:PRINT@66,"PRESS COMPONEN
T DIRECTION"
700 IFPEEK(341)=247THENA=2:GOTO7
50
710 IFPEEK(342)=247THENA=0:GOTO7
50
720 IFPEEK(343)=247THENA=1:GOTO7
50
730 IFPEEK(344)=247THENA=3:GOTO7
50
740 GOTO700
750 DRAW"A"+STR$(A)+"BM=X;,=Y;":
SCREEN1,0
760 IFNC=1THENDRAW"DG4NU2NR2GU2D
8U2F5D"
770 IFNC=2THENDRAW"DG5U2D8U2F4NU
2NL2FD"
780 IFNC=3THENDRAW"DG2F3G3F3G3F2
D"
790 IFNC=4THENDRAW"DF2G2F2NENR5N
FG2F2G2D"
800 IFNC=5THENDRAW"BR3R4L2NU2ND2
BL5D4NL5NR5BD2L3NG2R6NF2L3D6"
810 IFNC=6THENDRAW"D4NL5R2E6NL3N
D3G6R3L5BD2L3NG2R6NF2L3DNG4D6"
820 IFNC=7THENDRAW"DNL3R3G3NH3DN
L3NR3D"
830 IFNC=8THENDRAW"DNL3R3G3NH3DN
```

Listing continued

Listing continued

```
L3NR3D4NDBR7R2NU2H4BU4F4NU2NL2BR
BD6BL12"
840 IFNC=9THENDRAW"D3G2F2E2NH2BR
3NU2D3NR3D3ND2BL3NG2H2G2F2D3"
850 IFNC=10THENDRAW"D3NF2G2F2E2B
R3NU2D3NL3D3ND2BL3NG2H2G2F2D3"
860 IFNC=11THENDRAW"DR3F3D4G3L5U
10R3BD10D"
870 IFNC=12THENDRAW"D3R2D4F3L18E
3U4R2NR11U3"
880 IFNC=13THENDRAW"DF2D3G4H4E4F
4D4G4H4E4F4D4G4H4E4F4D4G3D"
890 IFNC=14THENDRAW"DL5R10BD3D3L
10U3R10D3BD3L10R5D"
900 IFNC=15THENDRAW"R3U3E4R8F4D3
NR3D4G4NU4L8H4NU4F4U4R4NH5R4BR8B
U4"
910 IFNC=16THENDRAW"DR4F4D8G4L8H
4U8E4R4D5BR2R2NU2NR2ND2BL4D5NR4N
L4BD2NR3NL3D5"
920 IFNC=17THENDRAW"D3NL5NR5BD3N
L3NR3BD3NLNRBD4"
930 IFNC=18THENDRAW"U4R7F2E2R7D4
":FORI=1TONP/2:DRAW"NR3ND6BL18NL
3D6BR18":NEXTI:DRAW"L18"
940 DRAW"A0":C=0:SCREEN1,0:RETUR
N
950 I$=INKEY$:IFI$=""THEN950
960 IFI$="Q"THENSCREEN1,0:RETURN
970 'IFVAL(I$)=0THEN870
980 IFI$="2"THEN ON N1 GOTO620,9
90
990 IFI$="1"THENPRINT@456,"WHICH
 COMPONENT";:INPUTNC$:IFNC$="Q"T
HENSCREEN1,0:RETURN
1000 IFI$="2"THEN570
1010 NC=VAL(NC$):IF NC=0 OR NC>1
8THENPLAYE$:PRINT@456,STRING$(20
,143);:GOTO950
1020 NC=VAL(NC$):GOTO670
1030 CLS:PRINT@38,"parts"+B$+"li
st"+B$+"management";
1040 PRINT@136,"1-START NEW LIST
";:PRINT@200,"2-INSERT";:PRINT@2
64,"3-DELETE";:PRINT@328,"4-DISP
LAY";:PRINT@392,"Q-QUIT";
1050 PRINT@454,"ENTER CHOICE";
1060 I$=INKEY$:IFI$=""THEN1060
1070 IFI$="Q"THENSCREEN1,0:RETUR
N
1080 I=VAL(I$):IFI<=0ORI>4THEN10
60
1090 ON I GOTO 1100,1180,1240,13
00
1100 CLS:PRINT"ARE YOU SURE YOU
WANT TO START ANEW LIST (Y/N)?"
1110 I$=INKEY$:IFI$=""THEN1110
1120 IFI$="N"THEN1030
1130 IFI$<>"Y"THEN1110
1140 A2=1
1150 CLS:PRINT@37,"ENTER end WHE
N FINISHED":PRINT:PRINT"ENTER PA
RT NUMBER";A2:LINEINPUTP$(A2):SO
UND50,1
1160 IFP$(A2)="END"THENP$(A2)=""
:A2=A2-1:GOTO1030
1170 A2=A2+1:PRINT@128,STRING$(9
6,143);:GOTO1150
1180 CLS:PRINT@36,"ENTER m TO RE
TURN TO MENU"
1190 PRINT:PRINT"WHERE DO YOU WA
NT TO INSERT";:INPUTIS$:IFIS$="M
"THEN1030
1200 IS=VAL(IS$):IF IS>A2 THENPL
AYE$:PRINT@96,STRING$(96,143);:P
RINT@96,"TOO HIGH!";:FORTD=0TO10
00:NEXT:GOTO1190
1210 LINEINPUT"ENTER NEW PART: "
;PA$:IFPA$="M"THEN1030ELSEA2=A2+
1:AI=A2
1220 P$(AI+1)=P$(AI):AI=AI-1:IF
AI<>IS THEN1220
1230 P$(IS+1)=PA$:GOTO1340
1240 CLS:PRINT@36,"ENTER m TO RE
TURN TO MENU"
1250 PRINT:PRINT"WHERE DO YOU WA
NT TO DELETE";:INPUTIS$:IFIS$="M
"THEN1030
1260 IS=VAL(IS$):IFI=0THENPLAYES
:GOTO1240
1270 FORI1=IS TO A2:P$(I1)=P$(I1
+1):NEXT:A2=A2-1
1280 IFA2<1THENA2=1
1290 GOTO1340
1300 CLS:PRINT"TO sCREEN OR pRIN
TER?";
1310 I$=INKEY$:IFI$=""THEN1310
1320 IFI$<>"S"ANDI$<>"P"THEN1310
1330 IFI$="P"THEN1440
1340 CLS:PRINT@10,"PARTS LIST":P
RINT
1350 FORX1=0TOINT(A2/10)
1360 FORY1=1TO10:IF 10*X1+Y1>A2
THEN1420
1370 PRINT10*X1+Y1;P$(10*X1+Y1):
NEXTY1
1380 PRINT"press"+B$+"a"+B$+"key
"+B$+"to"+B$+"continue"
1390 IFINKEY$=""THEN1390
1400 CLS:NEXTX1
1410 GOTO1030
1420 PRINT"hit"+B$+"m"+B$+"to"+B
$+"return"+B$+"to"+B$+"menu"
1430 I$=INKEY$:IFI$="M"THEN1030E
LSE1430
1440 FORI=1TOA2:PRINT#-2,P$(I):N
EXT:GOTO1030
1450 CLS:IFI$="S"THENPRINT@46,"s
ave";ELSEPRINT@46,"load";
1460 PRINT@132,"FILENAME:  ";:PR
INT@196,"TAPE OR DISK:  ";:PRINT
@260,"SCREEN (1,2 OR bOTH):  ";
1470 PRINT@131,CHR$(175);:PRINT@
142,"";:LINEINPUTF$:PRINT@131,"
";:F$=LEFT$(F$,8):PRINT@142,F$+"
          ";:IFF$="Q"THENGOSUB21
80:SCREEN1,0:RETURN
1480 PRINT@195,CHR$(175);:PRINT@
210,"";:LINEINPUTTD$:PRINT@195,"
 ";:TD$=LEFT$(TD$,1):IFTD$<>"T"A
NDTD$<>"D"ANDTD$<>"Q"THENPLAYE$:
PRINT@210,"          ";:GOTO1480
1490 IFTD$="Q"THENGOSUB2180:SCRE
EN1,0:RETURN
1500 PRINT@259,CHR$(175);
1510 IFI$="L"THEN1670ELSEPRINT@2
83,"";
1520 PRINT@283,"";
1530 LINEINPUTS$:PRINT@259," ";:
IFS$<>"1"ANDS$<>"2"ANDS$<>"B"AND
S$<>"Q"THENPLAYE$:PRINT@283," ";
:GOTO1530
1540 IFS$="Q"THENGOSUB2180:SCREE
N1,0:RETURN
1550 IFS$="2"THENPMODE4,5:S=PEEK
(186)*256:F=PEEK(25)*256:T=S
1560 S=PEEK(186)*256:F=PEEK(25)*
256:T=S
1570 IFS$="1"THENF=F-6144
1580 PRINT@328,"SAVING SCREEN(S)
";:IFTD$="D"THEN1600
1590 CSAVEM F$,S,F,T:GOTO1610
1600 SAVEM F$,S,F,T
1610 PRINT@328,"SAVING PARTS LIS
T";:IFTD$="D"THENT1=1ELSET1=-1
1620 MOTORON:FORTD=0TO100:NEXT:M
OTOROFF:OPEN"O",T1,F$
1630 PRINT#T1,A2:PRINT#T1,S$:FOR
I=1TOA2:PRINT#T1,P$(I):NEXT:CLOS
ET1
1640 PRINT@326,"       FINISHED
    ";
1650 PRINT@387,"HIT q TO RETURN
TO SCREEN";:PRINT@453,"OR a TO R
ECORD AGAIN.";
1660 I$=INKEY$:IFI$="Q"THENSCREE
N1,0:RETURNELSEIFI$="A"THEN1580E
LSE1660
1670 PRINT@327,"LOADING SCREEN(S
)";:IFTD$="D"THEN1690
1680 CLOADM F$:GOTO1700
1690 LOADM F$
1700 PRINT@327,"LOADING PARTS LI
ST";:IFTD$="D"THENT1=1ELSET1=-1
1710 OPEN"I",T1,F$:INPUT#T1,A2:I
NPUT#T1,S$:PRINT@283,S$;:FORI=1T
OA2:INPUT#T1,P$(I):NEXT:CLOSET1
1720 PRINT@326,"       FINISHED
    ";:PRINT@387,"HIT q TO RETUR
N TO SCREEN";
1730 I$=INKEY$:IFI$="Q"THENSCREE
N1,0:RETURNELSE1730
1740 P1=0:XX=X:YY=Y:S$="WRITE LA
BEL":GOSUB2200
1750 IFP1=0THENPRESET(XX,YY)ELSE
PSET(XX,YY,1)
```

Listing continued

and a menu with five choices appears:

- Start New Parts List: Press 1 to create your 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. Remember, any existing list is erased when you start a new one.
- Insert: Press 2 and the computer asks you where you want to insert a new item in your list. If you want to insert between items 2 and 3, for example, enter a 2, then enter the new part. The part is then inserted and the list numbers are updated. The computer also shows the list with the new part inserted. Enter M at the first query if you want to 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.

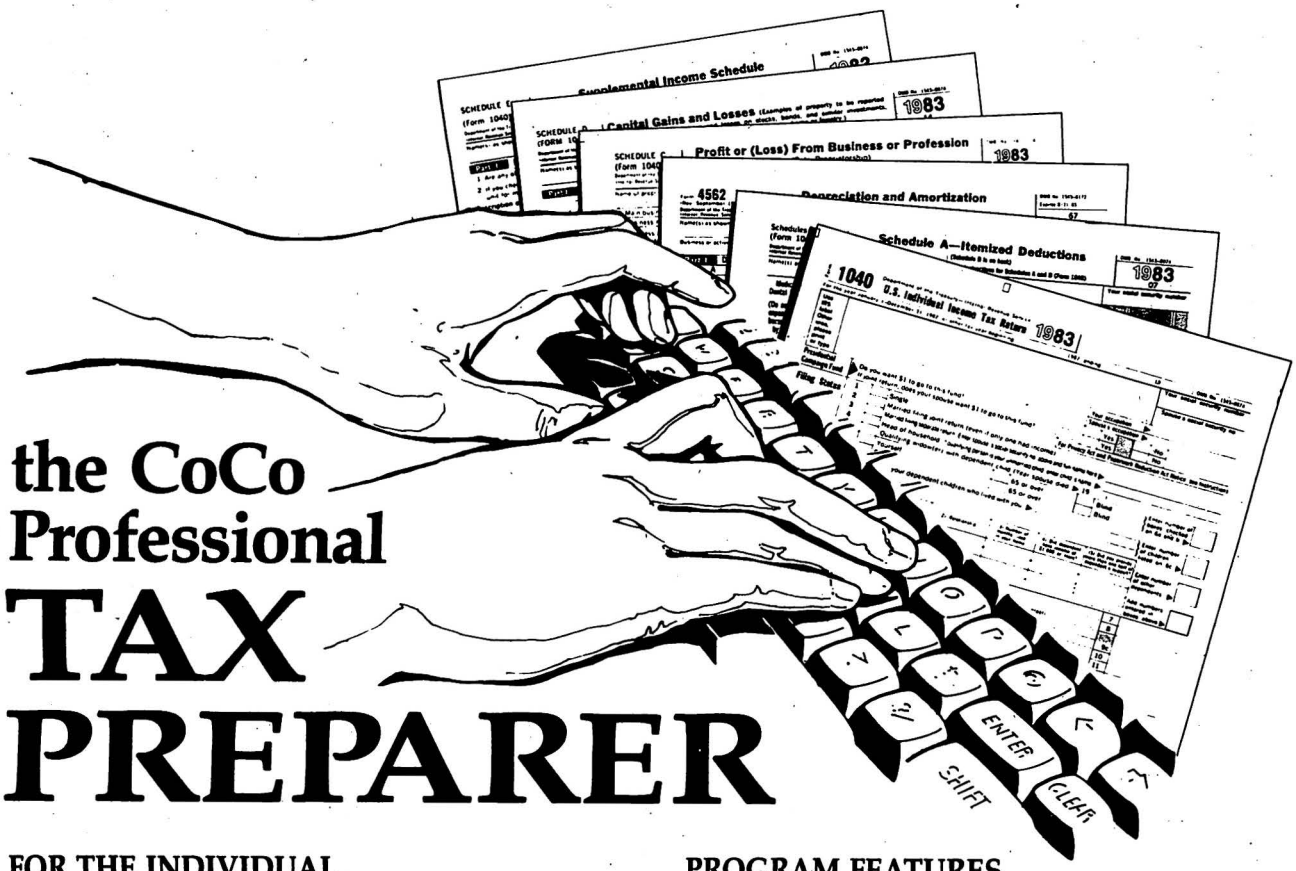
Write: This subroutine uses the DRAW command to draw all the standard ASCII characters. First, move your cursor to where you want to write, then enter W. Now type as you normally would, except that when you reach the bottom right corner of the screen, typing continues at the upper left. If you make a mistake, press the clear key to backspace and erase. The four arrow keys move the cursor in increments of 10 pixels in the Y direction, and eight in the X direction. Press a shifted up arrow to escape this subroutine.

Switch Screens: Pressing X flips the screen between screens 1 and 2. These screens are separate and have no effect on each other.

Clear Screen: To wipe a screen clean, enter K. The computer asks if you're sure you want to erase the screen. Answer "yes" or "no."

Print Screen: Press O to produce a printout of your circuit. See Fig. 1. Only the screen currently in view is printed. Since the Radio Shack Screen Print routine won't work in 32K, I had to use a Basic subroutine to produce the output.

Junction Symbol: Enter the period key to produce a junction symbol. The



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Card # _____ **Exp. Date** _____

Name _____

Address _____

City _____ **State** _____ **Zip** _____

Signature _____

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Schedules A, B, C, D, E, G, SE, W
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Office-at-Home
Installment Gain
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Credits and Other Taxes

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- Over 170 full-screen menus displayed on command. Fully menu-driven screens — each appears only when required.
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- Calculator mode supports +, −, *, /, = on numeric data.
- Edit capability: any line at any time. Supports change, delete, hack, search, and insert commands. Eliminates the need for check-off sheets
- Runs on 32K extended Basic (one disk drive with change of diskette during program execution) or two disk drives. (A special-order version runs on 64K RAM units with one or two disk drives.) Comes with diskettes and operating manual that describes each screen presentation. Additional forms are available by special order.
- Full disk drive storage for all data and computations.
- Printed output on pin-fed or tractor-fed printers, for government-approved forms.
- Its combination of machine language and Basic is fast and it minimizes memory use.

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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 the recorder is in play mode or a disk is inserted. The computer searches for and loads the diagram and parts list files. As with Save, you can enter Q at any point to get out of the load routine.

Circuit Drawer should be helpful to electronics hobbyists and I'm sure many of you will find areas for improvement in the program. I welcome your ideas, comments, or suggestions. ■

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

Listing continued

```
1760 IFPEEK(341)=247THENP1=PPOIN
T(XX,YY-10):YY=YY-10
1770 IFPEEK(342)=247THENP1=PPOIN
T(XX,YY+10):YY=YY+10
1780 IFPEEK(343)=247THENP1=PPOIN
T(XX-8,YY):XX=XX-8
1790 IFPEEK(344)=247THENP1=PPOIN
T(XX+8,YY):XX=XX+8
1800 IFXX<8THENXX=248ELSEIFXX>24
8THENXX=8
1810 IFYY<20THENYY=190ELSEIFYY>1
90THENYY=20
1820 PSET(XX,YY,1)
1830 IFPEEK(339)=191THEN1920
1840 I$=INKEY$:IFI$=""THEN1750EL
SEAS=ASC(I$)-31
1850 IFAS<>64THEN1870
1860 GOSUB2180:PRESET(XX,YY):P1=
1:X=XX:Y=YY:RETURN
1870 IFAS<10RAS>59THEN1830
1880 PRESET(XX,YY):IFXX>240THENX
X=8:YY=YY+10
1890 IFYY>190THENYY=20
1900 DRAW"BM=XX;,=YY;"+AS$(AS):X
X=XX+8:PSET(XX,YY,1)
1910 GOTO1830
1920 PRESET(XX,YY):XX=XX-8:IFXX<
8THENYY=YY-10ELSE1940
1930 XX=248:IFYY<20THENYY=190
1940 LINE(XX,YY+1)-(XX+8,YY-7),P
RESET,BF:PSET(XX,YY,1):FORTD=0TO
50:NEXT:GOTO1830
1950 GOSUB530
1960 S$="ARE YOU SURE (Y/N)?":GO
SUB2200
1970 I$=INKEY$:IFI$=""THEN1970
1980 IFI$="N"THENGOSUB2180ELSE20
00
1990 RETURN
2000 IFI$<>"Y"THEN1970
2010 PCLS:GOSUB2180
2020 PP=0:PRESET(X,Y)
2030 RETURN
2040 CIRCLE(X,Y),2:RETURN
2050 SOUND50,1:PRESET(X,Y):IFSC<
>1THEN2070
2060 PMODE4,5:PP=0:SC=5:GOTO2080
2070 PMODE4,1:PP=0:SC=1
2080 SCREEN1,0:RETURN
2090 LINE(0,0)-(255,12),PRESET,B
F:PRESET(X,Y):FORI=0TO6:T(I)=INT
(2^I):NEXTI:PRINT#-2,CHR$(18)
2100 FORY3=0TO191STEP7
2110 FORX3=0TO255
2120 A4=128
2130 FORZ=0TO6:IF PPOINT(X3,Y3+Z
)=1THENA4=A4+T(Z)
2140 NEXTZ:PRINT#-2,CHR$(A4);:NE
XTX3
2150 PRINT#-2:NEXTY3
2160 PRINT#-2,CHR$(30):SCREEN1,0
:GOSUB2180
2170 RETURN
2180 LINE(0,0)-(255,11),PRESET,B
F:IFSC=1THENDRAW"BM249,10"+AS$(1
8)ELSEDRAW"BM249,10"+AS$(19)
2190 LINE(0,12)-(255,12),PSET:RE
TURN
2200 DRAW"BM5,10"
2210 FORI=1TOLEN(S$):DRAWAS$(ASC
(MID$(S$,I,1))-31)+"BR3":NEXT:RE
TURN
2220 DATA"BR3","BR2U0BU2U4BM+2,6
","BRBU6D2BR2U2BEBD6","BRU2LR4LD
2BL3BU4RU2D2R2U2D2RBD4"
2230 DATA"BUR2DUREHL2HERUDR2BD5"
,"BUE4BL3LURDBR3BD5URDL","BR4BU2
G2LHE3UHLGDF4","BR2BU6D2BR2BD5"
2240 DATA"BR4BU6LGD4FR","REU4HLB
R4BD6","BUE4G2U2D4U2L2R4L2H2F4BD
","BU3R4L2U2D4BR2BD"
2250 DATA"BR3BULURD2GBR2BU","BRB
U3R2BRBD3","BR2LURDBR2","UE4UBD6
"
2260 DATA"BUU4ER2FD4GL2HBR4BD","
BRBU5ED6LR2BR","BU5ER2FDG4R4","B
U5ER2FDGLRFDGL2HBR4BD"
2270 DATA"BR3U6G3R4BD3","BUFR2EU
HL3U3R4BD6","BU3R3FDGL2HU3E2RBRB
D6","BU6R4G3D3BR3","BR4BU2DGL2HU
ER2L2HUER2FDGFBD2","BUFR2EU4HL2G
DFR2BRBD3"
2280 DATA"BRBURULDBU3RULDBR3BD4"
,"BR2BULURD2GBRBU5LURDBR2BD4","B
R4BU6G3F3","BRBU4R2BL2BD2R2BR3BD
2"
2290 DATA"E3H3BR4BD6","BU5ER2FDG
2BD2UBR2BD","BU5ER2FD4GL2HUER3BD
3","U4E2F2D2L4R4D2"
2300 DATA"RU6LR3FDGL2R2FDGL3BR4"
,"BR4BUGL2HU4ER2FDBD4","RU6LR3FD
4GL2BR3","U3R4L4U3R4BD6L4R4"
2310 DATA"U3R4L4U3R4BD6","BR2BU3
R2D2GL2HU4ER2FBD5","U6D3R4U3D6",
"BRR2LU6LR2BRBD6"
2320 DATA"BU2DFR2EU5BD6","U6BR4G
3F3","R4L4U6BR4BD6","U6F2E2D6"
2330 DATA"U6DF4U5D6","R4L4U6R4D6
","U6R3FDGL3BR4BD3","BUU4ER2FD4G
L2HBR2BUF2"
2340 DATA"U6R3FDGL3RF3","BUFR2EU
HL2HUER2FBD5","BU6R4L2D6BR2","U6
D6R4U6D6"
2350 DATA"BU6D4F2E2U4BD6","U6D6E
2F2U6D6","UE2H2UDF2E2UDG2F2D","B
U6DF2E2UDG2D3BR2","BU6R4DG2LR2LG
2DR4"
```

END

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 (as suspected) 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 accompaniments. 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 reviewers examine Time and Money and 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 Ramella begins a series called "Tantrum" with part I: "Cheese Louise." Hmmmmm.

If you miss this eclectic *HOT CoCo*, you miss too much. ■

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Hot CoCo, August '83

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Color Computer Magazine, June '83

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Color Computer News, June '83

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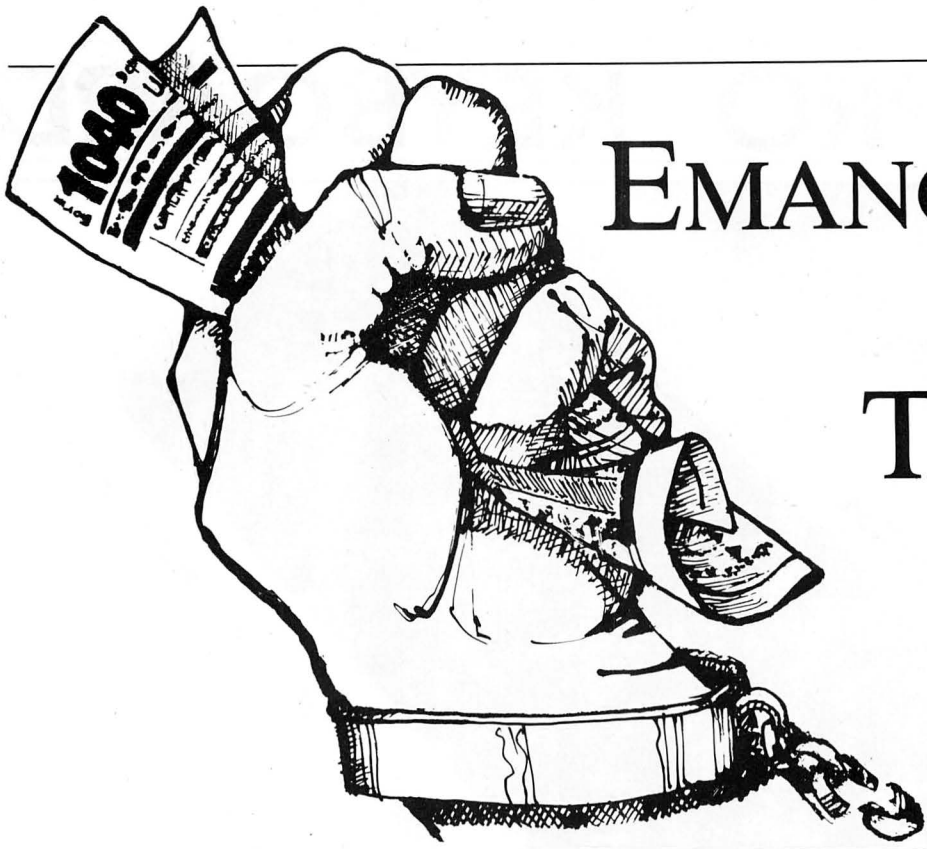
BY JOHN M. GREGG

EMANCIPATION OF THE TAXPAYER



instant CoCo

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

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.

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.

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.

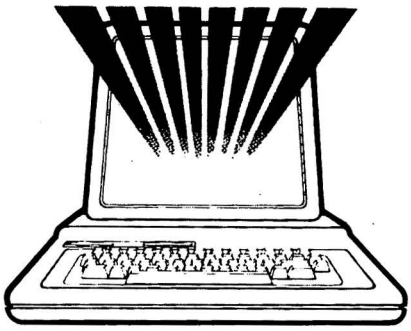
If you have been using the shoebox method of filing tax documents, now is a good time to organize. A good filing system helps you to take advantage of deductions. Buy or make a multi-com-

120–130	Inputs of personal data—used on the various printouts
140–570	Data inputs for and printing of schedule B
580–650	Input of W-2 wages
660–1880	Inputs for and the printing of schedule A
1890–2030	Inputs of other income items and adjustments
2040–2560	Prints the form 1040 information
2570–2710	The command menu
2720–2800	Prompts you to prepare certain items beforehand
2810–2960	Subroutine for computation of allowable deductions
2970–2990	Subroutine to print personal data
3000–3150	Subroutine to compute and print schedule W

Table 1. Line Descriptions

SUPER SCREEN

the Color Computer Supercharger



- **A big 51 character by 24 line screen.**
- **Full upper and lower case characters.**
- **Easily combine text with hi-res graphics.**
- **PRINT @ is completely functional on the big screen.**
- **The powerful ON ERROR GOTO is fully implemented.**
- **Auto-key repeat for greater keyboard convenience.**
- **Control codes for additional functions.**
- **Works with 16K, 32K or 64K computers.**
- **Available on disc or cassette.**

51 CHARACTER BY 24 LINE DISPLAY

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.

COMBINE 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.

AND MORE GOOD NEWS...

Super Screen comes with complete, well detailed instructions and is available on cassette or disc. It adjusts automatically to any 16K or greater, Extended or Disc Basic Color Computer or TDP-100 and uses only 2K of memory in addition to the screen memory reserved during power up. Guaranteed to be the most frequently used program in your software library. . .once you use it, you won't be without it! Super Screen's low price will really please you; only $29.95 on cassette or $32.95 on disc!

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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 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.

"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 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.

```
10 CLS:PRINT@12,"*TAX83*"
20 PRINT@66,"A PROGRAM FOR COMPU
TATION OF"
30 PRINT@99,"1983 FEDERAL INCOME
 TAX"
40 PRINT@160,"NO WARRANTY EXPRES
SED OR IMPLIED"
50 PRINT@232,"COPYRIGHT 1983"
60 PRINT@297,"JOHN M GREGG"
70 PRINT@327,"1008 ALTON CIRCLE
"
80 PRINT@357,"FLORENCE, SC 29501
"
90 PRINT@393,"803 662 9500"
100 INPUTKD$
110 GOTO2720
120 CLS:INPUT"ENTER NAME OF TAXP
AYER";Z$
130 INPUT "SOCIAL SECURITY NUMBE
R";AA$:INPUT "TAXYEAR";MA$: INPU
T"STREET";VA$:INPUT"CITY";V1$:IN
PUT"STATE ZIP";V2$:GOTO2570
140 PRINT#-2,"SCHEDULE B OF  ":G
OSUB 2970
150 PRINT#-2
160 PRINT#-2
170 PRINT#-2,"INTEREST INCOME"
180 CLS
190 INPUT"INPUT I              N
TEREST INCOME SOURCE <XX> TO TOT
AL";U$
200 IFU$="XX"THEN 260
210 INPUT"AMOUNT INTEREST EARNED
";KK
220 LL=LL+KK
230 PRINT#-2,U$,TAB(50)KK
240 GOTO 190
250 PRINT#-2
260 PRINT#-2,"TOTAL INTEREST INC
OME IS, ENTER ON LINE 8A OF 1040
"TAB(70)LL
270 PRINT#-2:CLS
280 PRINT#-2,"DIVIDEND INCOME"
290 INPUT"INPUT DIVIDEND INCOME
SOURCE<XX> TO TOTAL";V$
300 IF V$="XX" THEN 350
310 INPUT "AMOUNT OF DIVIDEND";M
M
320 NN=NN+MM
330 PRINT#-2,V$,TAB(50)MM
340 GOTO290
350 CLS:PRINT#-2,"TOTAL DIVIDEND
 INCOME"TAB(55)NN
360 INPUT"CAPITAL GAIN DISTRIBUT
ION SOURCE <XX> TO TOTAL";W$
370 IFW$="XX" THEN 440
380 INPUT"AMT CAP GAIN";OO
390 PP=PP+OO
400 PRINTW$,OO
410 PRINT#-2,W$,TAB(40)OO
420 GOTO360
430 PRINT#-2
440 PRINT#-2,"TOTAL CAP GAIN DIS
T, ENTER ON LINE 13, SCHD D"TAB(
65)PP
450 PRINT#-2
460 INPUT"NONTAXABLE DISTRIBUTIO
NS SOURCE, <XX> TO TOTAL";X$
470 IF X$="XX" THEN 520
480 INPUT"AMT NONTAXABLE";QQ
490 RR=RR+QQ
500 PRINT#-2,X$,TAB(50)QQ
510 GOTO460
520 PRINT#-2,"NONTAXABLE DISTRIB
UTION"TAB(50)RR
530 PRINT#-2,"TOTAL CAP GAIN AND
 NONTAXABLE DIST"TAB(60)PP+RR
540 SS=NN-PP-RR
550 PRINT#-2
560 PRINT#-2,"TOTAL DIVIDEND INC
OME, ENTER ON LINE 8B OF 1040"TA
B(70)SS
570 PRINT#-2:GOTO2570
580 CLS:INPUT"YOUR W2 WAGES $ ";
HA:JA=JA+HA
590 INPUT"<XX> TO TOTAL";IA$:IF
IA$="XX" THEN 610
600 GOTO580
610 CLS:INPUT"SPOUSE W2 WAGES";K
A:LA=LA+KA
620 INPUT"<XX> TO TOTAL";JA$:IF
JA$="XX" THEN 640
630 GOTO610
640 MA=JA+LA
650 GOTO2570
660 CLS
670 CLS:INPUT"PREPARE TO INPUT S
CHD A<ENTER> WHEN READY";Y$
680 PRINT#-2,"SCHEDULE A FOR "
690 GOSUB2970
700 PRINT#-2
710 INPUT "FULL MED INS PREM $ "
;V
720 INPUT"MEDICINE AND DRUGS $ "
;XX:X=X+XX
730 INPUT"<XX>TO TOTAL";Q$
740 IFQ$="XX"THEN760
750 GOTO720
760 PRINTYA
770 Z=(YA*.01)
780 PRINT#-2,"TOTAL MED AND DRUG
 EXP "X
790 PRINT#-2,"1% OF LINE 31, 104
0 $ "Z
800 IFZ>=X THEN820
810 IFX>=Z THEN 840
820 AA=0
830 GOTO850
840 AA=X-Z
```

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 INPUT"<XX> TO TOTAL";S$
890 EE=EE+CC
900 IF S$="XX" THEN 920
910 GOTO870
920 PRINT#-2,"TOTAL OTHER MED EX
P"TAB(50)EE+V
930 GG=YA*.05
940 PRINT#-2,"5% LINE 31, FORM 1
040"TAB(50)GG
950 HH=AA+BB+EE+(V)
960 II=HH-GG
970 IFGG>HH THEN II=0
980 PRINT#-2,"AMT ABOVE 5%"TAB(5
0)II
990 T=II+W
1000 PRINT#-2
1010 PRINT#-2,"TOTAL MED AND DEN
 EXP DEDUCTION "TAB(70)T
1020 PRINT#-2:CLS
1030 INPUT"ST INCOME TAX $";HE:A
E=AE+HE
1040 INPUT"<XX> TO TOTAL";GD$:IF
GD$="XX"THEN1060
1050 GOTO1030
1060 PRINT#-2, "STATE INC TAX"TA
B(50)AE+BE
1070 INPUT "REAL ESTATE TAX AMT"
;E
1080 INPUT"<XX>TO TOTAL";C$:F=F+
E
1090 IFC$="XX"THEN1110
1100 GOTO1070
1110 PRINT#-2, "REAL ESTATE TAX
$ ";TAB(50)F
1120 INPUT"SALES TAX $";G
1130 INPUT"<XX>TO TOTAL";G$:H=H+
G
1140 IFG$="XX"THEN1160
1150 GOTO1120
1160 PRINT#-2,"SALES TAX $ ";TAB
(50)H
1170 INPUT"PERSONAL PROPERTY TAX
 $ ";I
1180 INPUT"<XX>TO TOTAL";D$:J=J+
I
1190 IFD$="XX"THEN1210
1200 GOTO1170
1210 PRINT#-2,"PERSONAL PROPERTY
 TAX";TAB(50)J
1220 INPUT"OTHER TAX $ ";K
1230 INPUT"<XX>TO TOTAL";D$:L=L+
K
1240 IFD$="XX"THEN1260
1250 GOTO1220
1260 PRINT#-2,"OTHER TAX";TAB(50
)L
1270 PRINT#-2
1280 PRINT#-2,"TOTAL TAXES DEDUC
TED"TAB(70)F+H+L+J+AE+BE
1290 PRINT#-2:CLS
1300 INPUT"AMOUNT INTEREST";A
1310 INPUT"PAYEE <XX> TO TOTAL";
P$
1320 C=C+A
1330 IFP$="XX"THEN1370
1340 PRINT#-2,P$;:PRINT#-2,;A
1350 GOTO1300
1360 PRINT#-2
1370 PRINT#-2,"TOTAL INTEREST";T
AB(70)C
1380 PRINT#-2
1390 PRINT#-2,"CONTRIBUTIONS"
1400 INPUT"CONTRIBUTION TO- <XX>
 TO TOTAL";D$
1410 IFD$="XX"THEN1470
1420 INPUT"AMOUNT";M
1430 N=N+M
1440 PRINT#-2,D$,M
1450 GOTO1400
1460 PRINT#-2
1470 PRINT#-2,"TOTAL CONTRIBUTIO
NS"TAB(70)N
1480 PRINT#-2:CLS
1490 INPUT"CASUALITY AND THEFT L
OSS  ";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 $100"
1560 S=O-P-100-(YA*.1):IF S=<0 T
HEN S=0
1570 PRINT#-2,"TOTAL CASUALITY L
OSS DEDUCTIBLE "TAB(70)S:PRINT#-
2
1580 PRINT#-2,"MISC DEDUCTIONS"
1590 XD=WD+UD:PRINT#-2,"EDUCATIO
NAL EXP"XD
1600 CLS:INPUT"MISC DEDUCTIONS F
OR, <XX> TO TOTAL";I$
1610 IFI$="XX"THEN1660
1620 INPUT"AMOUNT";Q
1630 PRINT#-2,I$,Q
1640 R=Q+R:KE=Q+R
1650 GOTO1600
1660 R=R+XD
1670 PRINT#-2,"TOTAL MISC DEDUCT
IONS"TAB(70)R:PRINT#-2
1680 PRINT#-2,"TOTAL MEDICAL AND
 DENTAL DEDUCTION"T
1690 PRINT#-2,"TOTAL TAX DEDUCTI
ON"F+H+L+J+AE+BE
1700 PRINT#-2,"TOTAL INTEREST DE
DUCTION"C
1710 PRINT#-2,"TOTAL CONTRIBUTIO
N DEDUCTION"N
1720 PRINT#-2,"TOTAL CASUALITY A
ND THEFT DEDUCTION"S
```

Listing continued

```
1730 PRINT#-2,"TOTAL MISC DEDUCT
ION"R
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 PRINT@32,"INPUT NUMBER FOR
YOUR FILING STATUS"
1770 PRINT@230,"1  SINGLE"
1780 PRINT@262,"2  MARRIED FILIN
G JOINTLY"
1790 PRINT@294,"3  MARRIED FILIN
G SEPARATE"
1800 PRINT@326,"4  HEAD OF HOUSE
HOLD"
1810 PRINT@358,"5  QUALIFYING WI
DOW"
1820 INPUT K$
1830 IFK$="1"THEN GOSUB 2810
1840 IFK$="4"THEN GOSUB 2810
1850 IFK$="2"THEN GOSUB 2870
1860 IFK$="5"THEN GOSUB 2870
1870 IFK$="3" THEN GOSUB 2920
1880 GOTO2570
1890 CLS:INPUT"PREPARE TO INPUT
INCOME ITEMS";KA$:LINE INPUT"INP
UT DEPENDENTS NAME, AGES";WA$
1900 INPUT"TOTAL NUMBER EXEMPTIO
NS";OA
1910 INPUT"DIV &INT EXCLUSION $
";PA:QA=LL+SS-PA:IF QA<0 THEN QA
=0
1920 INPUT"REFUNDS OF STATE TAX
$ ";RA
1930 INPUT"RENTAL & ROYALITY INC
OME $ ";GA
1940 INPUT"CAPITAL GAINS $ ";TA
1950 INPUT"FARM INCOME $";YY:INP
UT"BUSINESS INCOME $ ";PD
1960 INPUT"OTHER INCOME $ ";SA
1970 NA=MA+QA+RA+TA+GA+YY+SA+PD
1980 INPUT"MOVING EXPENSE $ " ;U
A
1990 INPUT"EMPLOYEE BUSINESS EXP
ENSE $ ";VA
2000 INPUT"PAYMENT TO IRA $ ";WA
:GOSUB3000
2010 XA=UA+VA+WA
2020 YA=NA-(XA+W8):QA=LL+SS-PA
2030 GOTO2570
2040 CLS:INPUT"PREPARE PRINTER F
OR FORM 1040 INFORMATION";KA$
2050 PRINT#-2,"FORM 1040 FOR "
2060 GOSUB 2970
2070 PRINT#-2:PRINT#-2
2080 PRINT#-2, "FILING STATUS "K
$
2090 PRINT#-2,"COMPLETE LINE 6"
2100 PRINT#-2,"TOTAL WAGES,LINE
7"TAB(70)MA
2110 PRINT#-2,"INTEREST INCOME E
NTER ON LINE 8A"TAB(50)LL
2120 PRINT#-2,"DIVIDEND INCOME,
ENTER LINE 9A"TAB(50)SS
2130 PRINT#-2,"DIV  EXCLUSION, E
NTER 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 E
NTERON LINE 11"TAB(70)PD
2180 PRINT#-2,"CAPITAL GAINS, EN
TER LINE 13 "TAB(70)TA
2190 PRINT#-2,"RENT & ROYALITY I
NCOME, ENTER ON LINE 18 "TAB(70)
GA
2200 PRINT#-2,"FARM INCOME, ENTE
R ON LINE 19 "TAB(70)YY
2210 PRINT#-2,"OTHER INCOME, ENT
ER ON LINE 21"TAB(70)SA
2220 PRINT#-2,"TOTAL INCOME, ENT
ER ON LINE 22 "TAB(70)NA
2230 PRINT#-2,"MOVING EXPENSE, E
NTER LINE 23 "TAB(50)UA
2240 PRINT#-2,"EMPLOYEE BUSINESS
 EXPENSE, ENTER LINE24 "TAB(50)V
A
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)XA+W8
2280 PRINT#-2,"ADJUSTED GROSS IN
COME, LINE 32 "TAB(70)YA
2290 PRINT#-2,"AMT FROM SCH A, L
INE 34A "TAB(70)I3
2295 PRINT #-2,"AMT OF CHARITABL
E DEDUCTION FOR LINE 34B "TAB(70
)NC
2300 PRINT#-2,"ENTER ON LINE 35
"TAB(70)YA-I3-NC
2310 PRINT#-2,"TOTAL AMT CLAIMED
 FOR EXEMPTIONS, LINE 36 "TAB(71
)OA*1000
2320 PRINT#-2, "TAXABLE INCOME,
LINE37 "TAB(70)YA-I3-(OA*1000)-N
C
2330 PRINT,"TAXABLE INCOME "YA-I
3-(OA*1000)-NC
2340 INPUT"ENTER TAX FROM TABLE
";AC
2350 PRINT#-2,"ENTER TAX FROM TA
BLE, LINE 38"TAB(70)AC
2360 INPUT"TOTAL CREDITS";BC
2370 PRINT#-2,"TOTAL CREDITS, LI
NE 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, ENTE
R 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";TA$
2440 IC=IC+HC
2450 IF TA$="XX" THEN 2470
2460 GOTO2420
2470 FC=IC+JC
2480 PRINT#-2,"TAX WITHHELD, LIN
E 60 "TAB(50)FC
2490 INPUT"ESTIMATED TAX PAYMENT
S ";GC
2500 PRINT#-2,"TOTAL TAX PAYMENT
S, LINE 67 "TAB(50)FC+GC
2510 IF AC-BC+DC<FC+GC THEN2550
2520 IFAC-BC+DC>FC+GC THEN 2530
2530 PRINT#-2,"ADDITIONAL TAX DU
E, LINE 71 "TAB(70)(AC-BC+DC)-(F
C+GC)
2540 GOTO2580
2550 PRINT#-2,"AMT TAX OVERPAID,
 LINE 68 "TAB(70)(FC+GC)-(AC-BC+
DC)
2560 PRINT#-2:PRINT#-2,"AMT TO B
E REFUNDED "TAB(70)(FC+GC)-(AC-B
C+DC):GOTO2570
2570 PRINTMEM
2580 CLS:PRINT@0,"INPUT IN ORDER
":PRINTMEM"MEM"
2590 PRINT@130,"1  W2 WAGES"
2600 PRINT@162,"2  SCHD B"
2610 PRINT@194,"3  INCOME INPUT
"
2620 PRINT@226,"4  SCHD A"
2630 PRINT@258,"5  1040 INFO"
2640 PRINT"LAST "JD$
2650 INPUTJD$
2660 IF JD$="" THEN 2580
2670 IF JD$="2" THEN 140
2680 IF JD$="3" THEN 1890
2690 IF JD$="4" THEN 660
2700 IF JD$="5" THEN 2040
2710 IF JD$="1" THEN 580
2720 CLS:PRINT"BEFORE BEGINNING
COMPUTE"
2730 PRINT@104, "DEPRECIATION SC
HD"
2740 PRINT@168,"FORM 2106"
2750 PRINT@232,"CASUALITY LOSS"
2760 PRINT@296,"ADJUSTMENTS TO I
NCOME"
2770 PRINT@360,"CAPITAL GAINS"
2780 PRINT@424,"SCHEDULES D,E,F
"
2790 INPUTKD$
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
2850 PRINT#-2,"ENTER ON LINE 34A
, FORM 1040 $"IE-U:I3=IE-U
2860 GOTO 2580
2870 U=3400:IF IE>3400 THEN 2900
:IF IE <3400 THEN U=0:GOTO 2880
2880 PRINT#-2,"USE STANDARD DEDU
CTION":IE=0: GOSUB 6000
2890 GOTO2580
2900 PRINT#-2,"ENTER ON LINE 34A
,FORM1040 $"IE-U:I3=IE-U
2910 GOTO2580
2920 U=1700:IF IE>1700 THEN 2950
:IF IE<1700 THEN U=0:GO TO 2930
2930 PRINT#-2,"USE STANDARD DEDU
CTION ":IE=0: GOSUB 6000
2940 GOTO2580
2950 PRINT#-2,"ENTER ON LINE 34A
,FORM1040 $"IE-U:I3=IE-U
2960 GOTO2570
2970 PRINT#-2,Z$,AA$,MA$
2980 PRINT#-2,VA$;",";V1$;",";V2
$
2990 RETURN
3000 CLS:INPUT"PREPARE PRINTER F
OR SCH W";W$:IF HA=0 OR LA=0 THE
N RETURN
3010 PRINT#-2,"SCHEDULE W OF "Z$
",";AA$",";MA$
3020 PRINT#-2,TAB(55)"YOU";TAB(7
0)"SPOUSE"
3030 PRINT#-2,"1. WAGES,SALARY,T
IPS,ETC"TAB(55)JA;TAB(70)LA
3040 PRINT#-2,"2. NET PROFIT OR
LOSS FROM SELF EMP"TAB(55)(YY+SA
)/2;TAB(70)(YY+SA)/2
3050 PRINT#-2,"3. TOTAL EARNED I
NCOME"TAB(55)JA+(YY+GA)/2;TAB(70
)LA+(YY+SA)/2
3060 PRINT#-2,"4. ADJUST FROM LI
NE 24,25,26"TAB(55)(VA+WA)/2;TAB
(70)(VA+WA)/2
3070 W1=JA+((YY+SA)/2)-(VA+WA)/2
:W2=LA+((YY+SA)/2)-(VA+WA)/2
3080 PRINT#-2,"5. QUALIFIED EARN
ED INCOME"TAB(55)W1;TAB(70)W2
3090 IF W1<W2 THEN W3=W1
3100 IF W2<W1 THEN W3=W2
3110 IF W3>30000 THEN W3=30000
3120 W8=W3*.1
3130 PRINT#-2,"7. LINE 6X.10"TAB
(70)"X .10"
3140 PRINT#-2,"8. ENTER ON 1040
LINE 29"TAB(70) W8
3150 RETURN
6000 REM CHARITABLE CONTRIBUTION
 DEDUCTION WHEN NOT ITEMISING
6010 NC=N*.25
6020 IF K$="3" AND NC>12.5 THEN
NC=12.5:RETURN
6030 IF NC>25 THEN NC=25:RETURN
6040 IF NC<25 THEN NC=NC:RETURN
6050 RETURN
```

END

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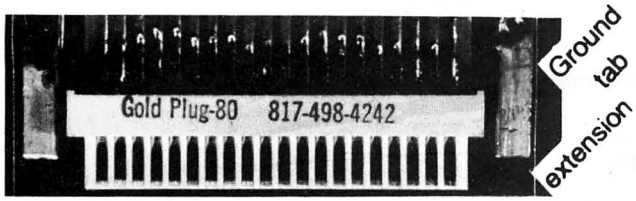

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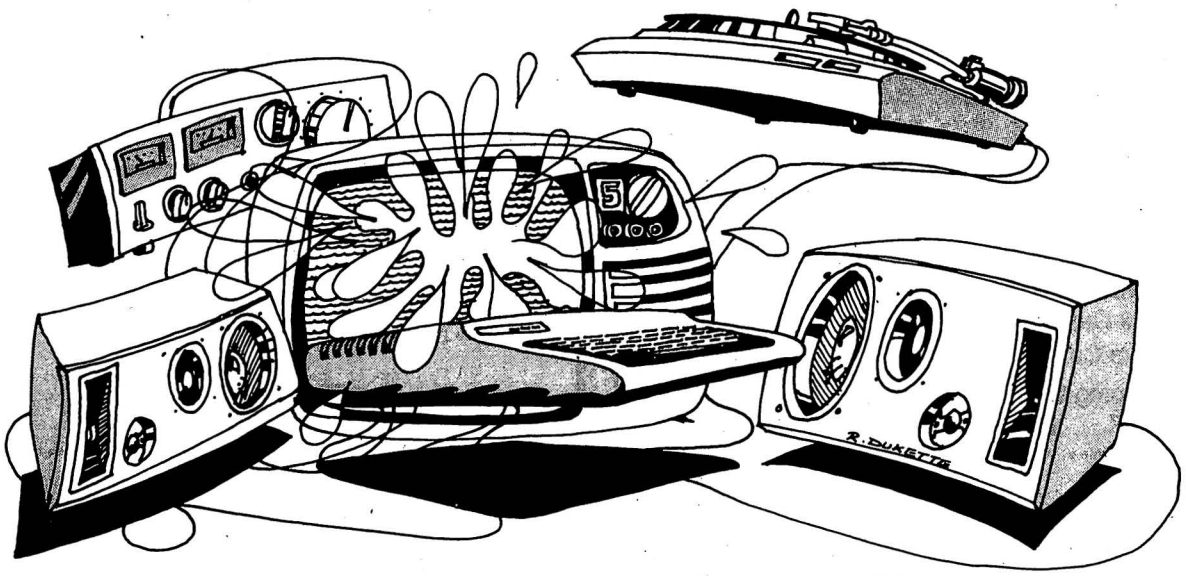
BY FRED K. LENHERR

CoCo LIGHTSHOW



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

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.

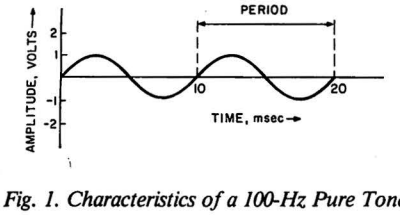


Fig. 1. Characteristics of a 100-Hz Pure Tone

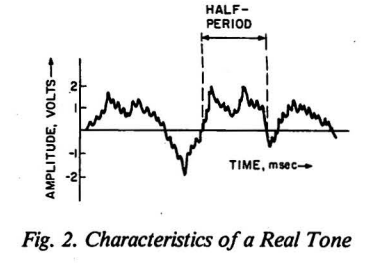


Fig. 2. Characteristics of a Real Tone

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

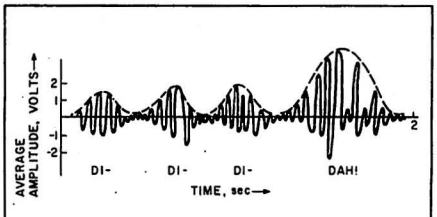


Fig. 3. Average Amplitude of Music (Broken Line)

System Requirements

16K RAM

Extended Color Basic

pitch, and the average amplitude will give it an indication of the current loudness.

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). When it does, start 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

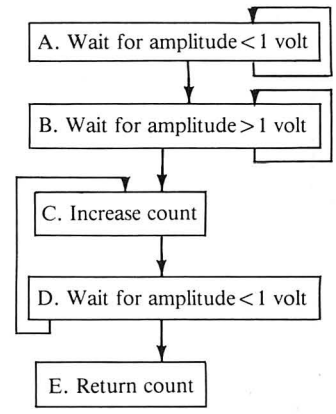


Fig. 4. Flowchart of a Subroutine to Measure the Frequency of a Wave

```
3200                    00100          ORG     $3200
3200 BD    B3ED         00110          JSR     $B3ED
3203 ED    8D 0043      00120          STD     MAX,PCR
3207 2F    3B           00130          BLE     NODATA
3209 10AE  8D 003C      00140          LDY     MAX,PCR
320E 31    AB           00150          LEAY    D,Y
3210 8E    FF20         00160          LDX     #$FF20
                        00170
3213 31    3F           00180 NWAIT    LEAY    -1,Y
3215 27    2D           00190          BEQ     NODATA
3217 A6    84           00200          LDA     ,X
3219 84    01           00210          ANDA    #1
321B 26    F6           00220          BNE     NWAIT
                        00230
321D 31    3F           00240 PWAIT    LEAY    -1,Y
321F 27    23           00250          BEQ     NODATA
3221 A6    84           00260          LDA     ,X
3223 84    01           00270          ANDA    #1
3225 27    F6           00280          BEQ     PWAIT
3227 10AE  8D 001E      00290          LDY     MAX,PCR
                        00300
322C 31    3F           00310 COUNT    LEAY    -1,Y
322E 27    14           00320          BEQ     NODATA
3230 A6    84           00330          LDA     ,X
3232 84    01           00340          ANDA    #1
3234 26    F6           00350          BNE     COUNT
                        00360
3236 1F    20           00370          TFR     Y,D
3238 A3    8D 000E      00380          SUBD    MAX,PCR
323C 53                 00390          COMB
323D 43                 00400          COMA
323E 5C                 00410          INCB
323F 26    05           00420          BNE     DATA
3241 4C                 00430          INCA
3242 20    02           00440          BRA     DATA
                        00450
3244 4F                 00460 NODATA   CLRA
3245 5F                 00470          CLRB
3246 BD    B4F4         00480 DATA     JSR     $B4F4
3249 39                 00490          RTS
                        00500
324A                    00510 MAX      RMB     2
                        00520
           0000         00530          END
00000 TOTAL ERRORS

COUNT   322C
DATA    3246
MAX     324A
NODATA  3244
NWAIT   3213
PWAIT   321D
```

Program Listing 1.

```
100 REM SET VARIABLES
110 REM N IS NUMBER OF BINS
120 REM NP IS NUMBER OF HALF-PER
IODS 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+1)=2*TH(I)
260 NEXT
270 '
280 REM POKE IN SUBROUTINE
290 '
300 FOR L=12800 TO 12873
310 READ V: POKE L,V: NEXT
320 DATA189,179,237,237,141,0,67
,47,59,16,174,141,0,60,49,171,14
2,255,32,49,63,39,45,166,132,132
,1,38,246
330 DATA49,63,39,35,166,132,132,
1,39,246,16,174,141,0,30,49,63,3
9,20,166,132,132,1,38,246
340 DATA31,32,163,141,0,14,83,67
,92,38,5,76,32,2,79,95,189,180,2
44,57
350 DEFUSR=12800
360 '
370 REM GET DATA
380 '
390 AUDIOON:MOTORON
400 FOR I=1 TO NP
410 Q=USR(255)
420 FOR J=1 TO N-1
430 IF Q>=TH(J) AND Q<TH(J+1) TH
EN P(J)=P(J)+1
440 NEXT:NEXT
450 '
460 REM DISPLAY SPECTRUM
470 '
480 DRAW"BM0,191"
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 400
```

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 RND(5)-1,1
190 COLOR RND(4)
200 SCREEN 1,RND(2)-1
210 '
220 REM PLOT ON BEATS ONLY
230 '
240 FOR X=0 TO 255 STEP 2:A=JOYS
TK(0):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 BOTTOM TOO
290 '
300 FOR X=255 TO 0 STEP -4:A=JOY
STK(0):AV=(AV+A)/2
310 IF A>AV THEN LINE(X,191)-(25
5,191-X/R),PSET:LINE(255-X,191)-
(0,191-X/R),PSET
320 NEXT
330 GOTO180
```

Program Listing 3.

the other into the joystick input on the CoCo. Then you can find the average amplitude of the music at any time simply by calling JOYSTK(0). The interface circuit will return a number from 0 (silence)–63 (very loud), just as if you were moving the joystick back and forth in time with the music.

Even if you do not normally attempt interfacing projects, this is one you might like to try. Most of the parts are available at Radio Shack (see Table 1).

Here's how the circuit works: Each time the amplitude of the music becomes positive, current flows through the diode (D1). R1 limits this current to a safe value, so the diode doesn't burn out. The resulting charge is stored on the capacitor (C1) where the CoCo can detect it through output resistor (R3). R2 slowly bleeds off the charge, to get ready for the next beat. (Since diodes allow current to flow in one direction only, charge on the capacitor cannot escape during the negative half-period of the cycle.)

When you build the circuit, be sure to insert the diode with the black band pointing toward the capacitor's positive terminal. Then just add a cable from your stereo's headphone output to the interface, and from the interface to the CoCo's right joystick input, pins 1 (input) and 3 (ground). See Fig. 6.

Also be sure that the tip of the headphone plug goes to R1, and that you've connected the base of the plug to the other interface input. The CoCo's joystick circuit is protected, so you can't hurt anything even if you short it out. But don't ground pin 4—the fire button—or the keyboard will lock up.

Also, be careful that you do not short out your stereo by grounding its headphone output. If it is not internally protected, this could possibly damage it.

Once you have finished building the interface, turn on your CoCo and type in and run the following test program:

```
10 CLS0: FOR X=0 TO 63
20 SET(X,31-JOYSTK(0),8):NEXT: GOTO 10
```

You should see a line of orange squares at the bottom of the screen.

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 1535
20 A=JOYSTK(0): IF A>6 THEN A=7
30 POKE I,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.

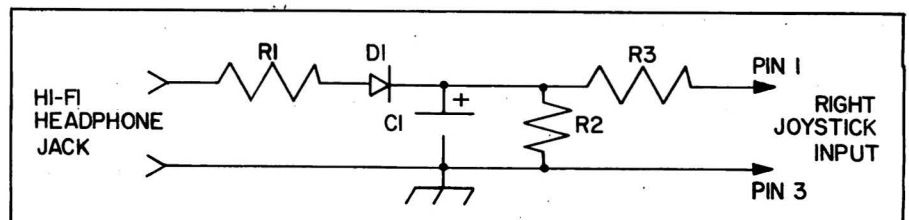


Fig. 5. Schematic of Amplitude Interface

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The following items are available from
New Salem Research, New Salem, MA 01355:

Demonstration cassette containing 12 Basic (16K) display programs and nine machine-language routines for high-speed effects	$4.95
Semi-kit for an amplitude interface (joystick plug, printed circuit board, and the above cassette)	$9.95
Full kit (everything you need for a two-channel (stereo) unit, including cassette and documentation)	$19.95
Assembled and tested unit with software	$34.95

Please send check or M.O. Sorry, no COD or charge cards.

Parts Available from Radio Shack

R1 100 ohm, 1/4 watt (Radio Shack #271-1311)
R2 100,000 ohm, 1/4 watt (RS #271-1347)
R3 100,000 ohm, 1/4 watt (RS #271-1347)
D1 Germanium diode (RS #276-1123)
C1 Electrolytic capacitor, 1 μF, 16 volts (RS #272-1419)
Plus: cable (i.e., RS #278-855)
perfboard (RS #276-1392) or breadboard (RS #276-170)
headphone plug (RS #274-139)
joystick plug (order from Table 1)

Table 1. Parts List

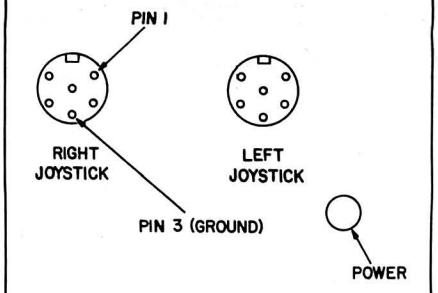


Fig. 6. Rear View of the CoCo

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.

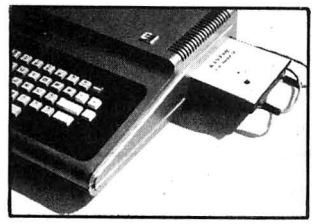
Two final suggestions: When using the cassette port, you can always hear the music by including the statement AUDIO ON in your program. If plugging the interface into the stereo disables your speakers, try driving the interface with a small FM radio or compact stereo. You can then listen to the same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

If you create any displays you're especially proud of, please send me a copy of them on cassette. I'll return your tape with one of our own new displays. Please include instructions for using your display, return postage (60¢), and a description of the type of CoCo you have, so I can choose a display that will run on your machine. ■

Write to Fred Lenherr at New Salem Research, West Main St., New Salem, MA 01355.

MITRONIX

MORSE CODE from MITRONIX



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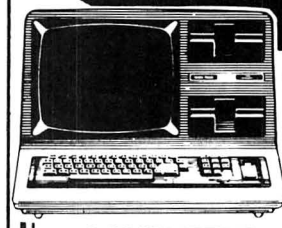

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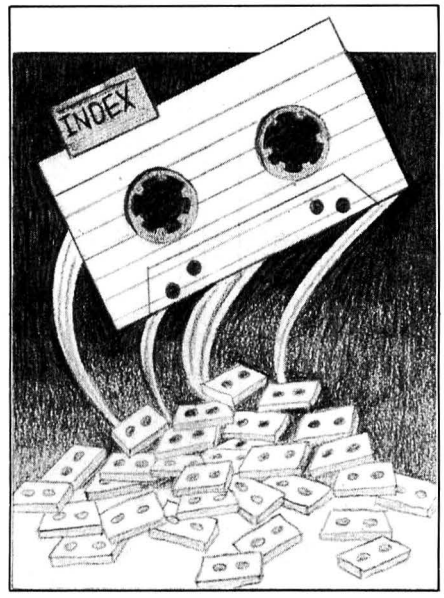
BY HELEN E. LABONVILLE

INDXCARD



Is your tape inventory getting out of hand? Get readable cassette insert cards with INDXCARD.

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.

```
C
.....................................C
FILENAME  TYP PAG    REMARKS    CTR-80A
=====================================
SEARLS3   BA  102 GRAPHICS      195-198
SEARLS4   BA  104 GRAPHICS      200-203
DSKDIR    BA  110 DSK UTILITY   205-207
CLNDSK    BA  111 DSK UTILITY   210-212
CAS->DSK  BA  111 DSK UTILITY   215-216
PAKCOPY   BA  112 DSK UTILITY   220-222
MERGE     ML  114 UTILITY       225-227
BCKGAMN   BA  120 GAME          230-245
-------------------------------------F
FILENAME  TYP PAG    REMARKS    CTR-80A
=====================================
ACWRITER  BA   29 TEXT PROCSR   005-014
EDIT      BA   37 COCOWP PRT1   020-035
AUTHOR    BA   40 COCOWP PRT2   040-056
CAVEHUNT  BA   44 ADV GAME      060-081
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     (index continues on next side)
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C
```

Fig. 1. Sample Indxcard Printout.

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

tion will cut off the excess. 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 ? 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.

```
10 CLS:CLEAR1500:DIMPL$(36)
20 F2$="## "
30 CL$="...change line number"
40 DL$=STRING$(40,45)
50 BL$="  BEGIN INPUT WITH  @  T
O CENTER THE LINE"
60 ' TOP OF MENU LOOP
70 CLS:PRINTTAB(15)"MENU OPTIONS
":PRINT:PRINT
80 PRINT" <1> = DO INDEX (side 1
)  15 LINES
90 PRINT" <2> = DO INDEX (side 2
)  15 LINES
100 PRINT" <3> = DO TITLE
     2 LINES
110 PRINT" <4> = DO FLAP
     4 LINES":PRINT
120 PRINT" <5> = EDIT side 1
130 PRINT" <6> = EDIT side 2
140 PRINT" <7> = EDIT TITLE
150 PRINT" <8> = EDIT FLAP":PRIN
T
160 PRINT" <9> = ERASE ALL":PRIN
T
170 PRINT" <?> = PRINT INDEX CAR
D"
180 IN$=INKEY$:IFIN$="?"THEN1240
190 IN=VAL(IN$)
200 ONIN GOTO520;280,750,980,580
,350,810,1040,220:GOTO180
210 ' ERASE MEMORY
220 PRINT:INPUT"...ARE YOU SURE
(Y/N)";ANS$
230 IFLEFT$(ANS$,1)<>"Y"THEN70
240 FORNL=1TO36
250 PL$(NL)=""
260 NEXTNL
270 GOTO70
280 'DO INDEX *SIDE2*
290 GOSUB500
300 FORNL=1TO15
310 PRINTUSINGF2$;NL;
320 LINEINPUTPL$(NL)
330 NEXTNL
340 'EDIT *SIDE2*
350 GOSUB500
360 FORNL=1TO15
370 PRINTUSINGF2$;NL;
380 PRINTPL$(NL)
390 NEXTNL
400 PRINT:PRINTCL$;
410 INPUTLC$:GOSUB1210
420 IFCL<1ORCL>15THEN350
430 GOSUB500
440 FORNL=1TOCL
450 PRINTUSINGF2$;NL;
460 PRINTPL$(NL)
470 NEXTNL
480 PRINTUSINGF2$;CL;
490 LINEINPUTPL$(CL):GOTO350
500 CLS:PRINTTAB(14)"*INDEX SIDE
 2*":PRINT:PRINTBL$:PRINT:RETURN
510 'DO INDEX *SIDE1*
520 GOSUB730
530 FORNL=16TO30
540 PRINTUSINGF2$;NL;
550 LINEINPUTPL$(NL)
560 NEXTNL
570 ' EDIT *SIDE1*
580 GOSUB730
590 FORNL=16TO30
600 PRINTUSINGF2$;NL;
610 PRINTPL$(NL)
620 NEXTNL
630 PRINT:PRINTCL$;
640 INPUTLC$:GOSUB1210
650 IFCL<16ORCL>30THEN580
660 GOSUB730
670 FORNL=16TOCL
680 PRINTUSINGF2$;NL;
690 PRINTPL$(NL)
700 NEXTNL
710 PRINTUSINGF2$;CL;
720 LINEINPUTPL$(CL):GOTO580
730 CLS:PRINTTAB(14)"*INDEX SIDE
 1*":PRINT:PRINTBL$:PRINT:RETURN
740 ' DO TITLE
750 GOSUB960
760 FORNL=31TO32
770 PRINTUSINGF2$;NL;
780 LINEINPUTPL$(NL)
790 NEXTNL
800 ' EDIT TITLE
810 GOSUB960
820 FORNL=31TO32
830 PRINTUSINGF2$;NL;
840 PRINTPL$(NL)
850 NEXTNL
860 PRINT:PRINTCL$;
870 INPUTLC$:GOSUB1210
880 IFCL<31ORCL>32THEN810
890 GOSUB960
900 FORNL=31TOCL
910 PRINTUSINGF2$;NL;
920 PRINTPL$(NL)
930 NEXTNL
940 PRINTUSINGF2$;CL;
950 LINEINPUTPL$(CL):GOTO810
960 CLS:PRINTTAB(17)"*TITLE*":PR
INT:PRINTBL$:PRINT:RETURN
970 ' DO FLAP
980 GOSUB1190
990 FORNL=33TO36
1000 PRINTUSINGF2$;NL;
1010 LINEINPUTPL$(NL)
1020 NEXTNL
1030 ' EDIT FLAP
1040 GOSUB1190
1050 FORNL=33TO36
1060 PRINTUSINGF2$;NL;
1070 PRINTPL$(NL)
1080 NEXTNL
1090 PRINT:PRINTCL$;
1100 INPUTLC$:GOSUB1210
1110 IFCL<33ORCL>36THEN1040
1120 GOSUB1190
1130 FORNL=33TOCL
1140 PRINTUSINGF2$;NL;
1150 PRINTPL$(NL)
1160 NEXTNL
1170 PRINTUSINGF2$;CL;
1180 LINEINPUTPL$(CL):GOTO1040
1190 CLS:PRINTTAB(18)"*FLAP*":PR
INT:PRINTBL$:PRINT:RETURN
1200 ' "ERROR" TRAP
1210 IFVAL(LC$)=0THEN70
1220 CL=VAL(LC$):RETURN
1230 ' PRINT#-2 ROUTINE
1240 PRINT:INPUT"...PRINTER READ
Y (Y/N)";ANS$
1250 IFLEFT$(ANS$,1)<>"Y"THEN70
1260 ' PRINT#-2 *SIDE2*
1270 PRINT#-2,"C"
1280 PRINT#-2,STRING$(40,46)+"C"
1290 FORNL=1TO15
1300 IFLEFT$(PL$(NL),1)="@"THENG
OSUB1570:GOTO1320
1310 GOSUB1630
1320 NEXTNL
1330 PRINT#-2,DL$;"F"
1340 'PRINT#-2 *SIDE1*
1350 FORNL=16TO30
1360 IFLEFT$(PL$(NL),1)="@"THENG
OSUB1570:GOTO1380
1370 GOSUB1630
1380 NEXTNL
1390 PRINT#-2,DL$;"F"
1400 ' PRINT#-2 *TITLE*
1410 FORNL=31TO32
1420 IFLEFT$(PL$(NL),1)="@"THENG
OSUB1570:GOTO1440
1430 GOSUB1630
1440 NEXTNL
1450 PRINT#-2,DL$;"F"
1460 ' PRINT#-2 *FLAP*
1470 FORNL=33TO36
1480 IFLEFT$(PL$(NL),1)="@"THENG
OSUB1570:GOTO1500
1490 GOSUB1630
1500 NEXTNL
1510 PRINT#-2
1520 PRINT#-2,DL$;"C"
1530 PRINT#-2,"C"
1540 ' REM ALL DONE - BACK TO ME
NU
1550 GOTO70
1560 ' CENTER THE LINE
1570 TL$=MID$(PL$(NL),2,38)
1580 LL=LEN(TL$)
1590 TB=(41-LL)/2
1600 PRINT#-2,TAB(TB)LEFT$(TL$,3
8)
1610 RETURN
1620 ' PRINT#-2 ONE LINE
1630 PRINT#-2,TAB(1)LEFT$(PL$(NL
),38):RETURN                    END
```

Program Listing. Indxcard

BY MICHAEL L. JOHNSON

COMMAND CUSTOMIZER

Writing CoCo compilers or interpreters? Want more programming flexibility? Command Changer helps.

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

Color Basic dispatch table	AB67
Color Basic command table	AA66
Extended Basic command table	8183
Extended Basic dispatch table	81F0

Table 1. Command and Dispatch Table Addresses

Color Basic command pointer	121 (hex)
Extended command pointer	12B
Color Basic dispatch pointer	123

Table 2. Command and Dispatch Pointer Addresses

```
100 READ X
110 FOR B=1 TO X
120 READ I,J
130 FOR A=0 TO &H3FFF
140 PRINT HEX$(A)
150 IF PEEK(A)<>I THEN 180
160 : IF PEEK(A+1)<>J THEN 180
170 :   PRINT HEX$(A);:GOTO 300
180 NEXT A
190 END
200 DATA 4
210 DATA &H81,&H83
220 DATA &H81,&HF0
230 DATA &HAA,&H66
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

System Requirements

16K RAM
Disk Basic
Editor/Assembler (optional)

```
100 REM ****COMMAND CHANGER****
110 REM ****BY MIKE JOHNSON****
120 REM ********5/10/83********
130 REM
140 CLS:PRINT@201,"COMMAND CHANG
ER"
150 PRINT@233,"BY MIKE JOHNSON"
160 PRINT@269,"5/10/83"
170 FOR I=1 TO 1000:IF INKEY$=""
 THEN NEXT I
180 CLEAR300,&H3E82:DIM CM$(25)
190 GOTO 900
200 CLS:FOR I=0 TO 108
210 :  T=PEEK(&H8183+I)
220 :  POKE &H3E83+I,T
230 NEXT I
240 A=1
250 FOR I=&H3E83 TO &H3EEF
260 :  IN$=CHR$(PEEK(I))
270 :  IF ASC(IN$) >&H80 THEN 31
0
280 :  CM$=CM$+IN$
290 NEXT I
300 GOTO 350
310 IN$=CHR$(ASC(IN$)-&H80)
320 CM$=CM$+IN$
330 CM$(A)=CM$:CM$=""
340 A=A+1:GOTO 290
350 FOR I=1 TO 24 STEP 2
360 :  PRINT CM$(I),CM$(I+1)
370 NEXT I
380 PRINT CM$(25)
390 PRINT@416,"WHAT COMMAND";
400 INPUT CM$
410 IF CM$="***" THEN CM$="":GOT
O 560
420 FOR I=1 TO 25
430 :  IF CM$=CM$(I) THEN 470
440 NEXT I
450 PRINT@416, "COMMAND NOT FOUN
D"
460 GOSUB 880:PRINT@416:GOTO390
470 F=I:PRINT@448,"NEW NAME";:IN
PUTNN$
480 FOR I=1 TO 25
490 :  IF CM$(I)=NN$ THEN 520
500 NEXT I
510 GOTO 540
520 PRINT@448,"ALREADY USED"
530 GOSUB 880:PRINT@448:GOTO470
540 CM$(F)=NN$
550 CLS:GOTO 350
560 C=&H3E83:FOR I=1 TO 25
570 FOR J=1 TO LEN(CM$(I))-1
580 :  IN=ASC(MID$(CM$(I),J,1))
590 :  POKE C,IN:C=C+1
600 NEXT J
610 IN=ASC(RIGHT$(CM$(I),1))
620 POKE C,IN+128:C=C+1
630 NEXT I
660 CLS:INPUT"ENTER NAME FOR TAB
LE";NA$
720 PRINT"INSERT DISK AND PRESS
ENTER"
730 IF INKEY$<>CHR$(13) THEN730
740 SAVEM NA$,&H3E83,&H3EEF,&H3E
83
750 GOTO 900
760 CLS:INPUT"ENTER NAME OF TABL
E";NA$
840 PRINT"INSERT DISK AND PRESS
ENTER"
850 IF INKEY$<>CHR$(13) THEN850
860 LOADM NA$
870 CLS:GOTO 240
880 FOR J=1 TO 750:NEXT J
890 RETURN
900 CLS:PRINT"ENTER SELECTION"
910 PRINT"  <1> CREATE NEW TABLE
"
920 PRINT"  <2> MODIFY SAVED TAB
LE"
930 PRINT"  <3> END PROGRAM"
940 A$=INKEY$:IF A$=""THEN 940
950 A=VAL(A$)
960 ON A GOTO 200,760,980
970 GOTO 940
980 CLS:PRINT"LEAVE MODIFIED TAB
LE IN CONTROL (Y/N)?";
990 A$=INKEY$:IF A$="" THEN990
1000 IF A$="Y" THEN POKE 299,&H3
E:END
1010 IF A$="N" THEN END
1020 GOTO 990
```

Program Listing 2. Command Changer

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-lan-

```
100 REM *****DISPATCHER******
110 REM ***BY MIKE JOHNSON***
120 REM *******5/11/82*******
130 CLEAR200,&H3F66:DIM CM$(36)
140 CLS
150 PRINT@235,"DISPATCHER"
160 PRINT@265,"BY MIKE JOHNSON"
170 PRINT@300,"05/11/82"
180 FOR X=1 TO 1250:IF INKEY$=""
 THEN NEXT X
190 CLS
200 A=1
210 FOR I=&HAA66 TO &HAAF5
220 :  IN$=CHR$(PEEK(I))
230 :  IF ASC(IN$) >&H80 THEN 26
0
240 :  CM$=CM$+IN$
250 NEXT I:GOTO 730
260 IN$=CHR$(ASC(IN$)-&H80):CM$=
CM$+IN$:CM$(A)=CM$:CM$="":A=A+1:
GOTO 250
270 FOR I=0 TO 70
280 :  T=PEEK(&HAB67+I)
290 :  POKE &H3F67+I,T
300 NEXT I
310 A=0:CLS:FORI=1 TO 36 STEP 2
320 A1$=HEX$(PEEK(I*2+&H3F65)*25
6+PEEK(I*2+&H3F66)):A2$=HEX$(PEE
K(I*2+&H3F67)*256+PEEK(I*2+&H3F6
8)):PRINT CM$(I);TAB(9);A1$,CM$(
I+1)
;TAB(25);A2$
330 A=A+1:IF A<13 THEN 360
340 A=0:PRINT:PRINT"PRESS ENTER
TO CONTINUE"
350 A$=INKEY$:IF A$<>CHR$(13) TH
EN 350 ELSE CLS
360 NEXT I
370 PRINT:PRINT"PRESS ENTER TO C
ONTINUE"
380 A$=INKEY$:IFA$<>CHR$(13) THE
N 380
390 CLS
400 PRINT@0,"CHANGE WHICH COMMAN
D";
410 INPUT CM$:IF CM$="***" THEN
CM$="" : GOTO 490
420 FOR I=1 TO 36:IF CM$=CM$(I)
THEN 440 ELSE NEXT I
430 PRINT@0:PRINT@0,"COMMAND NOT
 FOUND":FOR J=1 TO 750:NEXT J:PR
INT@0:GOTO 400
440 PRINT@32,"TO WHAT ADDRESS (H
EX)";:INPUT HX$:GOSUB 810
450 IF F1=1 THEN PRINT@32:PRINT@
32,"INCORRECT ADDRESS":FORJ=1TO7
50:NEXT:PRINT@32:F1=1:GOTO440
460 POKE I*2+&H3F65,INT(SM/256)
470 POKE I*2+&H3F66,INT((SM/256-
INT(SM/256))*256)
480 SM=0:F1=0:GOTO 310
490 REM
510 INPUT"ENTER NAME OF FILE";FI
$
530 PRINT"INSERT DISK AND PRESS
ENTER"
540 A$=INKEY$:IF A$<>CHR$(13) TH
EN 540
550 SAVEM FI$,&H3F67,&H3FAD,&H3F
67:GOTO 730
580 CLS
610 INPUT"ENTER FILE NAME";FI$
630 PRINT"INSERT DISK AND PRESS
ENTER"
640 A$=INKEY$:IFA$<>CHR$(13) THE
N 640
650 LOADM FI$:GOTO 310
690 CLS:PRINT"LEAVE TABLE IN OPE
RATION (Y/N)"
700 A$=INKEY$:IF A$<>"Y" AND A$<
>"N" THEN 700
710 IF A$="Y" THEN POKE291,&H3F
720 END
730 CLS:PRINT"ENTER OPTION"
740 PRINT"  <1> CREATE NEW TABLE
"
750 PRINT"  <2> MODIFY SAVED TAB
LE"
760 PRINT"  <3> END"
770 A$=INKEY$:IF A$="" THEN 770
780 A=VAL(A$)
790 ON A GOTO 270,580,690
800 GOTO 770
810 REM HEX CONVERSION ROUTINE
820 REM
830 IF LEN(HX$)<>4 THEN F1=1:RET
URN
840 FOR K=1 TO 4
850 M=16^(4-K)
860 T$=MID$(HX$,K,1)
870 IF T$>="A" AND T$<="F" THEN
T=ASC(T$)-55:GOTO 900
880 IF T$>="0" AND T$<="9" THEN
T=VAL(T$):GOTO 900
890 F1=1:RETURN
900 SM=SM+M*T
910 NEXT K
920 RETURN
```

Program Listing 3. Dispatcher

guage subroutine, you can create your own custom commands. Lines 200–260 load the Color Basic command table into array CM$. Lines 270–300 POKE the dispatch table into the cleared portion of RAM.

The rest of the program is the same as the first, except for the hex conversion routine, which converts the four-digit hex address into a decimal so that it can be POKEd. It contains several error-trapping routines to weed out bogus addresses. Remember to use leading zeros when the address is below 1000 hex.

"Dispatcher allows you to change the Color Basic dispatch table."

Since I have a disk system, I usually redirect the SKIPF command to my own routines. You can easily alter other commands that your program doesn't use. They can also have their own arguments if you know how to find the characters after the redirected command. A subroutine at 9F hex handles this.

The subroutine at 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 pointer, you can develop full-fledged commands such as machine-language sort routines. ■

Address correspondence to Michael L. Johnson, 7481 Greenway Drive, Jacksonville, FL 32210.

Listing continued

```
590 PRINT@32,"TAPE OR DISK (T/D)
"
600 A$=INKEY$:IF A$<>"T" AND A$<
>"D" THEN 600
610 INPUT"ENTER FILE NAME";FI$
620 IF A$="T" THEN 660
630 PRINT"INSERT DISK AND PRESS
ENTER"
640 A$=INKEY$:IFA$<>CHR$(13) THE
N 640
650 IM FI$:GOTO 310
660 PRINT"INSERT TAPE AND PRESS
ENTER"
670 A$=INKEY$:IF A$<>CHR$(13) TH
EN 670
680 CLOADM FI$:GOTO 310
690 CLS:PRINT"LEAVE TABLE IN OPE
RATION (Y/N)"
700 A$=INKEY$:IF A$<>"Y" AND A$<
>"N" THEN 700
710 IF A$="Y" THEN POKE 291,&H3F
720 END
730 CLS:PRINT"ENTER OPTION"
740 PRINT"  <1> CREATE NEW TABLE
"
750 PRINT"  <2> MODIFY SAVED TAB
LE"
760 PRINT"  <3> END"
770 A$=INKEY$:IF A$="" THEN 770
780 A=VAL(A$)
790 ON A GOTO 270,580,690
800 GOTO 770
810 REM HEX CONVERSION ROUTINE
820 REM
830 IF LEN(HX$)<>4 THEN F1=1:RET
URN
840 FOR K=1 TO 4
850 M=16^(4-K)
860 T$=MID$(HX$,K,1)
870 IF T$>="A" AND T$<="F" THEN
T=ASC(T$)-55:GOTO 900
880 IF T$>="0" AND T$<="9" THEN
T=VAL(T$):GOTO 900
890 F1=1:RETURN
900 SM=SM+M*T
910 NEXT K
920 RETURN                    END
```

```
009F    INC     $A7     BUMP LSB PARSE POINTER
00A1    BNE     +2      (00A5) IF NO CARRY
00A3    INC     $A6     BUMP MSB
00A5    LDA
00A6-00A7 BASIC PARSE POINTER
00A8    JMP     $AA1A   BACK TO ROM
```

Program Listing 4. Routine to Disassemble Subroutine at Location 9F

TOM MIX SOFTWARE

TELEX 706139

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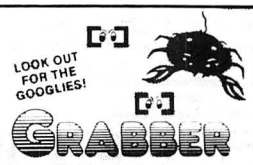

Arcade Action. Method of play you are the Grabber. The object is to grab the 8 treasures and store them in the center boxes. You start with 3 Grabbers and get extra ones at 20,000 points. Watch out for the googlies! Super high resolution graphics.

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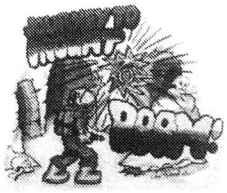
JOURNEY TO MT. DOOM

32K Mach. Lang.
$27.95 DISK ONLY



The Necromancer is about to wage war on earth. He needs his lost gold ring to acquire the power to do so. You must find the ring, take it to Mt. Doom and destroy it in the flames from which it came, thus eliminating the Necromancer's evil powers.

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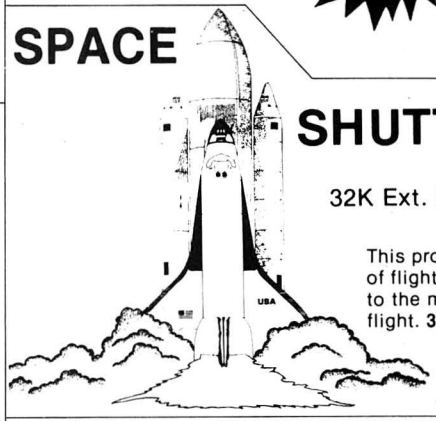
32K Ext. Basic

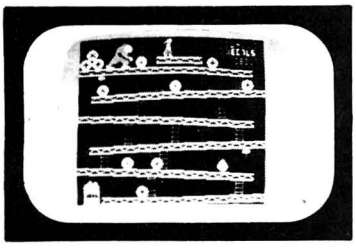


This program gives you the real feeling of flight. Full instrumentation complete to the max. Actual simulation of space flight. **32K Extended Basic**

16K MACHINE LANGUAGE
TAPE $27.95
DISK $30.95

"TRAPFALL"

By KEN KALISH
ARCADE ACTION
The "Pitfalls" in this game are many. Hidden treasures, jump over the pits, swing on the vine, watch out for alligators, beware of the scorpion. Another game for the Color Computer with the same high resolution graphics as "The King."



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GRAPHING FUNCTIONS

Do your students have trouble visualizing how to graph functions? These programs could help.

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+5*X-25
DEF FN R(X)=RND(X)
```

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

```
200 IF FN G(5)=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=96-40*(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

Line 150 defines the function A(X) as SIN(X). Line 160 draws an X axis across the middle of the screen so you can plot positive and negative values.

Lines 170–220 vary the value of X from 0 to 25 with a step size of 0.3, so the lines are fairly close together. Line 180 calculates the value for the Y coordinate, which is scaled. The function FN A(X) calculates the actual value of X, but that value is multiplied by 40 to be large enough to see on the graph. The program subtracts the Y coordinate from 96 to get the distance from the axis.

In the graph for SIN(X), the lines will not go off the screen, but if you try a different function, the Y values can exceed the limits of the screen. Lines 190 and 200 check for the Y coordinate limits and set the Y values to 0 or 191 at the edges of the screen if they are too large or too negative.

To form the graph, line 210 draws a line from the value of the Y coordinate to the X axis for each value of X. Line 230 keeps the graph on the screen until you press break.

To try graphing a different function,

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:

```
120 CLS:PCLS
130 PMODE 4,1
140 SCREEN 1,0
150 DEF FN A(X)=SIN(X)-(1/2)*SIN(2*X)+(1/3)*SIN(3*X)-(1/4)*SIN(4
*X)+(1/5)*SIN(5*X)-(1/6)*SIN(6*X)+(1/7)*SIN(7*X)-(1/8)*SIN(8*X)
160 DEF FN B(X)=(1/9)*SIN(9*X)-(1/10)*SIN(10*X)+(1/11)*SIN(11*X)
170 LINE(0,96)-(255,96),PSET
180 FOR X=0 TO 14 STEP .1
190 Y=96-40*(FN A(X)+FN B(X))
200 IF Y<=0 THEN Y=0
210 IF Y>=191 THEN Y=191
220 LINE(X*20,Y)-(X*20,96),PSET
230 NEXT X
240 GOTO 240
250 END
```

Program Listing 3. Fourier Expansion

$$f(x)=\Sigma\frac{1}{n}\sin nx$$
where n = 1,3,5,....

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 (3*X), which would be the second term in the series. Look at the graph. Now add the third term:

```
B(X)=(1/3)*SIN(3*X)+(1/5)*SIN(5*X)
```

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:

$$f(x)=\Sigma\frac{(-1)^{n+1}}{n}\sin nx$$
where n = 1,2,3,4,....

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.

See List of Advertisers on page 130

BY GERALD SPROUSE

A HELPING HAND FOR DATA ENTRY

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

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 9770–9790 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 B$(L,CP) to the data input, and line 9460 displays it on the screen. If you do press a control key, line 9460 displays the value of B$(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 skips lines 3 and 5 because they are two line fields. Line 9560 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 (B$(L,CP)) into a string variable (C$(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

Item	Length	Start		Stop	
		L	CP	L	CP
Last Name	20	0	12	0	31
First Name	20	1	12	1	31
Address	35	2	12	2	31
		3	12	3	26
City	25	4	12	4	31
		5	12	5	16
State	2	6	12	6	13
Zip Code	9	7	12	7	20
Phone	7	8	12	8	18
Status	10	9	12	9	21

Table 1. Data Input Fields

System Requirements

32K RAM
Disk Basic

(B$(L,CP)) to blanks and return to accept input of another set of data.

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.

20	Change 10 in DIM statement to number of lines.
9060–9150	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.

Table 2. Line Changes

```
10 CLEAR 1000,&H7DFF
20 DIMB$(10,32),C$(10)
9000 FORT=32256 TO 32270
9010 READD:POKET,D:NEXTT:DEFUSR0
=32257
9020 DATA 207,142,0,0,182,126,0,
167,128,140,0,0,45,246,57
9030 CLS:PRINT"LAST NAME":PRINT"
FIRST NAME":PRINT"ADDRESS":PRINT
9040 PRINT"CITY":PRINT:PRINT"STA
TE":PRINT"ZIP CODE":PRINT"PHONE"
9050 PRINT"STATUS":PRINT:PRINT"
 FOR HELP KEY <@>"
9060 DATA0,12,0,31
9070 DATA1,12,1,31
9080 DATA2,12,2,31
9090 DATA3,12,3,26
9100 DATA4,12,4,31
9110 DATA5,12,5,16
9120 DATA6,12,6,13
9130 DATA7,12,7,20
9140 DATA8,12,8,18
9150 DATA9,12,9,21
9160 FORR=0TO9:READD1,D2,D3,D4
9170 A1=1024+D1*32+D2:A2=1024+D3
*32+D4+1
9180 A3=INT(A1/256):A4=A1-A3*256
9190 A5=INT(A2/256):A6=A2-A5*256
9200 POKE32258,A3:POKE32259,A4:P
OKE32266,A5:POKE32267,A6
9210 K=USR0(I):NEXT
9220 L=0:CP=12
9230 IF(L=0 AND CP=32) THEN L=1:
CP=12:GOTO9330
9240 IF(L=1 AND CP=32) THEN L=2:
CP=12:GOTO9330
9250 IF(L=2 AND CP=32) THEN L=3:
CP=12:GOTO9330
9260 IF(L=3 AND CP=27) THEN L=4:
CP=12:GOTO9330
9270 IF(L=4 AND CP=32) THEN L=5:
CP=12:GOTO9330
9280 IF(L=5 AND CP=17) THEN L=6:
CP=12:GOTO9330
9290 IF(L=6 AND CP=14) THEN L=7:
CP=12:GOTO9330
9300 IF(L=7 AND CP=21) THEN L=8:
CP=12:GOTO9330
9310 IF(L=8 AND CP=19) THEN L=9:
CP=12:GOTO9330
9320 IF(L=9 AND CP=22) THEN 9630
9330 IFL>9 THEN 9630
9340 A=1024+L*32+CP
9350 A$=INKEY$:POKEA,206:POKEA,2
07:IFA$="" THEN 9350
9360 IFASC(A$)=8 THEN 9460
9370 IFASC(A$)=9 THEN 9460
9380 IFASC(A$)=10 THEN 9460
9390 IFASC(A$)=94 THEN 9460
9400 IFASC(A$)=64 THEN 9770
9410 IFCP<>12 THEN 9440
9420 IFL<>0 THEN 9440
9430 IFASC(A$)=13 THEN 9610
9440 IFASC(A$)=13 THEN 9460
9450 B$(L,CP)=A$
9460 PRINT@32*L+CP,B$(L,CP);
9470 IFASC(A$)=8 THEN 9480 ELSE
9500
9480 CP=CP-1:IF CP<12 THEN CP=12
9490 GOTO9230
9500 IFASC(A$)=9 THEN 9510 ELSE
9520
9510 CP=CP+1:GOTO9230
9520 IFASC(A$)=10 THEN 9530 ELSE
9560
9530 L=L+1:CP=12:IF(L=3 OR L=5)
THEN L=L+1
9540 IF L>9 THEN 9630
9550 GOTO9230
9560 IFASC(A$)=13 THEN 9530 ELSE
9570
9570 IFASC(A$)=94 THEN 9580 ELSE
9600
9580 L=L-1:IFL<0 THEN L=0
9590 GOTO9230
9600 CP=CP+1:GOTO9230
9610 REM EXIT HERE TO MAIN PROGR
AM
9620 END
9630 C$(1)=B$(0,12):FORCP=13TO31
:C$(1)=C$(1)+B$(0,CP):NEXT
9640 C$(2)=B$(1,12):FORCP=13TO31
:C$(2)=C$(2)+B$(1,CP):NEXT
9650 C$(3)=B$(2,12):FORCP=13TO31
:C$(3)=C$(3)+B$(2,CP):NEXT
9660 FORCP=12TO26:C$(3)=C$(3)+B$
(3,CP):NEXT
9670 C$(4)=B$(4,12):FORCP=13TO31
:C$(4)=C$(4)+B$(4,CP):NEXT
9680 FORCP=12TO16:C$(4)=C$(4)+B$
(5,CP):NEXT
9690 C$(5)=B$(6,12)+B$(6,13)
9700 C$(6)=B$(7,12):FORCP=13TO20
:C$(6)=C$(6)+B$(7,CP):NEXT
9710 C$(7)=B$(8,12):FORCP=13TO18
:C$(7)=C$(7)+B$(8,CP):NEXT
9720 C$(8)=B$(9,12):FORCP=13TO21
:C$(8)=C$(8)+B$(9,CP):NEXT
9730 REM EXIT HERE WITH SUBROUTI
NE TO STORE DATA
9740 FORL=0TO9:FORCP=12TO31
9750 B$(L,CP)="":NEXTCP:NEXTL
9760 RESTORE:FORT=0TO14:READD:NE
XT:GOTO 9160
9770 CLS:PRINT" KEY IN DATA AS R
EQUESTED.  KEY <ENTER> AT START
TO EXIT.  USE  ARROWS TO MOVE CU
RSOR."
9780 LINE INPUT" TO RETURN FOR D
ATA ENTRY KEY   <ENTER>";X$
9790 RESTORE:GOTO 9000
```

END

Program Listing. Data-Entry Utility

See List of Advertisers on page 130

BY PHILIP N. WILCOX

THE SELF-INSTRUCTING PROGRAM

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.

Don't assume that everyone will know how to use your program. Let the software guide them.

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 numeric, 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

tions 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.

```
10 CLS
20 PRINT @ 40,"--TAPE DB MENU--"
30 PRINT @ 105,"1. CLOAD FILE"
40 PRINT @ 137,"2. CSAVE FILE"
50 PRINT @ 169,"3. NEW RECORDS"
60 PRINT @ 201,"4. UPDATE RECORD
S"
70 PRINT @ 233,"5. DELETE RECORD
S"
80 PRINT @ 265,"6. SELECT"
90 PRINT @ 297,"7. SORT"
100 PRINT @ 329,"8. PRINT"
110 PRINT @ 361,"9. QUIT"
120 PRINT @ 419,"PRESS NUMBER FO
R FUNCTION";: FOR T=1 TO 300: NE
XT T
130 PRINT @ 419,STRING$(25,32);:
 FOR T=1 TO 300: NEXT T
140 R$=INKEY$: IF R$="" THEN GOT
O 120
150 R=VAL(R$)
160 ON R GOTO 1000, 2000, 3000,
4000, 5000, 6000, 7000, 8000, 90
00
170 GOTO 120
```

Program Listing 1. Sample Menu

```
5 CLS: INPUT"DO YOU WANT MENU <Y
/N>";BYPASS$
10 CLS: IF BYPASS$="N" THEN GOTO
 120
20 PRINT @ 40,"--TAPE DB MENU--"
30 PRINT @ 105,"<L> CLOAD FILE"
40 PRINT @ 137,"<C> CSAVE FILE"
50 PRINT @ 169,"<N> NEW RECORDS"
60 PRINT @ 201,"<U> UPDATE RECOR
DS"
70 PRINT @ 233,"<D> DELETE RECOR
DS"
80 PRINT @ 265,"<S> SELECT"
90 PRINT @ 297,"<A> ARRANGE"
100 PRINT @ 329,"<P> PRINT"
110 PRINT @ 361,"<Q> QUIT"
120 PRINT @ 419,"PRESS LETTER FO
R FUNCTION";: FOR T=1 TO 300: NE
XT T
130 PRINT @ 419,STRING$(25,32);:
 FOR T=1 TO 300: NEXT T
140 R$=INKEY$: IF R$="" THEN GOT
O 120
150 IF R$="L" THEN GOTO 250
160 IF R$="C" THEN GOTO 260
170 IF R$="N" THEN GOTO 270
180 IF R$="U" THEN GOTO 280
190 IF R$="D" THEN GOTO 290
200 IF R$="S" THEN GOTO 300
210 IF R$="A" THEN GOTO 310
220 IF R$="P" THEN GOTO 320
230 IF R$="Q" THEN GOTO 330
240 GOTO 120
250 GOTO 340
260 GOTO 340
270 GOTO 340
280 GOTO 340
290 GOTO 340
300 GOTO 340
310 GOTO 340
320 GOTO 340
330 END
340 CLS: PRINT @ 65,"THIS SUBROU
TINE IS INCOMPLETE"
350 FOR J=1 TO 1000: NEXT J
360 GOTO 10
```

Program Listing 2. Sample Menu Using Letter Designation

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 6020–6040 print the fields. Lines 6050–6060 prompt for the field that the selection is based on. Line 6070 prompts for the information that the fields are to be compared to. Next, line 6080 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.

```
6000 '**** SELECT SUBROUTINE ***
*
6010  FI$(1)="NAME": FI$(2)="ADD
RESS": FI$(3)="CITY, STATE": FI$
(4)="ZIP": FI$(5)="PHONE"
6020 CLS: PRINT @ 11,"--SEARCH--
": FOR J=1 TO 5
6030 PRINT J;". "; FIELD$(J)
6040 NEXT J
6050 PRINT @ 227, "WHICH FIELD":
 INPUT FIELD
6070 INPUT "SEARCH STRING";SRCHS
T$
6080 PRINT @ 355, "FIND <, >, =
SEARCH STRING"
6090 PRINT @ 420, "PRESS FUNCTIO
N DESIRED";: FOR T=1 TO 300: NEX
T T
6100 PRINT @ 420, STRING$(22,32)
: FOR T=1 TO 300: NEXT T
6110 R$=INKEY$: IF R$="" THEN GO
TO 6090
6120 IF R$="<" THEN GOTO 6200
6130 IF R$=">" THEN GOTO 6400
6140 IF R$="=" THEN GOTO 6600
6150 GOTO 6090
6200 PRINT "YOU CHOSE <"
6210 GOTO 10
6400 PRINT "YOU CHOSE >"
6410 GOTO 10
6600 PRINT "YOU CHOSE ="
6610 GOTO 10
```

Program Listing 3. Menu Used When User Must Make a Choice

```
10 INPUT "WHAT MONTH IS IT";MONT
H$
20 PRINT "HOW MANY DAYS IN ";MON
TH$
30 INPUT DAYS
40 PRINT "THERE ARE";DA;"DAYS IN
 ";MONTH$
50 END
```

Program Listing 4. Sample INPUT Prompts

include a prompt with all INPUT statements. When prompting for information, use as few words as possible to make it clear what you are asking for. If there is any chance that the user might enter a comma, then use the LINE INPUT command. If you are asking for the date and the operator uses a comma, the computer will ignore all the information entered after the comma using INPUT.

If the program has already collected some data, use it in collecting other data (see Program Listing 4). Line 10 asks for the month, and stores the response in string variable MONTH$. Line 20 provides the prompt and prints the information associated with MONTH$. Line 30 collects the input, and line 40 prints the data mingled with text. This is the same technique used by bulletin-board services to refer to you by name while you are logged on. ■

Address correspondence to Phil Wilcox, 16665 Olive Circle, Fountain Valley, CA 92708.

↙See List of Advertisers on page 130

BY HAROLD SCHNEIDER

MAKE COLOR BASIC THINK IT'S EXTENDED

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.

You can use many of those Extended Basic listings on your Color Basic CoCo with these subroutines.

STRING$

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

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

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

then replace line 50 with:

```
50 ZL = 5:ZC = 192:GOSUB 50000: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:

```
60 X$ = STRING$(32,"*")
```

You can replace this with:

```
60 ZL = 32:ZC = ASC("*"):GOSUB 50000:X$ = ZS$
```

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

Notice that all the variables in Listing 1 and my other subroutines begin 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.

```
50000 'ZS$=STRING$(ZL,ZC)
50010 ZS$="":FOR ZJ=1 TO ZL:ZS$=
ZS$+CHR$(ZC):NEXT ZJ:RETURN
```

Program Listing 1. STRING$ Subroutine

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
```

```
50100 'ZI=INSTR(ZS$,ZT$):START A
T 50120 FOR ZI=INSTR(ZS,ZS$,ZT$)
50110 ZS=1
50120 ZI=0:IF ZS<1 THEN ZS=1
50130 FOR ZJ=ZS TO LEN(ZS$):IF M
ID$(ZS$,I,LEN(ZT$))=ZT$ THEN ZI=
ZJ:RETURN ELSE NEXT ZJ:RETURN
```

Program Listing 2. INSTR Subroutine

```
50200 'MID$(ZS$,ZI)=ZM$:FOR MID$
(ZS$,ZI,ZL)=ZM$, START AT 50220
50210 ZL=LEN(ZM$):GOTO 50230
50220 IF ZL>LEN(ZM$) OR ZL=0 THE
N ZL=LEN(ZM$)
50230 IF ZI<1 OR ZI>LEN(ZS$) THE
N PRINT"FC ERROR":STOP ELSE ZT$=
LEFT$(ZM$,ZL):ZS$=LEFT$(ZS$,ZI-1
)+ZT$+RIGHT$(ZS$,LEN(ZS$)-ZI-ZL+
1):ZM$="":RETURN
```

Program Listing 3. MID$ Subroutine

System Requirements

4K RAM
Color Basic

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:ZS$ = "10/12/83":ZT$ = "/":GOSUB
50120:IN = ZI
```

MID$

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

Sometimes the command appears in the form MID$(A$,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 MID$ 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 MID$(A$,P) = B$
```

becomes:

```
40 ZS$ = A$:ZI = P:ZM$ = B$:GOSUB 50200:
A$ = ZS$
```

and the line:

```
50 MID$(A$,P,L) = B$
```

becomes:

```
50 ZS$ = A$:ZI = P:ZL = L:ZM$ = B$:GOSUB
50220:A$ = ZS$
```

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 &H0100,&H3E00
```

is replaced by:

```
10 ZH$ = "0100":GOSUB 50400:T = ZN:ZH$ =
"3E00":GOSUB 50400:CLEAR T,ZN
```

The line:

```
20 A = VAL(&H + A$)
```

becomes:

```
20 ZH$ = 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(AN)
```

becomes:

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

```
50300 'ZH$=HEX$(ZN)
50310 ZH$=""
50320 Z2=INT(ZN/16):Z1=ZN-Z2*16:
ZH$=MID$("0123456789ABCDEF",Z1+1
,1)+ZH$:IF Z2=0 THEN RETURN ELSE
 ZN=Z2:GOTO 50320
```

Program Listing 4. HEX$ Subroutine

```
50400 'ZN=&H(ZH$)
50410 ZN=0:ZF=1:FOR ZJ=1 TO LEN(
ZH$):ZM$=MID$(ZH$,LEN(ZH$)+1-ZJ,
1):IF ASC(ZM$)>64 THEN ZI=ASC(ZM
$)-55 ELSE ZI=VAL(ZM$)
50420 IF ZI>15 THEN PRINT"FC ERR
OR":STOP ELSE ZN=ZN+ZI*ZF:ZF=ZF*
16:NEXT ZJ:RETURN
```

Program Listing 5. &H Subroutine

and the line:

```
70 X = VARPTR(Q$)
```

is replaced by:

```
70 ZV$ = "Q$":GOSUB 50500:X = ZV
```

Use the second subroutine in Listing 6 for one-dimensional arrays. It is used exactly the same way as the first subroutine, but ZI must be set to the subscript of the array element you want to find. To find VARPTR(ST$(11)), for example, set ZV$ = "ST$", ZI = 11, and GOSUB 50600. Then ZV is the required VARPTR.

Take care using the VARPTR subroutines. Do not use any new variables or arrays between finding the VARPTR and using it or the value can change. If new variables appear in the program in between, give each of them a value (such as zero or "") before using the VARPTR subroutine.

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 = 15000
```

becomes:

```
50500 'ZV=VARPTR(ZV$)
50510 GOSUB 50550:FOR ZJ=PEEK(27
)*256+PEEK(28) TO PEEK(29)*256+P
EEK(30)-2:IF PEEK(ZJ)=Z1 AND PEE
K(ZJ+1)=Z2 THEN ZV=ZJ+2:RETURN E
LSE NEXT ZJ:PRINT"VARPTR NOT FOU
ND":STOP:RETURN
50550 ZV=0:IF RIGHT$(ZV$,1)="$"
THEN Z2=128:Z1=ASC(LEFT$(ZV$,1))
:IF LEN(ZV$)>2 THEN Z2=Z2+ASC(MI
D$(ZV$,2,1)):RETURN ELSE RETURN
50560 Z1=ASC(LEFT$(ZV$,1)):Z2=0:
IF LEN(ZV$)>1 THEN Z2=Z2+ASC(MID
$(ZV$,2,1)):RETURN ELSE RETURN
50600 'ZV=VARPTR(ZV$(ZI))
50610 GOSUB 50550:FOR ZJ=PEEK(29
)*256+PEEK(30) TO PEEK(31)*256+P
EEK(32)-2:IF PEEK(ZJ)=Z1 AND PEE
K(ZJ+1)=Z2 THEN ZV=ZJ+7+5*ZI:RET
URN ELSE NEXT ZJ:PRINT"VARPTR NO
T FOUND":STOP:RETURN
```

Program Listing 6. VARPTR Subroutine

```
20 ZK=3:ZN=15000:GOSUB 50700
```

Program Listing 8 gives the corresponding USR function. If the line calling the program at 15000 is:

```
90 Z=USR3(Y)
```

then this is replaced by:

```
90 ZK=3: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 as example, the line:

```
30 LINEINPUT "LAST NAME, FIRST
NAME"; N$
```

becomes:

```
30 PRINT "LAST NAME, FIRST NAME";
:GOSUB 50900:N$=ZA$
```

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.

```
50700 'DEFUSRZK=ZN (ZK=0,1,...,9
):FOR DEFUSR USE ZK=0
50710 ZM=INT(ZN/256):ZL=ZN-ZM*25
6:POKE 318+2*ZK,ZM:POKE 319+2*ZK
,ZL:IF ZK=0 THEN POKE 275,ZM:POK
E 276,ZL:RETURN ELSE RETURN
```

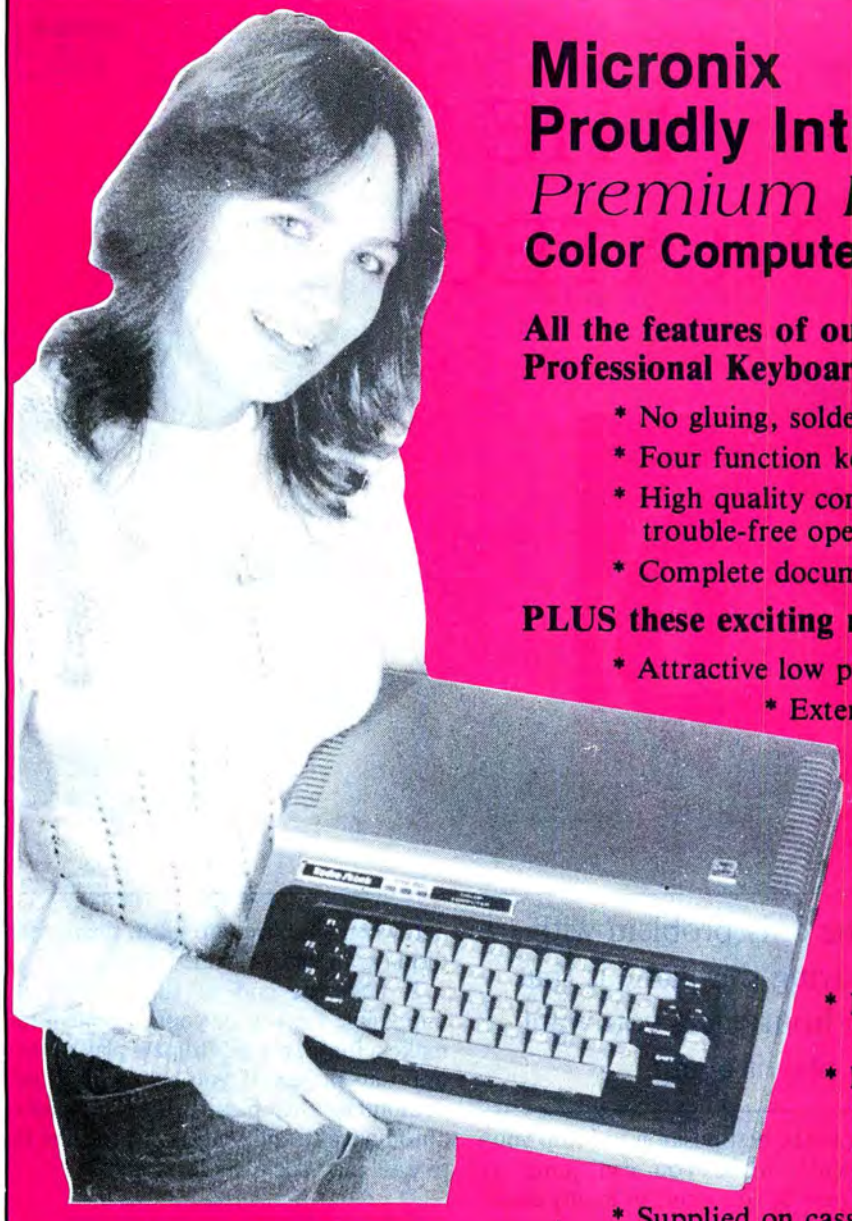
Program Listing 7. DEFUSR Subroutine

```
50800 'USRZK (GOSUB 50800 FIRST,
 THEN REPLACE USRZK BY USR IN PR
OGRAM):IF ONLY USR IS USED THEN
THIS SUBROUTINE IS  UNNECESSARY
50810 POKE 275,PEEK(318+2*ZK):PO
KE 276,PEEK(319+2*ZK):RETURN
```

Program Listing 8. USR Subroutine

```
50900 'LINEINPUT ZA$
50910 ZA$=INKEY$:ZA$=""
50920 ZB$=INKEY$:IF ZB$="" THEN
50920
50930 ZB=ASC(ZB$):IF ZB=13 THEN
RETURN ELSE IF LEN(ZA$)>0 AND ZB
=8 THEN ZA$=LEFT$(ZA$,LEN(ZA$)-1
):PRINT ZB$;:GOTO 50920 ELSE IF
ZB=8 OR ZB=21 OR ZB=12 THEN 5092
0 ELSE ZA$=ZA$+ZB$:PRINT ZB$;:GO
TO 50920
```

Program Listing 9. LINEINPUT Subroutine



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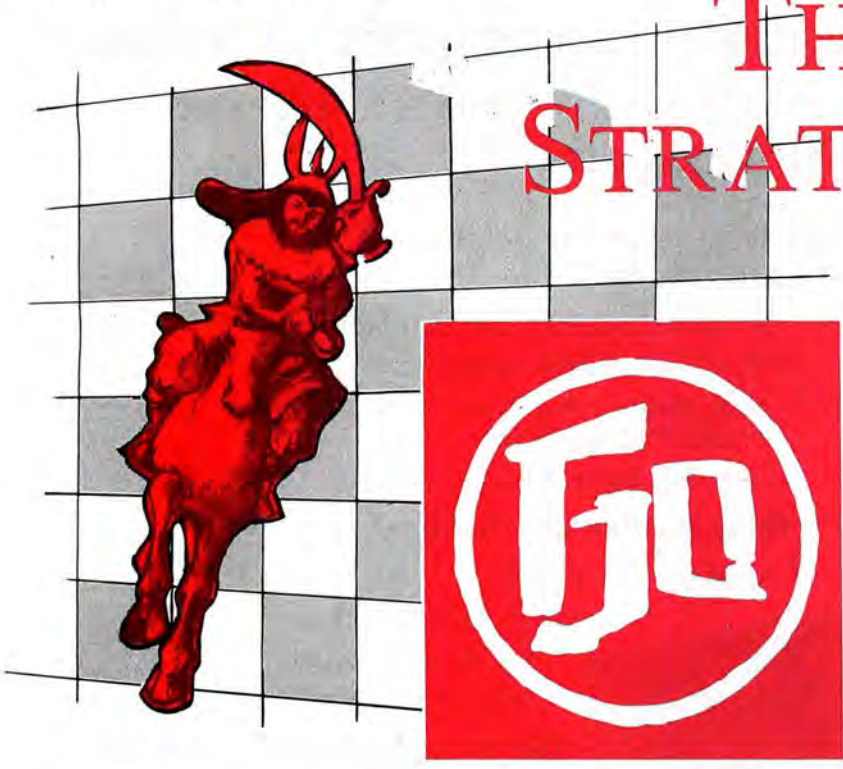
GAME

BY PETER A. HOLDEN

THE CHINESE STRATEGY GAME



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 only problem with playing this game is that an hour later, you want to play it again.

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.

Table 1. Variables

K	Opponent's color
J	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	TU
T=P−7	T
U=Q−4	PQ
V=Q+4	TV
	U
	SU
	S
	SV
	V
AA=S	AF=V
AB=SU	AF=T
AC=SV	AG=TU
AD=U	AH=TV
ZZ	If 1=player 1 If 2=player 2
ZX	1 or 2 computer is opponent
BG	Check for any possible jumps
BA–BH	Computer turn check for largest possible jump
AJ	Total number of jumps by computer
AK	Largest jump by computer
PP	Largest jump by computer's horizontal position
QQ	Largest jump by computer's vertical position

System Requirements

16K RAM
Extended Color Basic

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	Player 1 and 2 pass input
940	Flashes computer's turn indicator
950–970	Check for opponent at 90°
980–1000	Check for opponent at 45°
1010–1030	Check for opponent at 135°
1040–1060	Check for opponent at 0°
1070–1090	Check for opponent at 180°
1100–1120	Check for opponent at 270°
1130–1150	Check for opponent at 315°
1160–1180	Check for opponent at 225°
1190–1220	Send player or computer back for next position if jump is illegal
1230–1320	Check for possible jump, 90°
1330–1350	If computer's turn, check for largest jump, 90°
1360–1400	Jump 90°
1410–1500	Check for possible jump, 45°
1510–1530	If computer's turn, check for largest jump, 45°
1540–1580	Jump 45°
1590–1680	Check for possible jump, 135°
1690–1710	If computer's turn, check for largest jump, 135°
1720–1760	Jump 135°
1770–1860	Check for possible jump, 0°
1870–1890	If computer's turn, check for largest jump, 0°
1900–1940	Jump 0°
1950–2040	Check for possible jump, 180°
2050–2070	If computer's turn, check for largest jump, 180°
2080–2120	Jump 180°
2130–2220	Check for possible jump, 270°
2230–2250	If computer's turn, check for largest jump, 270°
2260–2300	Jump 270°
2310–2400	Check for possible jump, 315°
2410–2430	If computer's turn, check for largest jump, 315°
2440–2480	Jump 315°
2490–2580	Check for possible jump, 225°
2600–2620	If computer's turn, check for largest jump, 225°
2630–2670	Jump 225°
2680–2690	Determine which player's turn
2700–2710	If no jump possible, send computer back for next position
2720–2740	Determine which player's turn
2750–2810	Check for largest number of men jumped by computer
2820	Sends computer to position for largest jump
2830	Sends computer back to increment position
2835–2837	If no jumps possible, send computer to pass position
2840	Sets cursor to player's color after a jump
2890	Flashes computer's turn indicator
2860	Resets computer's turn variable
2870–2880	Add 1 to score for cursor position
2910–2990	Pass section
2960	Returns play to player 1
2970	Prints score
3000	Returns to start of game
3010–3060	Scoring subroutine

END

Program Listing. The Ancient Chinese Game of Go

```
10 CLS(4)
20 PRINT@96," THE ANCIENT CHINES
E GAME OF GO "
30 PRINT@201,"PROGRAMED BY";
40 PRINT@256,"        PETER A HO
LDEN          ";
50 PRINT@297,"RT 2 BOX 53E";
60 PRINT@329,"CAMDENTON MO";
70 PRINT@352,"             65020
          ";
80 FOR A=1 TO 1000:NEXT A
90 CLS(0)
100 PRINT@96," WOULD YOU LIKE TO
 PLAY AGAINST  THE COMPUTER OR A
NOTHER PERSON"
110 PRINT@192,"   PRESS C FOR CO
MPUTER P FOR                PERSO
N"
120 K$=INKEY$:IF K$=""GOTO 120
130 IF K$="P"GOTO 160
140 IF K$="C"THEN ZX=1
150 IF K$<>"C"GOTO 120
160 CLS(0)
170 FOR A=4 TO 54 STEP 7
180 FOR B=0 TO 28 STEP 4
190 SET(A,B,3)
200 NEXT B
210 NEXT A
220 ZA=2:ZB=2
230 PRINT@481,"PLAYER 1 "ZA;
240 SET(1,31,5)
250 SET(1,30,5)
260 SET(31,30,4)
270 IF ZX<>1 GOTO 290
280 PRINT@496,"COMPUTER "ZB;:GOT
O 300
290 PRINT@496,"PLAYER 2 "ZB;
300 SET(31,31,4)
310 SET(25,12,5)
320 SET(32,16,5)
330 SET(25,16,4)
340 SET(32,12,4)
350 P=4:Q=0:ZZ=0
360 ZZ=ZZ+1
370 IF ZZ=1 THEN J=4
380 IF ZZ=1 THEN K=5
390 IF ZZ=2 THEN J=5
400 IF ZZ=2 THEN K=4
410 IF ZX<1 GOTO 520
420 IF ZZ=1 GOTO 520
430 P=-3:Q=-4
440 P=P+7:IF P>53 THEN P=-3:GOTO
 440
450 RESET(31,30)
460 IF P=4 THEN Q=Q+4
470 IF Q=32 GOTO 2790
480 GG=POINT(P,Q)
490 IF GG=4 GOTO 440
500 IF GG=5 GOTO 440
510 GOTO 900
520 A$=INKEY$:IF A$=""GOTO 685
530 IF A$="P"GOTO 2910
540 IF A$="R" GOTO 600
550 IF A$="L" GOTO 600
560 IF A$="U" GOTO 600
570 IF A$="D" GOTO 600
580 IF A$=" "GOTO 600
590 GOTO 520
600 SOUND100,1
610 IF A$="R"THEN P=P+7
620 IF P>53 THEN P=4
630 IF A$="L"THEN P=P-7
640 IF P<4 THEN P=53
650 IF A$="U"THEN Q=Q-4
660 IF Q<0 THEN Q=28
670 IF A$="D"THEN Q=Q+4
680 IF Q>28 THEN Q=0
685 IF P>54 THEN P=4
687 IF Q>28 THEN Q=0
690 D=POINT(P,Q)
700 C=D
710 RESET(P,Q)
720 IF ZZ=1 GOTO 750
730 RESET(31,30)
740 GOTO 760
750 RESET (1,30)
760 FOR A=1 TO 150:NEXT A
770 IF P=H AND Q=R GOTO 790
780 H=P:R=Q
790 SET(P,Q,C)
800 IF ZZ=1 GOTO 830
810 SET(31,30,4)
820 GOTO 840
830 SET(1,30,5)
840 IF A$=" "GOTO 860
850 GOTO 520
860 F=POINT(P,Q)
865 IF F<>3 AND ZX=2 GOTO 2910
870 IF F=3 THEN 900
880 SOUND 1,2:GOTO 520
890 GOTO 360
900 S=P+7:T=P-7:U=Q-4:V=Q+4
910 AA=3:AB=3:AC=3:AD=3:AE=3:AF=
3:AG=3:AH=3
920 K$=INKEY$:IF K$=""GOTO 940
930 IF K$="P"GOTO 2910
940 IF ZX=1 AND ZZ=2 THEN SET(31
,30,4)
950 IF S>53 GOTO 980
960 AA=POINT(S,Q)
970 IF AA=K THEN AA=3
980 IF S>53 OR U<0 GOTO 1010
990 AB=POINT(S,U)
1000 IF AB=K THEN AB=3
1010 IF S>53 OR V>28 GOTO 1040
1020 AC=POINT(S,V)
1030 IF AC=K THEN AC=3
1040 IF U<0 GOTO 1070
1050 AD=POINT(P,U)
1060 IF AD=K THEN AD=3
1070 IF V>28 GOTO 1100
1080 AE=POINT(P,V)
1090 IF AE=K THEN AE=3
1100 IF T<4 GOTO 1130
1110 AF=POINT(T,Q)
1120 IF AF=K THEN AF=3
1130 IF T<4 OR U<0 GOTO 1160
1140 AG=POINT(T,U)
1150 IF AG=K THEN AG=3
1160 IF T<4 OR V>28 GOTO 1190
1170 AH=POINT(T,V)
1180 IF AH=K THEN AH=3
1190 IF ZZ=1 GOTO 1210
1200 IF ZX>=1  AND AA=3 AND AB=3
 AND AC=3 AND AD=3 AND AE=3 AND
AF=3 AND AG=3 AND AH=3 GOTO 440
1210 IF AA=3 AND AB=3 AND AC=3 A
ND AD=3 AND AE=3 AND AF=3 AND AG
=3 AND AH=3 GOTO 880
1220 BA=0:BB=0:BC=0:BD=0:BE=0:BF
=0:BI=0:BH=0
1230 IF AA=3 GOTO 1410
1240 L=S
1250 L=L+7
1260 IF L>53 GOTO 1410
1270 I=POINT(L,Q)
1280 IF I=J GOTO 1250
1290 IF I=3 GOTO 1410
1300 BG=1
1310 M=S:MB=S
```

Listing continued

Listing continued

```
1320 IF ZX<1 OR ZZ=1 GOTO 1360
1330 BA=BA+1
1340 MB=MB+7:IF MB<L GOTO 1330
1350 IF ZX=1 GOTO 1410
1360 SET(M,Q,K)
1370 GOSUB 3010
1380 SOUND100,1
1390 FOR A=1 TO 50:NEXT A
1400 M=M+7:IF M<L GOTO 1360
1410 IF AB=3 GOTO 1590
1420 L=S:N=U
1430 L=L+7:N=N-4
1440 IF L>53 OR N<0 GOTO 1590
1450 I=POINT(L,N)
1460 IF I=J GOTO 1430
1470 IF I=3 GOTO 1590
1480 BG=1
1490 M=S:O=U:MB=S:MO=U
1500 IF ZX<1 OR ZZ=1 GOTO 1540
1510 BB=BB+1
1520 MB=MB+7:MO=MO-4:IF MB<L OR
MO>N GOTO 1510
1530 IF ZX=1 GOTO 1590
1540 SET(M,O,K)
1550 GOSUB 3010
1560 SOUND100,1
1570 FOR A=1 TO 50:NEXT A
1580 M=M+7:O=O-4:IF M<L OR O>N G
OTO 1540
1590 IF AC=3 GOTO 1770
1600 L=S:N=V
1610 L=L+7:N=N+4
1620 IF L>53 OR N>29 GOTO 1770
1630 I=POINT(L,N)
1640 IF I=J GOTO 1610
1650 IF I=3 GOTO 1770
1660 BG=1
1670 M=S:MB=S:O=V:MO=V
1680 IF ZX<1 OR ZZ=1 GOTO 1720
1690 BC=BC+1
1700 MB=MB+7:MO=MO+4:IF MB<L OR
MO<N GOTO 1690
1710 IF ZX=1 GOTO 1770
1720 SET(M,O,K)
1730 GOSUB 3010
1740 SOUND100,1
1750 FOR A=1 TO 50 :NEXT A
1760 M=M+7:O=O+4:IF M<L OR O<N G
OTO 1720
1770 IF AD=3 GOTO 1950
1780 N=U
1790 N=N-4
1800 IF N<0 GOTO 1950
1810 I=POINT(P,N)
1820 IF I=J GOTO 1790
1830 IF I=3 GOTO 1950
1840 BG=1
1850 O=U:MO=U
1860 IF ZX<1 OR ZZ=1 GOTO 1900
1870 BD=BD+1
1880 MO=MO-4:IF MO>N GOTO 1870
1890 IF ZX=1 GOTO 1950
1900 SET(P,O,K)
1910 GOSUB 3010
1920 SOUND100,1
1930 FOR A=1 TO 50:NEXT A
1940 O=O-4:IF O>N GOTO 1900
1950 IF AE=3 GOTO 2130
1960 N=V
1970 N=N+4
1980 IF N>28 GOTO 2130
1990 I=POINT(P,N)
2000 IF I=J GOTO 1970
2010 IF I=3 GOTO 2130
2020 BG=1
2030 O=V:MO=V
2040 IF ZX<1 OR ZZ=1 GOTO 2080
2050 BE=BE+1
2060 MO=MO+4:IF MO<N GOTO 2050
2070 IF ZX=1 GOTO 2130
2080 SET(P,O,K)
2090 GOSUB 3010
2100 SOUND 100,1
2110 FOR A=1 TO 50:NEXT A
2120 O=O+4:IF O<N GOTO 2080
2130 IF AF=3 GOTO 2310
2140 L=T
2150 L=L-7
2160 IF L<4 GOTO 2310
2170 I=POINT(L,Q)
2180 IF I=J GOTO 2150
2190 IF I=3 GOTO 2310
2200 BG=1
2210 M=T:MB=T
2220 IF ZX<1 OR ZZ=1 GOTO 2260
2230 BF=BF+1
2240 MB=MB-7:IF MB>L GOTO 2230
2250 IF ZX=1 GOTO 2310
2260 SET(M,Q,K)
2270 GOSUB 3010
2280 SOUND 100,1
2290 FOR A=1 TO 50:NEXT A
2300 M=M-7:IF M>L GOTO 2260
2310 IF AG=3 GOTO 2490
2320 L=T:N=U
2330 L=L-7:N=N-4
2340 IF L<4 OR N<0 GOTO 2490
2350 I=POINT(L,N)
2360 IF I=J GOTO 2330
2370 IF I=3 GOTO 2490
2380 BG=1
2390 M=T:O=U:MB=T:MO=U
2400 IF ZX<1 OR ZZ=1 GOTO 2440
2410 BI=BI+1
2420 MB=MB-7:MO=MO-4:IF MB>L OR
MO>N GOTO 2410
2430 IF ZX=1 GOTO 2490
2440 SET(M,O,K)
2450 GOSUB 3010
2460 SOUND 100,1
2470 FOR A=1 TO 50:NEXT A
2480 M=M-7:O=O-4:IF M>L OR O>N G
OTO 2440
2490 IF AH=3 GOTO 2680
2500 L=T:N=V
2510 L=L-7:N=N+4
2520 IF L<4 OR N>28 GOTO 2680
2530 I=POINT(L,N)
2540 IF I=J GOTO 2510
2550 IF I=3 GOTO 2680
2560 BG=1
2570 M=T:MB=T:O=V:MO=V
2580 IF ZX<1 OR ZZ=1 GOTO 2630
2600 BH=BH+1
2610 MB=MB-7:MO=MO+4:IF MB>L OR
MO<N GOTO 2600
2620 IF ZX=1 GOTO 2680
2630 SET(M,O,K)
2640 GOSUB 3010
2650 SOUND 100,1
2660 FOR A=1 TO 50:NEXT A
2670 M=M-7:O=O+4:IF M>L OR O<N G
OTO 2630
2680 IF ZX<1 GOTO 2710
2690 IF ZZ=1 GOTO 2710
2700 IF BG=0 GOTO 440
2710 IF BG=0 GOTO 880
2720 IF ZZ=1 GOTO 2840
2730 IF ZX=0 GOTO 2840
2740 IF ZX=2 GOTO 2840
2750 AJ=BA+BB+BC+BD+BE+BF+BI+BH
2760 IF AJ>AK THEN PP=P
2770 IF AJ>AK THEN QQ=Q
2780 IF AJ>AK THEN AK=AJ
2790 IF P<53 GOTO 2830
2800 IF Q<28 GOTO 2830
2810 AK=0
2820 P=PP:Q=QQ:ZX=2:GOTO 860
2830 IF ZX<=1 AND ZZ=2 GOTO 440
2835 IF P>54 GOTO 2910
2837 IF Q>28 GOTO 2910
2840 SET(P,Q,K)
2850 SET(31,30,4)
2860 IF ZX=2 THEN ZX=1
2870 IF K=5 THEN ZA=ZA+1
2880 IF K=4 THEN ZB=ZB+1
2890 BG=0
2900 GOTO 2960
2910 PRINT@232,"OK TO PASS Y/N "
;
2920 R$=INKEY$:IF R$=""GOTO 2920
2930 FOR VV=230 TO 252
2932 PRINT@VV,CHR$(128);
2934 NEXT VV
2940 IF R$="Y"GOTO 2960
2950 IF R$="N"GOTO 370
2960 IF ZZ=2 THEN ZZ=0
2970 PRINT@491,ZA;:PRINT@506,ZB;
2980 IF ZA+ZB<64 GOTO 3000
2990 PRINT@234,"END OF GAME";:GO
TO 2990
3000 GOTO 360
3010 IF K=5 THEN ZA=ZA+1
3020 IF K=5 THEN ZB=ZB-1
3030 IF K=4 THEN ZB=ZB+1
3040 IF K=4 THEN ZA=ZA-1
3050 PRINT@491,ZA;:PRINT@506,ZB;
3060 RETURN
```

END

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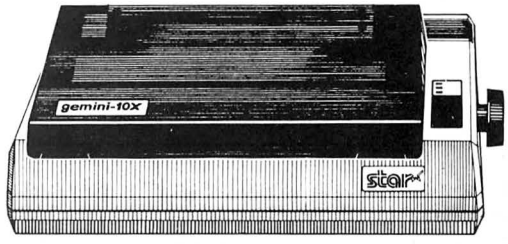

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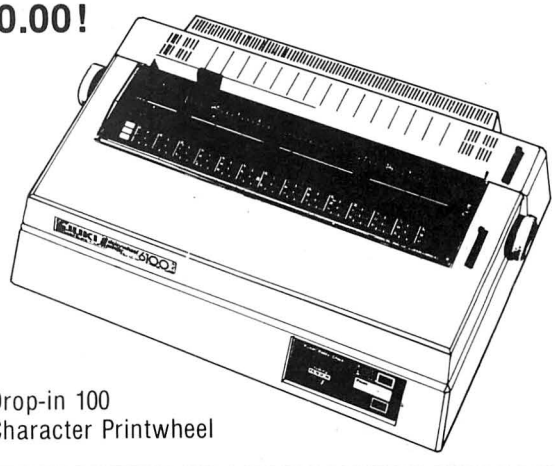

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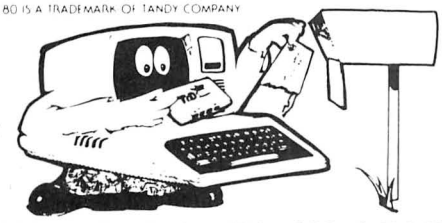

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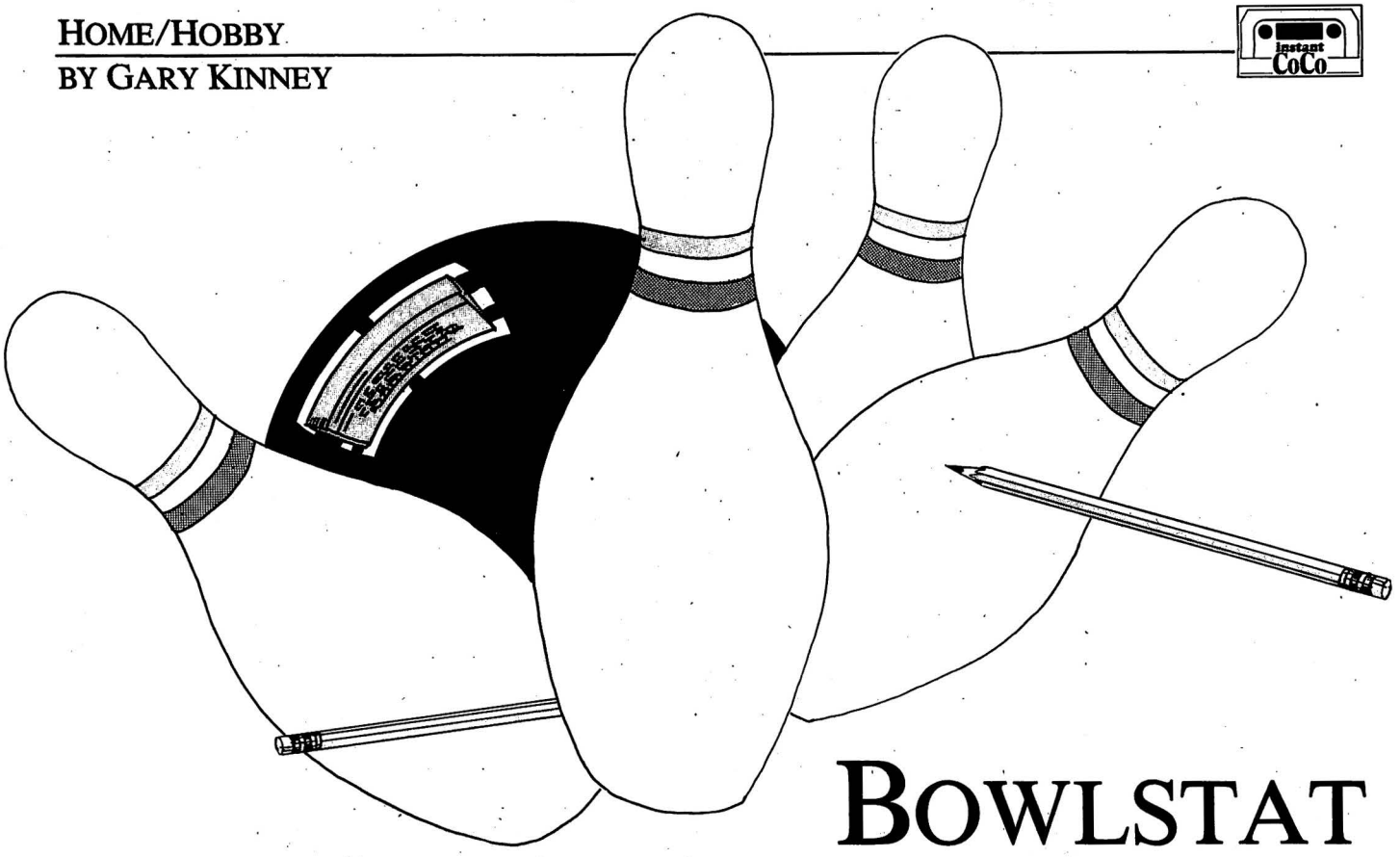

BOWLSTAT

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.

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

NA$	Names
TP	Total pins
TG	Total games
HG	High game
HS	High series
AV	Average
NG	New Games
S	Series
N$	File name
D$	Date
Q,C,D,E,F, G,H$,H	Used in sort
FS	File sort need

Table 1. Variable List

System Requirements

16K RAM
Extended Color Basic
Printer (optional)

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

```
TEST                    2/28/83

                NAME              GAMES          SERIES  HIGH   HIGH   TOTAL TOTAL  AVE
                                  1ST  2ND  3RD          SERIES GAME   PINS  GAMES

1  TED JONES------------ 0    0    0    0      590    201    1133     6    188.8
2  KEN SPOFFORD--------- 0    0    0    0      581    245    1104     6    184
3  JAMES WILLIAMS------- 0    0    0    0      492    178     660     4    165
4  BEA LILIAN----------- 0    0    0    0      496    184     784     5    156.8
5  JOE DOE-------------- 0    0    0    0      424    156     805     6    134.1
6  MARY SMITH----------- 0    0    0    0      240    134     442     4    110.5

TEST                    2/28/83

                NAME              GAMES          SERIES  HIGH   HIGH   TOTAL TOTAL  AVE
                                  1ST  2ND  3RD          SERIES GAME   PINS  GAMES

1  TED JONES------------ 178  198  200  576    590    201    1709     9    189.8
2  KEN SPOFFORD--------- 207  0    189  396    581    245    1500     8    187.5
3  JAMES WILLIAMS------- 167  187  145  499    499    187    1159     7    165.5
4  BEA LILIAN----------- 156  0    0    156    496    184     940     6    156.6
5  JOE DOE-------------- 156  134  132  422    424    156    1227     9    136.3
6  MARY SMITH----------- 109  112  126  347    347    134     789     7    112.7
```

Fig. 1. Sample Output

100–120	Initialization
130–250	Main menu
260–310	Input file choice
320–700	Main input routine
710–790	Output routines
800–830	Saving device choice
840–960	Tape-saving routine
970–1080	Disk-saving routine
1090–1140	Printing choice
1150–1460	Printer output
1470–1600	Screen output
1610–1760	Sort routine
1770–1820	Name-inputting routine
1830–1890	Disk input
1900–1950	Tape input
1960–2220	Correction routine

Table 2. Program Breakdown

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 data 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.■

Write to Gary Kinney at 10 Whitford Ave., Whitesboro, NY 13492.

```
10 ' ############################
20 ' # GARY KINNEY              #
30 ' # 10 WHITFORD AVENUE       #
40 ' # WHITESBORO, NY 13492     #
50 ' # NOVEMBER 1982            #
60 ' # BOWLING AVERAGE          #
70 ' ############################
80 '
100 CLEAR 2500
110 M=50
120 DIM NA$(M),TP(M),TG(M),HG(M)
,AV(M),NG(M,3),S(M),Q(3),HS(M)
130 CLS:PRINT:PRINTN$;"    ";D$
140 PRINT:PRINT"SELECT BY NUMBER
":PRINT
150 PRINT"   (1) INPUT FILE"
160 PRINT"   (2) INPUT NEW SCORES
"
170 PRINT"   (3) OUTPUT"
180 PRINT"   (4) INPUT NAMES"
190 PRINT"   (5) CORRECT FILE"
200 PRINT"   (6) END"
210 Z$=INKEY$:IF Z$="" THEN 210
220 Z=VAL(Z$):IF Z<1 OR Z>6 THEN
 210
230 IF N=<0 AND Z<>6 AND Z<>4 AN
D Z<>1 THEN 130
240 ON Z GOTO 260,320,710,1770,1
960
250 END
260 CLS:PRINT:PRINT
270 LINE INPUT"NAME OF FILE? ";N
$
280 PRINT:LINEINPUT"DATE  ";D$
290 PRINT:INPUT"(1) DISK OR (2)
TAPE";DT
300 IF DT=1 THEN GOSUB 1830 ELSE
 GOSUB 1900
310 GOTO 130
320 CLS:FS=1
330 FOR I=1 TO N
340 PRINT NA$(I);"  ";
350 JJ=0:G$=""
360 IF INT(JJ/3)=JJ/3 THEN PRINT
" ";
370 JJ=JJ+1
380 Z$=INKEY$:IF Z$="" THEN 380
390 IF Z$="E" THEN 130
400 IF Z$<>CHR$(13) THEN 440
410 G$=G$+"000":JJ=JJ+2
420 IF JJ<=9 THEN PRINT"000";
430 GOTO 460
440 G$=G$+Z$
450 PRINTZ$;
460 IF JJ=>10 AND Z$<>CHR$(8)  T
HEN PRINTCHR$(8):GOTO520
470 IF Z$<>CHR$(8) THEN 360
480 IF LEN(G$)=<1 THENPRINT" ";:
G$=LEFT$(G$,LEN(G$)-1):GOTO380
490 G$=LEFT$(G$,LEN(G$)-2):JJ=JJ
-1
500 IF INT(JJ/3)=JJ/3 THEN PRINT
CHR$(8);
510 GOTO 380
520 PRINT:FOR J=1 TO 3
530 NG(I,J)=VAL(MID$(G$,(J-1)*3+
1,3))
540 NEXT J
550 S(I) = NG(I,1)+NG(I,2)+NG(I,
3)
560 PRINT"SERIES = ";S(I):PRINT
570 FOR J=1 TO 3
580 IF NG(I,J)>HG(I) THEN HG(I)=
NG(I,J)
590 NEXT J
600 IF S(I)>HS(I) THEN HS(I)=S(I
)
610 TP(I)=TP(I)+S(I)
620 IF NG(I,1)>0 THEN NG=NG+1
630 IF NG(I,2)>0 THEN NG=NG+1
640 IF NG(I,3)>0 THEN NG=NG+1
650 TG(I)=TG(I)+NG
660 IF TG(I)=0 THEN 690
670 AV(I) = INT(TP(I)*10/TG(I))/
10
680 NG=0
690 NEXT I
700 GOTO 130
710 GOSUB 1610
720 CLS:PRINT:PRINT"SELECT BY NU
MBER"
730 PRINT:PRINT"  (1) SAVE DATA
FILE"
740 PRINT"  (2) PRINT DATA"
750 PRINT"  (3) RETURN TO MAIN M
ENU"
760 Z$=INKEY$:IF Z$="" THEN 760
770 Z=VAL(Z$):IF Z<1 OR Z>3 THEN
 760
780 IF N$="" THEN LINE INPUT"NAM
E OF FILE  ";N$:PRINT:LINEINPUT"
DATE ";D$
790 ON Z GOTO 800,1090,130
800 CLS:PRINT@128," (1) DISK OR
(2) TAPE"
810 Z$=INKEY$:IF Z$="" THEN 810
820 Z=VAL(Z$):IF Z<1 OR Z>2 THEN
 810
830 IF Z=1 THEN 970
840 CLS:PRINT@128,"INSERT TAPE,
PRESS PLAY AND     RECORD"
850 PRINT:PRINT"PRESS ENTER WHEN
 READY"
860 Z$=INKEY$:IF Z$="" THEN 860
870 IF Z$<>CHR$(13) THEN 860
880 PRINT:PRINT:PRINT"   LOADING
 TO TAPE"
890 OPEN"O",-1,N$
900 PRINT#-1,N
910 FOR I=1 TO N
920 PRINT#-1,NA$(I)
930 PRINT#-1,TP(I),TG(I),HG(I),H
S(I),AV(I)
940 NEXT I
950 CLOSE#-1
960 GOTO 720
970 CLS:PRINT@128,"INSERT DISK,
PRESS ENTER WHEN   READY"
980 Z$=INKEY$:IF Z$="" THEN 980
990 IF Z$<>CHR$(13) THEN 980
1000 CLS:PRINT@230,"SAVING DATA
TO DISK"
1010 M$=LEFT$(N$,8)
1020 OPEN"O",#1,M$
1030 WRITE#1,N
1040 FOR I=1 TO N
1050 WRITE#1,NA$(I),TP(I),TG(I)I
,HG(I),HS(I),AV(I)
1060 NEXT I
1070 CLOSE#1
1080 GOTO 720
1090 CLS:PRINT@96,"SELECT BY NUM
BER"
1100 PRINT:PRINT"  (1) OUTPUT TO
 PRINTER"
1110 PRINT"  (2) OUTPUT TO SCREE
N"
1120 Z$=INKEY$:IF Z$="" THEN 112
0
1130 Z=VAL(Z$):IF Z<1 OR Z>2 THE
N 1120
1140 IF Z=2 THEN 1470
1150 CLS:PRINT@233,"PRINTING DAT
A"
1160 OPEN"O",-2,N$
1170 PRINT#-2,CHR$(16);"30";CHR$
(31);N$;"          ";D$;CHR$(30)
1180 PRINT#-2:PRINT#-2
```

Listing continued

Listing continued

```
1190 PRINT#-2,CHR$(16);"12";"NAM
E";
1200 PRINT#-2,CHR$(16);"30";"GAM
ES";
1210 PRINT#-2,CHR$(16);"40";"SER
IES";
1220 PRINT#-2,CHR$(16);"48";"HIG
H";
1230 PRINT#-2,CHR$(16);"54";"HIG
H";
1240 PRINT#-2,CHR$(16);"61";"TOT
AL";
1250 PRINT#-2,CHR$(16);"67";"TOT
AL";
1260 PRINT#-2,CHR$(16);"74";"AVE
"
1270 PRINT#-2,CHR$(16);"26";"1ST
  2ND  3RD";
1280 PRINT#-2,CHR$(16);"47";"SER
IES";
1290 PRINT#-2,CHR$(16);"54";"GAM
E";
1300 PRINT#-2,CHR$(16);"61";"PIN
S";
1310 PRINT#-2,CHR$(16);"67";"GAM
ES"
1320 PRINT#-2
1330 FOR I=1 TO N
1340 PRINT#-2,I;
1350 DA$="--------------------"
: DN$=NA$(I)+RIGHT$(DA$,21-LEN(N
A$(I)))
1360 PRINT#-2, CHR$(16);"04";DN$
;
1370 PRINT#-2,CHR$(16);"25";NG(I
,1);CHR$(16);"30";NG(I,2);CHR$(1
6);"35";NG(I,3);
1380 PRINT#-2,CHR$(16);"40";S(I)
;
1390 PRINT#-2,CHR$(16);"47";HS(I
);
1400 PRINT#-2,CHR$(16);"54";HG(I
);
1410 PRINT#-2,CHR$(16);"60";:PRI
NT#-2,USING"#####";TP(I);
1420 PRINT#-2,CHR$(16);"68";:PRI
NT#-2,USING"###";TG(I);
1430 PRINT#-2,CHR$(16);"73";AV(I
)
1440 NEXT I
1450 CLOSE#-2
1460 GOTO 720
1470 GOSUB 1550
1480 FOR I=1 TO N
1490 IF I/4=INT(I/4) THEN GOSUB
1580:GOSUB 1550
1500 PRINT
1510 PRINTI;"  ";NA$(I)
1520 PRINTHS(I);TAB(6)HG(I);TAB(
12)TP(I);TAB(19)TG(I);TAB(24)AV(
I)
1530 NEXT I
1540 GOSUB 1580:GOTO 720
1550 CLS:PRINT" HIGH  HIGH TOTAL
 TOTAL   AVE"
1560 PRINT"SERIES GAME PINS  GAM
ES"
1570 RETURN
1580 PRINT@480,"PRESS C TO CONTI
NUE";
1590 Z$=INKEY$:IF Z$="" THEN 159
0
1600 IF Z$="C" THEN RETURN ELSE
1590
1610 CLS:PRINT@230,"SORTING SCOR
ES":NN=N
1615 IF FS=0 THEN RETURN ELSE FS
=0
1620 POKE65495,0
1630 C=0:NN=NN-1
1640 IF NN=<0 THEN 1760
1650 FOR I=1 TO NN
1660 IF AV(I)>=AV(I+1) THEN1730
1670 C=AV(I):D=HG(I):E=HS(I):F=T
P(I):G=TG(I):H$=NA$(I):H=S(I)
1680 FOR J=1 TO 3:Q(J)=NG(I,J):N
EXT J
1690 AV(I)=AV(I+1):HG(I)=HG(I+1)
:HS(I)=HS(I+1):HG(I)=HG(I+1):TP(
I)=TP(I+1):TG(I)=TGF(I+1):NA$(I)
=NA$(I+1):S(I)=S(I+1)
1700 FOR J=1 TO 3:NG(I,J)=NG(I+1
,J):NEXT J
1710 AV(I+1)=C:HG(I+1)=D:HS(I+1)
=E:TP(I+1)=F:TG(I+1)=G:NA$(I+1)=
H$:S(I+1)=H
1720 FOR J=1 TO 3:NG(I+1,J)=Q(J)
:NEXT J
1730 C=1
1740 NEXT I
1750 IF C=1 THEN 1630
1760 POKE65494,0:RETURN
1770 CLS:PRINT"INPUT NAMES, TYPE
 END FOR NAME  TO END"
1775 IF N=M THEN PRINT" FILE FUL
L":GOTO 1790
1780 N=N+1
1790 LINE INPUT NA$(N)
1800 IF NA$(N)="END" THEN N=N-1:
GOTO1820
1810 GOTO 1775
1820 GOTO130
1830 CLS:PRINT@228,"READING DISK
"
1840 M$=LEFT$(N$,8)
1850 OPEN"I",#1,M$:INPUT#1,N
1860 FOR I=1 TO N
1870 INPUT#1,NA$(I),TP(I),TG(I),
HG(I),HS(I),AV(I)
1880 NEXT I
1890 CLOSE#1:RETURN
1900 CLS:PRINT@228,"READING TAPE
"
1910 OPEN"I",#-1,N$:INPUT#-1,N
1920 FOR I=1 TO N
1930 INPUT#-1,NA$(I),TP(I),TG(I)
,HG(I),HS(I),AV(I)
1940 NEXT I
1950 CLOSE#-1:RETURN
1960 CLS:PRINT"SELECT NAME BY NU
MBER"
1970 FOR I=1 TO N
1980 IF I/10=INT(I/10) THEN2150
1990 PRINTI;NA$(I)
2010 NEXT I
2020 GOTO 2150
2030 CLS:PRINT"IF CORRECT PRESS
ENTER"
2035 FS=1
2040 PRINT"IF WRONG TYPE CORRECT
ION":PRINT
2050 NC=VAL(Z$):PRINTNA$(NC);
2060 LINE INPUT"  "; NA$:IF NA$<
>"" THEN NA$(NC)=NA$
2070 PRINT"HIGH GAME";HG(NC);:IN
PUT HG:IF HG<>0 THEN HG(NC)=HG
2080 PRINT"HIGH SERIES";HS(NC);:
INPUT HS:IF HS<>0 THEN HS(NC) =
HS
2090 PRINT"TOTAL PINS";TP(NC);:I
NPUT TP:IF TP<>0 THEN TP(NC)=TP
2100 PRINT"TOTAL GAMES";TG(NC);:
INPUTTG:IF TG<>0 THEN TG(NC)=TG
2105 IF TG(NC)=0 THEN 2120
2110 AV(NC)=INT(TP(NC)*10/TG(NC)
)/10
2120 PRINT"TYPE D TO DELETE THIS
 NAME";
2130 Z$=INKEY$:IF Z$="" THEN 213
0
2140 IF Z$="D" THEN AV(NC)=-1:GO
SUB 1610:GOSUB2220:GOTO 1960ELSE
 GOTO1960
2150 PRINT@448,"PRESS  C TO CONT
INUE"
2155 PRINT@480,"       R TO RETU
RN TO MAIN MENU";
2160 Z$=INKEY$:IF Z$="" THEN 216
0
2170 IF Z$="R" THEN 130
2180 IF Z$<>"C" THEN  2200
2185 IF I=N+1 THEN 1960
2190 PRINT@0,"SELECT NAME BY NUM
BER":GOTO 1990
2200 A$=INKEY$:IF A$="" THEN 220
0
2210 Z$=Z$+A$:IF VAL(Z$)>N OR VA
L(Z$)<1 THEN 1960 ELSE 2030
2220 NA$="":TP(N)=0:TG(N)=0:HG(N
)=0:AV(N)=0:HS(N)=0:N=N-1:RETURN
```

END

of the hill!

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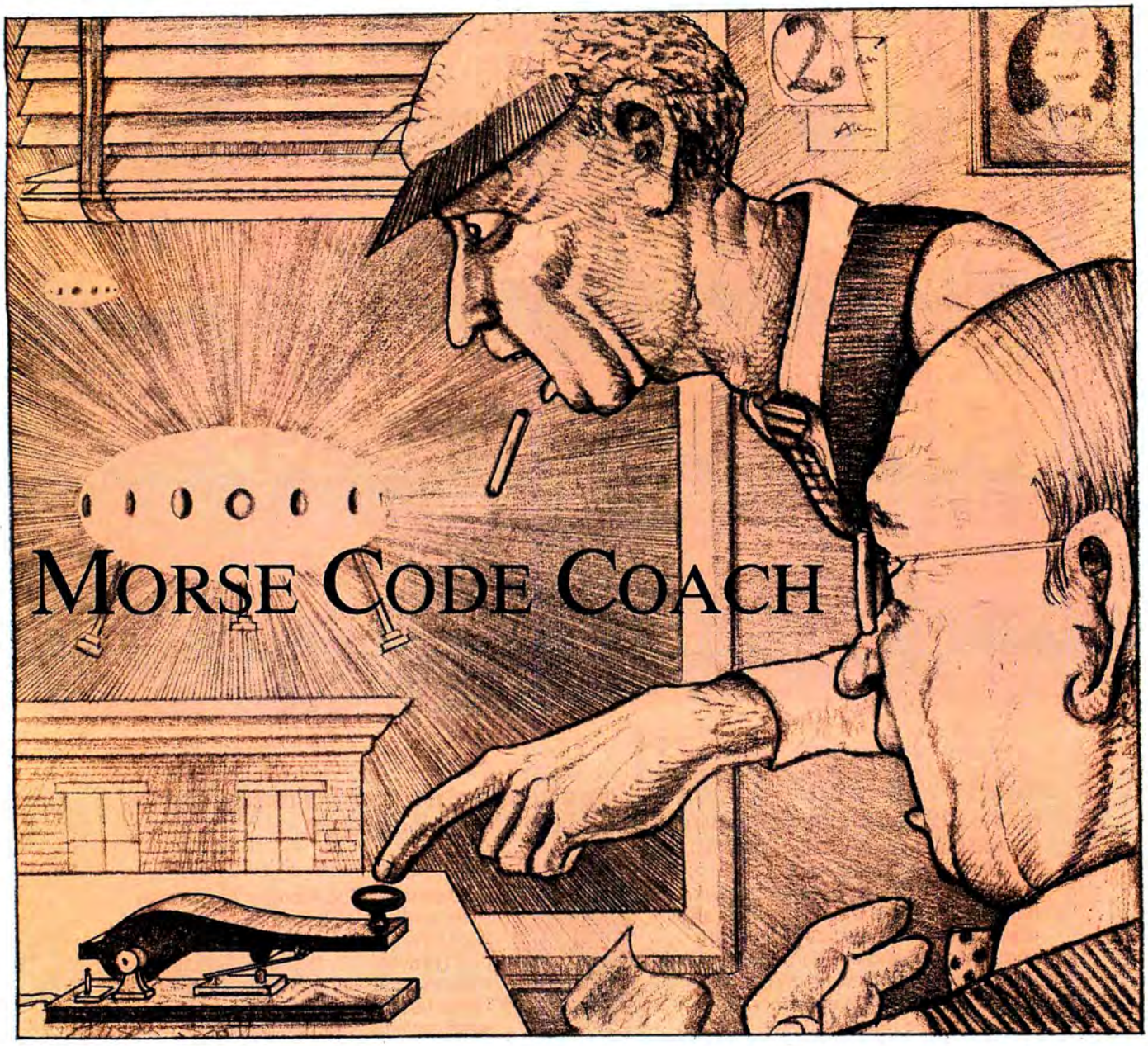
⌐296

Just for your TRS-80® COLOR TDP System 100 Dragon-32 MC-10

BY ROBERT P. YEATER



MORSE CODE COACH

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

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

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 CLEAR200,16000
10 '*****MORSE CODE TEACHER*****
20 'WRITTEN BY ROBERT P. YEATER
30 'WRITTEN JULY 10,1983
35 'POKE SCREEN BORDER ROUTINE
40 FOR X=16000 TO 16068:READ C:P
OKE X,C:NEXT X
50 DATA 198,30,134,169,142,4,0,1
67,128,140
60 DATA 4,33,38,249,142,5,223,16
7,128,140
70 DATA6,0,38,249,142,4,63,167,1
28,167
80 DATA 128,58,140,5,223,38,246,
57,0,198
90 DATA 30,134,182,126,62,132,13
4,255,142,4
100 DATA 0,167,128,140,4,64,38,2
49,142,5
110 DATA 192,167,128,140,6,0,38,
249,57
120 DIM V(20,20)
130 DIM C$(39),M$(39)
140 CLS2:EXEC 16000
150 PRINT@165,"MORSE CODE TEACHE
R";
160 PRINT@264,"BY BOB YEATER";
170 FOR X=1 TO 500:NEXTX
175 'ASSIGN CODE TO CHARACTERS
180 DATA E,.,I...,S,...,H,....
190 DATA T,-,M.--,O,---
200 DATA A,.-,W,.--,J,.---
210 DATA N,-.,D,-..,B,-...
220 DATA U,..-,V,...-
230 DATA R,.-.,K,-.-,G,--.
240 DATA L,.-..,Q,--.-,P,.--.,C,
-.-.
250 DATA F,..-.,X,-..-,Y,-.--,Z,
--..
260 DATA 1,.----,2,..---,3,...--
,4,....-,5,.....
270 DATA  6,-....,7,--...,8,---.
.,9,----.,0,-----
280 DATA .,.-.-.-,?,..--..
290 C$(39)=",":M$(39)="--..--"
300 SC=0:NU=0
310 RESTORE:FOR X=1 TO 69:READC:
NEXT X:FOR X=1 TO38:READ C$(X),M
$(X):NEXT X
320 PRINT@165,STRING$(24,159);:P
RINT@264,STRING$(17,159);:PRINT@
196,"CHOOSE LEVEL (1 TO 11)";
330 INPUT L
340 IF L=1 THEN LL=4 ELSEIF L=2
THEN LL=7 ELSE IF L=3 THEN LL=10
350 IF L=4 THEN LL=13 ELSE IF L=
5 THEN LL=15 ELSE IF L=6 THEN LL
=18
360 IF L=7 THEN LL=22 ELSE IF L=
8 THEN LL=26 ELSE IF L=9 THEN LL
=31
370 IF L=10 THEN LL=36 ELSE IF L
=11 THEN LL=39
380 IF L<1 OR L>11 THEN 320
390 CLS2:EXEC 16000:PRINT@170,"S
ELECT SPEED";:PRINT@202," '1'= S
LOW  ";:PRINT@234," '2'= MEDIUM"
;:PRINT@266," '3'= FAST  ";
400 SP$=INKEY$
410 IF SP$="" THEN 400
420 IF SP$="1" THEN SP=3
430 IF SP$="2" THEN SP = 2
440 IF SP$="3" THEN SP =1
450 'STUDY MODE
460 CLS6:EXEC 16039:FOR X=1 TO L
L:PRINT@240,C$(X)" ";:FOR G=1 TO
 250:NEXT G:GOSUB 500
470 NEXT X
490 GOTO 570
495 'SOUND CODE
500 CL=LEN(M$(X))
510 FOR M=1 TO CL:E$=MID$(M$(X),
M,1)
520 IF E$="." THEN SOUND 156,INT
(SP*.5+1)
530 IF E$="-" THEN SOUND 156,SP+
3
540 FOR Q=1 TO SP*100:NEXT Q:NEX
T M
550 FOR Z=1 TO SP*100+100: NEXT
Z
560 RETURN
570 'PRACTICE
580 CLS7:EXEC 16046
590 PRINT@132,"PRESS KEY TO HEAR
 CODE ";
600 PRINT@164,"OF ANY OF THE FOL
LOWING";
610 FOR X=1 TO LL:PRINT@192+4*X,
C$(X)" ";:NEXTX
620 PRINT@389," ENTER '>' TO GO
TO TEST";
630 J$=INKEY$:IF J$="" THEN 630
640 IF J$=">" THEN 680
650 FOR P=1 TO LL:IF J$=C$(P) TH
EN X=P:GOSUB 500
660 NEXT P
670 GOTO 630
680 CLS
690 PRINT:PRINT:PRINT"  A TEST O
F YOUR MORSE CODE       KNOWLEDG
E FOLLOWS.THE ALIEN     SHIP WIL
L DESCEND TOWARD        EARTH AF
TER SOUNDING A CODE.    IF YOU I
DENTIFY THE CODE        AND PRES
S THE CORRESPONDING     KEY. THE
 ALIEN SHIP WILL"
700 PRINT"  EXPLODE AND THE EART
H WILL      BE SAVED"
710 PRINT:PRINT"      READY <Y OR
 N>";:EXEC 16039
720 F$=INKEY$:IF F$="Y" THEN 740
 ELSE 720
730 IF F$<>"Y" THEN 680
735 'PICK CHARACTER
740 X=RND(-TIMER)
750 IF NU = LL THEN 1050
760 RESTORE:X=RND(LL)
770 XX=X
780 IF C$(XX)="*" THEN 750
790 NU=NU+1
800 GOSUB830
810 CLS5:IF R$><C$(X) THEN PRINT
@230,"WRONG!!! THAT WAS "C$(X);:
EXEC16039
820 FOR G=1 TO 800:NEXT G:NU=NU-
1:GOTO750
825 'DESCENDING SHIP ROUTINE
830 PMODE 4,1
840 PCLS
850 SCREEN 1,1
860 CIRCLE (128,9),3,3
870 PAINT (128,9),3,3
880 GOSUB 500
890 FOR Z=6 TO 150 STEP 6
900 GET (125,Z)-(131,Z+6),V
910 PCLS
920 PUT(125,Z+6)-(131,Z+12),V
930 A$=INKEY$:IF A$=C$(X) THEN G
OTO 960
940 IFZ=150 THEN SOUND 1,30:GOTO
810
950 NEXT Z
955 'EXPLODING SHIP ROUTINE
960 PCLS
970 PMODE 4,1
980 SCREEN 1,1
990 ZZ=1
1000 FOR I=2  TO 15 STEP 2
1010 SOUND ZZ,1:ZZ=ZZ+5
1020 CIRCLE (128,96),I
1030 NEXT I
1035 'SCORE KEEPING ROUTINE
1040 SC=SC+1:FOR G=1 TO 150:NEXT
 G:C$(XX)="*":GOTO750
1050 CLS7:PRINT@165,"YOUR SCORE
IS";INT(SC/NU*100);"%";
1060 PRINT@227,"THE EARTH WAS IN
VADED";NU-SC;
1070 PRINT@259,"TIMES";
1080 PRINT@358,"PRESS 'C' TO CON
TINUE";:EXEC 16000
1090 G$=INKEY$:IF G$="C" THEN 11
00ELSE 1090
1100 CLS2:EXEC 16000:GOTO180
```

END

See List of Advertisers on page 130

BY MARK D. GOODWIN

JOURNEY TO THE CENTER OF THE ROM—PART IV

THE BASIC COMMUNICATIONS AREA

Ed. note: The first three parts of Journey to the Center of the ROM described how the code inside your ROM functions, and Part III provided an Assembly-language program that performed the actual disassembly of the Color Basic ROM. The rest of this series will be that disassembly. This month we give you the Basic Communications Area.

0000–03FF	**BASIC COMMUNICATIONS AREA**
0000–0002	Scratch use
0003	Number of subscripts in an array
0004	IF counter during scan
0005	LOCATE/CREATE variable flag
0006	Number Type Flag (NTF) 0—Numeric <> 0—String
0007	Open string space flag
0008	FOR flag
0009	READ/INPUT flag 0—INPUT <> 0—READ
000A	Mask for true/false
000B–000C	Next available location in the temporary string area pointer
000D–000E	Last entry in the temporary string area pointer
000F–0010	Stack memory pointer during stack scan
0011–0012	Stack VARPTR during stack scan
0013–0016	Total during multiplication and division 0013 MSB 0014 NMSB 0015 NNMSB 0016 LSB
0017–0018	Stack pointer during memory check
0019–001A	Start of the Basic program area pointer
001B–001C	Start of the simple variables area pointer
001D–001E	Start of the array variables area pointer
001F–0020	Start of the free memory area pointer
0021–0022	Start of the string space pointer
0023–0024	Next available location in string space pointer
0025–0026	String space storage location while building a string entry
0027–0028	Start of the reserved-memory-area pointer
0029–002A	BREAK line number
002B–002C	Result of unsigned 16-bit ASCII to binary conversion
002D–002E	BREAK encoded statement pointer
002F–0030	Location of last byte executed
0031–0032	READ line number
0033–0034	READ pointer
0035–0036	Input pointer during READ/INPUT
0037–0038	Variable name during variable location/creation 0037 First character of the variable name 0038 Second character of the variable name—bit 7 will be set if the variable is a string
0039–003A	VARPTR during variable location/creation
003B–003C	Current VARPTR
003D–003E	< = > flag during expression evaluation
003F	< = > flag during expression evaluation
0040	Scratch use
0041–0042	End of destination during block move
0043–0044	End of source during block move
0045–0046	Start of destination during block move
0047–0048	Start of source during block move
0049	Scratch use
004A	Reserved
004B–004C	VARPTR for string to be moved to string space
004D–004E	Temporary string VARPTR
004F–0053	Floating-Point Accumulator #1 (FPAC1) 004F EXP1 0050 MSB1 0051 NMSB1 0052 NNMSB1 0053 LSB1
0054	SF1
0055	Sign of the result for ASCII-to-binary conversion
0056	String length while building a string entry
0057	Reserved
0058–0059	String starting address while building a string entry
005A–005B	Reserved
005C–0060	Floating-Point Accumulator #2 (FPAC2) 005C EXP2 005D MSB2 005E NMSB2 005F NNMSB2 0060 LSB2
0061	SF2
0062	Combined sign flag (SF)
0063	Rounding byte (RB)
0064–0065	String ending address while building a string entry
0066–0067	Address of the next line during LIST/LLIST
0068–0069	Current Basic line number
006A–006B	Comma field width and last comma field
006C	Current line position
006D	Line length
006E	Cassette flag for comma check
006F	Current device flag: 0=video or keyboard, −1=cassette, −2=printer
0070	EOF flag
0071	RESET flag
0072–0073	RESET address

Listing continued

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Listing continued

0074–0075	End of RAM pointer
0076–0077	Reserved
0078	OPEN/CLOSE flag: 0=cassette CLOSEd, 1=cassette OPEN"I", 2=cassette OPEN"O"
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–00AA	Bump the encoded statement pointer (ESP) routine 009F: INC <00A7 Bump ESP LSB 00A1: BNE <00A5 Jump if it's nonzero 00A3: INC <00A6 Bump ESP MSB 00A5: LDA ESP A=Next ESP character 00A8: JMP AA1A Join Color Basic code ***ESP is stored at locations 00A6 and 00A7
00AB–00AE	Rounding bytes used by RND
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	FIRQ Vector
0112–0114	USR Vector
0115	Reserved
0116–0119	RND seed 0116 MSB 0117 NMSB 0118 NNMSB 0119 LSB
011A	Keyboard shift flag
011B–011C	Keyboard debounce value
011D–011F	↑ 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 functions 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:

	FE	FD	FB	F7	EF	DF	BF
152	@	H	P	X	0	8	ENTER
153	A	I	Q	Y	1	9	CLEAR
154	B	J	R	Z	2	:	BREAK
155	C	K	S	↑	3	;	
156	D	L	T	↓	4	,	
157	E	M	U	←	5	-	
158	F	N	V	→	6	.	
159	G	O	W	SPACE	7	/	

Listing continued

Listing continued

***if inactive, the above locations will be equal to FF

015A–015D	Joystick storage area: 015A JOYSTK 0 015B JOYSTK 1 015C JOYSTK 2 015D JOYSTK 3
015E–0160	Extended Color Basic link called from A5F6—OPEN
0161–0163	Extended Color Basic link called from A5B9—Device
0164–0166	Extended Color Basic link called from A35F—Output
0167–0169	Extended Color Basic link called from A282—Output
016A–016C	Extended Color Basic link called from A176—Input
016D–016F	Extended Color Basic link called from A3ED—Device
0170–0172	Extended Color Basic link called from A406—Device
0173–0175	Extended Color Basic link called from A426—CLOSE
0176–0178	Extended Color Basic link called from A42D—CLOSE
0179–017B	Extended Color Basic link called from B918—PRINT
017C–017E	Extended Color Basic link called from B061—READ/INPUT
017F–0181	Extended Color Basic link called from A549—Device
0182–0184	Extended Color Basic link called from A390—Input
0185–0187	Extended Color Basic link called from A4BF—CLOAD
0188–018A	Extended Color Basic link called from A5CB—EOF
018B–018D	Extended Color Basic link called from B223—Evaluate Expression
018E–0190	Extended Color Basic link called from AC46—Error
0191–0193	Extended Color Basic link called from AC49—Error
0194–0196	Extended Color Basic link called from AE75—RUN
0197–0199	Extended Color Basic link called from BD22—ASCII to Binary
019A–019C	Extended Color Basic link called from AD9E—Interpreter
019D–019F	Extended Color Basic link called from A8C4—Graphics
01A0–01A2	Extended Color Basic link called from A910—CLS
01A3–01A5	Extended Color Basic link called from B821—Tokenize
01A6–01A8	Extended Color Basic link called from B7C2—Untokenize
01A9–01D0	Temporary string work area
01D1	Length of name in the cassette file-name buffer
01D2–01D9	Cassette file-name buffer
01DA–02D9	Cassette buffer
02DA–02DB	Basic line number after tokenization
02DC	Start of tokenized buffer
02DD–03DC	Input buffer
03DD–03FF	ASCII buffer ■

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

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BY EMMETT M. LEWIS JR.

RAMASTER

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

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 them with function keys while in the monitor mode: A for ASCII and H for hexadecimal (hex). You can also use a monitor to read data tables of machine-language adventure games (taking a sneak peek), if it's in the ASCII mode.

You use a hex loader to input machine code directly into memory or to change existing memory. A hex loader is also an extremely fast and easy method of typing in those machine-language programs you have encountered through various sources.

You can assemble this program (provided you have an assembler) anywhere in memory (I use Radio Shack's EDTASM+). 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.

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

Using the Hex Loader

The first time you push a correct key (0–9, A–F), the program stores a single nibble until you hit a second key (2 nibbles per byte). The program then enters the byte into RAM. You don't need to press the enter key.

Should you push an incorrect key, it appears on the screen but not in memory; therefore, if you push Q, the Q appears with an entry error 1, meaning you made an error entering the most-significant nibble (MSN).

There are also two function keys: R (restart) and M (monitor). The first time you push R, the screen displays an R as a warning, indicating that the second time you push R you are going to erase the screen and restart the hex loader. However, you won't change or erase a program you have already entered.

When you push the M key, you transfer control to the monitor program and save the present hex-loader screen in memory, should control be transferred from monitor back to the hex loader.

Use the hex loader with Program Listing 2.

As the hex loader's instructions point out, the first 2 bytes you enter are your program's starting address. Therefore, push keys 0, 9, 0, 0, 8, E, 0, 4, 0, 2, 8, 6, F, F, A, 7, 8, 4, 2, 0, F, and E (ignore the commas). Your program should appear as follows:

```
09 'starting address of program,
   most-significant byte (MSB)
00 'starting address of program,
   least-significant byte (LSB)
8E
04
02
86
FF
A7
84
20
FE
```

System Requirements

16K RAM
Editor/Assembler

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 (2EE0). Push 7, 0, 7, 1, 7, 2, 7, 3, 7, 4, 7, 5, 7, 6, 7, 7, 7, 8, 7, and 9 (again, ignore the commas). The screen should display the following:

Program Listing 1. Ramaster

```
00100          ORG     14000
00110          JSR     CLRSCR  CLEAR SCREEN
00120 * THIS ROUTINE PRINTS MY NAME
00130 START    LDX     #1024
00140          LDY     #NAME
00150 LOOP     LDA     ,Y+
00160          CMPA    #200
00170          BHS     EXIT
00180          STA     ,X+
00190          BRA     LOOP
00200 NAME     FCC     /WRITTEN BY EMMETT M.LEWIS JR.,4818 FRENCH,
TEXAS/ CORPUS CHRISTI,
00210          FCB     255
00220 EXIT     LDA     #15
00230 DLAYLP   LDX     #10
00240 DLAY     LDB     #1
00250          ABX
00260          CMPX    #65000
00270          BLO     DLAY
00280          DECA
00290          CMPA    #1
00300          BHI     DLAYLP
00310          JSR     CLRSCR
00320          JMP     STRTRM
00330 SAVKY1   RMB     1       TEMP STORAGE FOR L/S NIBB.
00340 DAFLAG   RMB     1       DISPLAY ASCII FLAG
00350 PROGRM   RMB     2       START MONITOR
00360 HDCONV   RMB     2       HEX TO DECIMAL SCREEN ADDRESS
00370 TEMPKS   RMB     2       TEMPORARY STORAGE FOR MONITOR AND
ING ADDRESS HEX LOADER START
00380 STEXAM   RMB     2       MEMORY VALUE TO BE CONVERTED TO
DEC.
00390 TSTLOD   RMB     1       RETURN TO LOADER FLAG
00400 TEMSTR   RMB     2       TEMP STORAGE
00410 SETRTM   RMB     1       SET RETURN TO MONITOR
00420 PRNTHX   RMB     2       HEX VALUE PUT ON SCREEN(MONITOR)
00430 MONSCR   RMB     2       MONITOR SCREEN LOCATION
00440 OFF10    FCB     0       DRAW TEN B OFFSET
00450 OFF100   FCB     0       DRAW HUNDRED B OFFSET
00460 OF1000   FCB     0       DRAW THOUSAND B OFFSET
00470 O10000   FCB     0       DRAW TEN THOUSAND B OFFSET
00480 TEMCUR   RMB     2       TEMPORARY STORE FOR CURSER LOCATION
00490 EVOROD   RMB     1       M/S NIBB OR L/S NIBB
00500 SAFERP   FCB     2       SAFETY RESTART
00510 MSNIBB   RMB     1       M/S NIBB
00520 LSNIBB   RMB     1       L/S NIBB
00530 MLSNIB   RMB     1       TEMP STORE FOR LEAST SIGNIFICANT N
IBBLE
00540 CURSER   RMB     2       STORE ASCI CHARACTER ON SCREEN STA
RTING ADDR.
00550 SAVKEY   RMB     1       TEMP STORAGE FOR M/S NIBB
00560 KEYSTR   RMB     2       ASCI CODE CONVERTED TO HEX STARTIN
G HERE
00570 STRTRM   LDX     #1089   LOAD SCREEN LOCATION(ADDRESS)
00580          STX     CURSER  STORE LOCATION
00590          LDX     #TEMPKS ADDRESS WHERE HEX LOADER AND MONIT
OR FINDS STARTING ADDR.(STORE IN MEMORY OR MONITOR MEMORY)
00600          STX     KEYSTR  STARTING ADDRESS MOVED HERE
00610          LDX     #1024   TEXT SCREEN
00620          LDY     #INFO   BASE ADDR.
00630 PRNTRS   LDA     ,Y+     LOAD ASCI
00640          STA     ,X+     PUT ON SCREEN
00650          CMPA    #250    END FLAG
00660          BEQ     STRTKY  GOTO START
00670          CMPA    #175    END FLAG FOR ERROR1
00680          LBEQ    EXERR1
00690          CMPA    #176    END FLAG FOR ERROR2
00700          LBEQ    EXERR2
00710          BRA     PRNTRS  CONT.PRINTING
00720 INFO     FCC     /INPUT RAMSTART,FIRST TWO BYTES,THE OTHER
INPUTS ARE DATA/ INSTRUCTIONS
00730          FCB     250     INSTRUCTIONS END FLAG
00740 STRTKY   JSR     GETKEY  GET KEY FROM KEYBOARD
00750          STA     SAVKEY  TEMP. STORAGE
00760          LDX     #ASCI   LOAD BASE ADDR. OF ASCI TABLE
00770          LDB     #0      CLEAR B
00780 ASCCMP   LDA     B,X     LOAD ASCI
00790          INCB            INCREASE TABLE ADDR.
00800          CMPA    SAVKEY  COMPARE ASCI FROM TABLE W/SAVEKEY
00810          BEQ     STRKEY  FOUND EQUAL
00820          CMPA    #250    END TABLE FLAG?
00830          BEQ     ERROR1  INPROPER KEY INPUT TO KEYBOARD
00840          BRA     ASCCMP  BACK TO LOOP
00850 ERROR1   LDX     #1520   SCREEN ADDR.
00860          LDY     #ERMSG  ERROR1 MESSAGE BASE ADDR.
00870          JMP     PRNTRS  PUT ON SCREEN
00880 ERMSG    FCC     /ENTRY ERROR1/
00890          FCB     175     END FLAG
00900 STRKEY   LDX     CURSER  SCREEN ADDR.
00910          LEAX    1,X     INCREMENT SCREEN ADDR.
00920          STX     CURSER
00930          CMPX    #1530   END OF SCREEN?
00940          LBEQ    ENDSCR  GET NEW SCREEN ADDR.
00950          LDA     #1
00960          STA     EVOROD  STORE 1 ,M/S NIBB FLAG
00970          LDX     #VALUE  BASE ADDR. OF HEX VALUE
00980          LDA     B,X     LOAD HEX VALUE
00990          LSLA            MOVE TO M/S NIBB
01000          LSLA
01010          LSLA
01020          LSLA
01030          STA     MSNIBB  STORE M/S NIBB
01040 LSN      JSR     GETKEY  GET ANOTHER KEY
01050          STA     SAVKY1  TEMP. STORAGE
01060          LDX     #ASCI   LOAD BASE ADDR.
01070          LDB     #0      CLEAR B
01080          STB     EVOROD  CLEAR FOR EDIT FEATURE
01090 ASCMP    LDA     B,X
01100          INCB
01110          CMPA    SAVKY1  COMPARE KEY FROM KEYBOARD WITH IN
FO. FROM TABLE
01120          BEQ     FORMBT  GOTO FORM BYTE
01130          CMPA    #250    END TABLE FLAG
01140          LBEQ    ERROR2  KEYBOARD ENTRY ERROR ON L/S NIBB
01150          BRA     ASCMP
01160 * THIS ROUTINE PUTS ERROR MESSAGE ON SCREEN
01170 ERROR2   LDX     #1520
01180          LDY     #ERMSG2
01190          JMP     PRNTRS
01200 ERMSG2   FCC     /ENTRY ERROR2/
01210          FCB     176
```

Listing continued

```
2E    'start MSB
00    'start LSB
70    '0
71    '1
72    '2
73    '3
74    '4
75    '5
76    '6
77    '7
78    '8
79    '9
```

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

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

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 2304 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.

Listing continued

```
01220 FORMBT  LDX     #VALUE   TABLE ADDR.
01230         LDA     B,X      LOAD FROM TABLE
01240         STA     LSNIBB   STORE L/S NIBB
01250         LDA     MSNIBB   LOAD M/S NIBB
01260         ORA     LSNIBB   OR CONTENTS TO FORM BYTE
01270         LDX     KEYSTR   LOAD MEMORY START ADDR.
01280         STA     ,X       PLACE IN MEMORY
01290         LEAX    1,X      INCREASE MEMORY ADDR.
01300         STX     KEYSTR   STORE NEW ADDR.
01310         LDX     CURSER
01320         LEAX    31,X     ADVANCE SCREEN ADDR.
01330         STX     CURSER   STORE NEW SCREEN ADDR.(NEXT LINE)
01340 * THIS ROUTIN DETERMINES NEXT COLUMN
01350         CMPX    #1505
01360         LBEQ    SCRMV
01370         CMPX    #1510
01380         LBEQ    SCRMV
01390         CMPX    #1515
01400         LBEQ    SCRMV
01410         CMPX    #1520
01420         LBEQ    SCRMV
01430         CMPX    #1525
01440         LBEQ    SCRMV
01450         CMPX    #1530
01460         LBEQ    ENDSCR   END OF SCREEN
01470         CMPX    #1153    ADDR. FLAG TO FORM LOADING ADDR.OF HEX LOADER(STAR
T IN RAM)ALSO FOR MONITOR START
01480         LBEQ    LDRMST   GOTO LOAD RAM START
01490         LBRA    STRTKY   STAY IN MAIN LOOP
01500 LDRMST  LDX     TEMPKS   ADDR.OF WHERE HEX IS PLACED IN MEMORY(STARTING ADD
R.)
01510         STX     KEYSTR   PLACE STARTING ADDR.
01520         LDB     SETRTM   SET UP RTS TO MONITR FLAG
01530         CMPB    #1
01540         LBEQ    GOTOMN   GOTO MONITR
01550         LBRA    STRTKY
01560 GETKEY  JSR     $A1C1    GET KEYBOARD INPUT FROM BASIC ROM SUBROUTINE
01570         CMPA    #0       CHECK FOR KEY
01580         BEQ     GETKEY   IF NONE GET ONE
01590         LDX     CURSER   TO PUT R ON SCREEN
```

Listing continued

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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 space after the memory byte or address, and the fact that the memory address is not incremented on the next line.

The next line in the program (110) begins also with 2710. But this time it is followed by data (8E0402) and is the program assembled into hex. When you use this hex loader, enter the starting address first, and follow it with the data.

Everything else is automatic, and therefore it is much faster to enter programs with a hex loader than with an editor/assembler. For example, line 110

Continued on p. 115

Listing continued

```
01600          CMPA   #95      UP+SHIFT TO EDIT HEX LOADER
01610          LBEQ   BACKSP   GOTO BACKSPACE(UP)
01620          CMPA   #77      M FOR MONITR
01630          LBEQ   MONITR
01640          CMPA   #82      R FOR RESTART
01650          LBEQ   RESET    GOTO RESET(RESTART)
01660          CMPA   #60      CHECK FOR NUMBER
01670          LBLO   RVVIDO   REVERSE VIDEO
01680 FRRVID   LDX    CURSER
01690          STA    ,X
01700          CMPA   #100     REVERSE VIDEO BACK (FOR ASCI TABLE COMPARASION)
01710          LBHS   RVVID    GOTO REVERSE VIDEO BACK
01720 FVID     RTS            RETURN
01730 ASCI     FCB    0        ASCI CHARACTERS FOR COMPARASION
01740          FCB    48       0
01750          FCB    49       1
01760          FCB    50       2
01770          FCB    51       3
01780          FCB    52       4
01790          FCB    53       5
01800          FCB    54       6
01810          FCB    55       7
01820          FCB    56       8
01830          FCB    57       9
01840          FCB    65       A
01850          FCB    66       B
01860          FCB    67       C
01870          FCB    68       D
01880          FCB    69       E
01890          FCB    70       F
01900          FCB    250
01910 VALUE    FCB    0        HEX VALUE TO BE PLACED IN RAM(CHANGED BY ASSEMBLER
)
01920          FCB    0
01930          FCB    0
01940          FCB    1
01950          FCB    2
01960          FCB    3
01970          FCB    4
01980          FCB    5
01990          FCB    6
02000          FCB    7
```

Listing continued

Listing continued

```
02010          FCB     8
02020          FCB     9
02030          FCB     10
02040          FCB     11
02050          FCB     12
02060          FCB     13
02070          FCB     14
02080          FCB     15
02090          FCB     250
02100 * THIS ROUTINE MOVES HEX LOADER TO NEXT COLUMN
02110 SCRMV    TFR     X,D
02120          SUBD    #411
02130          STD     CURSER
02140          LBRA    STRTKY
02150 EXERR1   LBRA    STRTKY
02160 EXERR2   LBRA    LSN
02170 ENDSCR   LDX     #1153   NEW SCREEN LOC.
02180          STX     CURSER
02190          JSR     CLRSCR  CLEAR SCREEN
02200          LDA     #255    LOAD RED CURSER
02210          STA     ,X      PUT ON SCREEN
02220          LBRA    STRTKY
02230 BACKSP   LDA     EVORDD  CHECK FOR M/S NIBB ADDR.
02240          CMPA    #0
02250          BNE     GETKEY  IF NOT ON M/S NIBB ADDR. RETURN
02260 * THIS ROUTINE TESTS FOR NEXT COLUMN FOR EDIT
02270          CMPX    #1094
02280          BEQ     SCRBCK
02290          CMPX    #1099
02300          BEQ     SCRBCK
02310          CMPX    #1104
02320          BEQ     SCRBCK
02330          CMPX    #1109
02340          BEQ     SCRBCK
02350          CMPX    #1114
02360          BEQ     SCRBCK
02370          CMPX    #1153   CANNOT CHANE START ADDR.
02380          LBEQ    GETKEY
02390 RTSBK    LDA     #0
02400          STA     EVORDD  CLEAR FLAG
02410          LDX     CURSER  LOAD SCREEN ADDR.
02420          LDA     #96     LOAD BLANKS
02430          STA     ,X      CLEAR CURRENT CURSER POSITION
02440          STA     1,X     CLEAR PAST POSITION
02450          STA     -31,X   CLEAR PAST POSITION
02460          LDY     KEYSTR  LOAD START RAM ADDR. OF HEX LOADER
02470          LEAX    -32,X   MOVE CURSER UP
02480          LEAY    -1,Y    MOVE STARTING ADDR. UP
02490          STX     CURSER  STORE NEW ADDR.
02500          STY     KEYSTR  STORE NEW ADDR.
02510          LDA     #255    LOAD RED CURSER
02520          STA     ,X      PUT ON SCREEN
02530          LBRA    GETKEY  GOTO MAIN LOOP
02540 * THIS ROUTINE MOVE EDIT CURSER TO NEXT COLUMN
02550 SCRBCK   TFR     X,D
02560          ADDD    #411
02570          STD     CURSER
02580          TFR     D,X
02590          LDA     #255
02600          STA     ,X
02610          LBRA    RTSBK
02620 GOTOMN   RTS
02630 * THIS RESET RESTARTS THE HEX LOADER
02640 RESET    STA     ,X      STORE R ON SCREEN
02650          LDB     SAFERP  LOAD SAFETY
02660          DECB
02670          STB     SAFERP
02680          LBNE    GETKEY  IF R IS NOT KEYED IN TWICE GOT GETKEY
02690          LDX     #TEMPKS
02700          STX     KEYSTR
02710          LDX     #1089
02720          STX     CURSER
02730          JSR     CLRSCR
02740          LDA     #2      RESET RESTART FLAG
02750          STA     SAFERP
02760          LBRA    STRTRM  GOTO MAIN LOOP
02770 * THIS ROUTINE CLEARS SCREEN
02780 CLRSCR   PSHS    A,B,X,Y SAVE REGISTERS
02790          LDX     #1024   SCREEN LOC
02800 CSLP     LDA     #96     LOAD BLANK
02810          STA     ,X+     PUT ON SCREEN
02820          CMPX    #1536   END OF SCREEN?
02830          BNE     CSLP    IF NOT CONTINUE
02840          PULS    A,B,X,Y RESTORE REGISTERS
02850          RTS
02860 RVVIDD   ORA     #64     REVERSE VIDEO CHARACTER
02870          LBRA    FRRVID
02880 RVVID    ANDA    #191    CHANGE VIDEO CHARACTER BACK
02890          LBRA    FVID
02900 MONITR   LDX     #1163   MONITOR SCREEN LOC
02910          STX     MONSCR
```

Listing continued

Listing continued

```
02920           LDX     #1157   HEX TO DEC CONVERTER SCREEN LOC.
02930           STX     HDCONV
02940           LDX     #LASTEN STORE HEX LOADER SCREEN HERE
02950           LDY     #1024   SCREEN LOC
02960 SCRSAV    LDA     ,Y+     LOAD HEX SCREEN
02970           STA     ,X+     SAVE HEX SCREEN
02980           CMPY    #1536   END?
02990           BNE     SCRSAV  IF NOT CONT.
03000           JSR     PUTINS  GOTO PUT INSTRUCTIONS ON SCREEN
03010           LDX     PROGRM  START MONITOR LOC.
03020           STX     STEXAM  STORE START ADDR.
03030 DISPLY    JSR     EXMKEY  GOTO GET NEW RAM ADDR.
03040           LDA     TSTLOD  TEST FOR RETURN TO LOADER
03050           CMPA    #1
03060           LBEQ    RITOLD  GOTO HEX LOADER
03070           LDA     ,X      LOAD MONITOR BYTE
03080           LDB     DAFLAG  DISPLAY ASCII
03090           CMPB    #1
03100           LBEQ    DSPASC  DISPLAY ASCII CHARACTER
03110           STA     MLSNIB  STORE MOST SIGNIFICANT BYTE
03120           LSRA            SHIFT BYTE
03130           LSRA
03140           LSRA
03150           LSRA
03160           JSR     MNSPUT  CHANGE BYTE PUT ON SCREEN
03170           BRA     MNLSN   MONITOR LEAST SIG. BYTE
03180 MNSPUT    TFR     X,Y     TRANSFER MEM LOC TO Y
03190           LDX     MONSCR  LOAD MONITOR SCREEN LOC
03200           CMPA    #9
03210           BHI     CVTOLT  CONVERT TO LETTER
03220           ADDA    #112    CONVERT TO NUMBER
03230           BRA     MPS
03240 CVTOLT    ADDA    #55     CONVERTS NIBBLE TO LETTER
03250 MPS       STA     ,X      PUT NIBBLE ON SCREEN
03260           LEAX    1,X     ADVANCE SCREEN LOCATION
03270           STX     MONSCR  STORE NEW LOCATION
03280           RTS
03290 MNLSN     LDA     MLSNIB  GET LEAST SIG. NIBB.
03300           ANDA    #15     CLEAR MOST SIG. NIBB.
03310           JSR     MNSPUT  CONVERT HEX TO ASCII PUT ON SCREEN
03320           LEAX    30,X    NEW LINE
03330           STX     MONSCR  STORE NEW LOC.
03340           LBRA    HXTODX  GOTO HEX TO DEC.CONVERTER
03350 ENDMSC    JSR     CLRSCR  CLEAR SCREEN
03360           LDX     #1035   GET NEW ADDR.
03370           STX     MONSCR  STORE NEW ADDR.
03380           LDX     #1030   GET NEW ADDR.
03390           STX     HDCONV
03400           LBRA    FEMS
03410 DISPHX    CLR     DAFLAG  CLEAR FLAG
03420           RTS
03430 DSPASC    LDX     MONSCR  LOAD SCREEN ADDR.
03440           STA     ,X      PUT ASCII ON SCREEN
03450           LEAX    32,X    NEW LINE
03460           STX     MONSCR  STORE NEW LOCATION
03470           LBRA    HXTODX
03480 EXMKEY    JSR     $A1C1   GET KEY FROM KEYBOARD
03490           CMPA    #0
03500           BEQ     EXMKEY  IF NOT NEW KEY GO BACK
03510           LDX     MONSCR  LOAD MONITOR SCREEN LOC.
03520           CMPX    #1515   END OF SCREEN?
03530           LBEQ    ENDMSC  GOTO END MONITOR SCREEN
03540 FEMS      CMPA    #94     UP ARROW?
03550           BEQ     SCNUP
03560           CMPA    #10     DOWN ARROW?
03570           BEQ     SCNDN
03580           CMPA    #69     E FOR EXIT
03590           BEQ     EXEXAM
03600           CMPA    #9      RIGHT ARROW
03610           LBEQ    SCAN
03620           CMPA    #87     W FOR ASCII
03630           LBEQ    DSPWDS
03640           CMPA    #72     H FOR HEX NUMBERS
03650           LBEQ    DISPHX
03660           BRA     EXMKEY  STAY IN LOOP IF FUNCTION KEY NOT
ENTERED
03670 SCNUP     LDX     STEXAM  LOAD MEM.LOC.
03680           LEAX    -1,X    SUBTRACT MEM.LOC.
03690           STX     STEXAM  STORE NEW ADDR.
03700           RTS
03710 SCNDN     LDX     STEXAM
03720           LEAX    1,X     ADD MEM.LOC.
03730           STX     STEXAM
03740           RTS
03750 EXEXAM    LDA     #1      RETURN TO HEX LOADER FLAG
03760           STA     TSTLOD  STORE FLAG
03770           RTS
03780 SCAN      LDX     STEXAM  DO NOT CHANGE MEM.LOC.
03790           RTS
03800 DSPWDS    LDA     #1      DISPLAY ASCII ON SCREEN FLAG
```

Listing continued

Listing continued

```
03810           STA     DAFLAG  STORE FLAG
03820           RTS
03830 HXTODX    LDX     STEXAM  HEX NUMBER TO BE CONVERTED TO
DECIMAL
03840           STX     PRNTHX  HEX SCREEN ADDR.
03850           LDY     HDCONV  LOAD SCREEN ADDR.
03860           LDU     #DECTAB LOAD BASE ADDR.OF TABLE
03870 CONTLP    LDA     ,U+     LOAD DECIMAL
03880           STA     ,Y      PUT ON SCREEN
03890           CMPX    #9      COMPARE HEX WITH 9
03900           BLS     FINCNT  BRANCH TO FINISH COUNT
03910           CMPX    #0      IS COUNTING FINISHED?
03920           LBEQ    NXTLNE
03930           CMPA    #112    TABLE END FLAG
03940           LBEQ    DRWTEN  DRAW TEN
03950           BRA     CONTLP  CONT. LOOP
03960 FINCNT    LDU     #FNCNT  LOAD TABLE BASE ADDR.
03970           LEAX    1,X     ADJUST FOR 11 COUNT IN TABLE
03980 FINLP     LDA     ,U+     LOAD DEC.
03990           STA     ,Y      PUT ON SCREEN
04000           LEAX    -1,X    DECREASE MEMORY VALUE
04010           CMPX    #0      COUNTING FINISHED?
04020           LBEQ    NXTLNE
04030           BRA     FINLP   STAY IN LOOP
04040 FNCNT     FCB     48      INVERSE VIDEO ZERO
04050 DECTAB    FCB     113     ONE
04060           FCB     114     TWO
04070           FCB     115     THREE
04080           FCB     116     FOUR
04090           FCB     117     FIVE
04100           FCB     118     SIX
04110           FCB     119     SEVEN
04120           FCB     120     EIGHT
04130           FCB     121     NINE
04140           FCB     112     ZERO
04150 DRWTEN    LDU     #DECTAB LOAD TABLE ADDR.
04160           LDB     OFF10   LOAD OFFSET
04170           LDA     B,U     LOAD DEC.NUMBER
04180           LEAX    -10,X   SUBTRACT MEMORY LOC.
04190           ADDB    #1      ADD TO OFFSET
04200           STB     OFF10   STORE NEW OFFSET
04210           STA     -1,Y    PUT NUMBER ON SCREEN
04220           CMPA    #112    ZERO FLAG
04230           BEQ     DRWHUN  IF YES,GOTO DRAW HUNDRED
04240           LBRA    CONTLP  STAY IN LOOP
04250 DRWHUN    LDA     #0      LOAD ZERO
04260           STA     OFF10   CLEAR DRAW TEN OFFSET
04270           LDU     #DECTAB TABLE BASE ADDR.
04280           LDB     OFF100  OFFSET
04290           LDA     B,U     NUMBER
04300           ADDB    #1
04310           STB     OFF100
04320           STA     -2,Y    PUT ON SCREEN
04330           CMPA    #112    ZERO FLAG
04340           BEQ     DRWTHO
04350           LBRA    CONTLP
04360 DRWTHO    LDA     #0
04370           STA     OFF100
04380           LDU     #DECTAB
04390           LDB     OF1000
04400           LDA     B,U
04410           ADDB    #1
04420           STB     OF1000
04430           STA     -3,Y
04440           CMPA    #112
04450           BEQ     DRWTNT
04460           LBRA    CONTLP
04470 DRWTNT    LDA     #0
04480           STA     OF1000
04490           LDU     #DECTAB
04500           LDB     010000
04510           LDA     B,U
04520           ADDB    #1
04530           STB     010000
04540           STA     -4,Y
04550           CMPA    #112
04560           BEQ     RSTOFF
04570           LBRA    CONTLP
04580 RSTOFF    LDA     #0      LOAD ZERO
04590           STA     010000  CLEAR DRAW TEN THOUSAND OFFSET
04600           LBRA    CONTLP
04610 NXTLNE    LDY     HDCONV  HEX TO DEC SCREEN ADDR.
04620           LEAY    32,Y    NEXT LINE
04630           STY     HDCONV  STORE NEW ADDR.
04640           CLR     OFF10   CLEAR OFFSETS
04650           CLR     OFF100
04660           CLR     OF1000
04670           CLR     010000
04680           LBRA    PTHXSC  PUT HEX LOC.ON SCREEN
04690 PUTINS    JSR     CLRSCR  CLEAR SCREEN
```

Listing continued

↙See List of Advertisers on page 130

Listing continued

```
04700           LDX     #1280   INSTRUCTIONS SCREEN ADDR.
04710           LDY     #INSTR
04720 INSLP     LDA     ,Y+
04730           STA     ,X+     PUT INSTRUCTIONS ON SCREEN
04740           CMPA    #250    END FLAG
04750           LBEQ    EXINS
04760           BRA     INSLP
04770 INSTR     FCC     /FIRST TWO BYTES ENTERED IS MONITORS STARTING ADDRESS/
04780           FCC     /AFTER ENTERING STARTING ADDRESS USE ARROW KEYS TO SCAN UP
 MEMORY OR DOWN MEMORY/
04790           FCB     250
04800 EXINS     LDX     KEYSTR  LOAD MEMORY START
04810           STX     TEMSTR  SAVE MEM.START
04820           LDX     #TEMPKS MONITOR LOOKS FOR STARTING ADDR.AT 8A IN LOADING R
OUTINE
04830           STX     KEYSTR
04840           LDA     #1      SET RETURN TO MONITOR FLAG
04850           STA     SETRTN  STORE FLAG
04860           LDX     CURSER
04870           STX     TEMCUR  TEMPORARY STORE CURSER POSITION
04880           LDX     #1089   LOAD NEW CURSER POSITION
04890           STX     CURSER  STORE NEW CURSER POS.
04900           JSR     STRTKY  GET MONITOR STARTING ADDRESS
04910           LDX     KEYSTR  LOAD STARTING ADDRESS
04920           STX     PROGRM  STORE STARTING ADDR.
04930           CLR     SETRTN  CLEAR RTS FLAG
04940           JSR     CLRSCR
04950           LDX     TEMSTR  RESTORE OLD LOCATIONS
04960           STX     KEYSTR
04970           LDX     TEMCUR
04980           STX     CURSER
04990           RTS             GOTO MONITOR
05000 * THIS RDUTINE RESTORES HEX LOADER SCREEN
05010 RTTOLD    LDX     #LASTEN
05020           LDY     #1024
05030 MNPTSC    LDA     ,X+
05040           STA     ,Y+
05050           CMPY    #1536
05060           BNE     MNPTSC
05070           CLR     TSTLOD
05080           LBRA    STRTKY
05090 PTHXSC    LDX     MONSCR
05100           LEAX    -24,X   OLD LINE ON SCREEN
05110           LDD     PRNTHX  HEX NUMBER TO BE PUT ON SCREEN
05120           TFR     A,B     PUT HEX MOST SIG.BYTE IN A&B
05130           JSR     SFTNIB  PRINT M/S NIB. OF M/S BYTE
05140           TFR     B,A
05150           ANDA    #15     CLEAR M/S NIBB.
05160           JSR     PUTLSN  PRINT L/S NIBB OF M/S BYTE
05170           LDD     PRNTHX
05180           TFR     B,A
05190           JSR     SFTNIB  PRINT M/S NIB OF L/S BYTE
05200           TFR     B,A
05210           ANDA    #15     CLEAR M/S NIBB.
05220           JSR     PUTLSN  PRINT L/S NIBB OF L/S BYTE
05230           LBRA    DISPLY  GOTO MONITOR MAIN LOOP
05240 SFTNIB    LSRA            SHIFT NIBBLE RIGHT
05250           LSRA
05260           LSRA
05270           LSRA
05280 PUTLSN    CMPA    #9      COMPARE TO 9
05290           BHI     CONVLT  IF HIGHER CONVERT TO LETTER
05300           ADDA    #112    CONVERT TO NUMBER
05310           BRA     MPS1    PUT ON SCREEN
05320 CONVLT    ADDA    #55     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
```

END

```
0900            00100       ORG   $0900   'prog start address
0900  8E 0402   00110 START LDX   #$402   'screen location
0903  86 FF     00120       LDA   #$FF    'RED cursor
0905  A7 84     00130       STA   ,X      'put cursor on scrn
0907  20 FE     00140 STOP  BRA   STOP    'stay in loop
          0000  00150       END
00000 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 O, 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.)

"...if the binary bug is byting you, I hope this program gives at least temporary relief..."

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.

The commented text should explain the program's functions, so I don't need to spend much time on that. However, I would like to explain the hexadecimal-to-decimal converter. You accomplish this by decreasing STEXAM (hexadecimal to be converted) contained in the X register. The HXTODX routine is actually counting until X equals zero.

So, if the binary bug is byting you, I hope this program gives at least temporary relief from this contagious disease. For some, it may be a starting point in learning Assembly language. ■

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

Memory Location	Assembled Source Code	Assembler Line Number		
2710		00100	ORG	10000
2710	8E 0400	00110 START	LDX	#1024
2713	108E 2721	00120	LDY	#NAME
2717	A6 A0	00130 LOOP	LDA	,Y+
2719	81 C8	00140	CMPA	#200
271B	24 1B	00150	BHS	EXIT
271D	A7 80	00160	STA	,X+
271F	20 F6	00170	BRA	LOOP
2721	49	00180 NAME	FCC	/I/
2722	60	00190	FCB	96
2723	4C	00200	FCC	/LOVE/
	4F			
	56			
	45			
2727	60	00210	FCB	96
2728	4D	00220	FCC	/MY/
	59			
272A	60	00230	FCB	96
272B	43	00240	FCC	/COLOR/
	4F			
	4C			
	4F			
	52			
2730	60			
2731	43	00260	FCC	/COMPUTER/
	4F			
	4D			
	50			
	55			
	54			
	45			
	52			
2739	FA	00270	FCB	250
273A	20 FE	00280 EXIT	BRA	EXIT
	0000	00290	END	

00000 TOTAL ERRORS

EXIT 273A
LOOP 2717
NAME 2721
START 2710

Program Listing 3. Sample Assembly Program

Byte	Assembled Source Code			
		00090 * DEMONSTRATION ONLY		
2C22		00100	ORG	9000
2C22	86 00	00110 START	LDA	#0
2C24	A7 84	00120	STA	,X
2C26	FF	00130 BONK	FCB	255
2C27	FFDC	00140 KONK	FDB	65000
	2C27	00150 SHOUT	EQU	KONK
	2C26	00160 LOUD	EQU	BONK
2C29		00170 DOWN	RMB	1
2C2A		00180 RIGHT	RMB	2
2C2C	04D2	00190 LEFT	FDB	1234
2C2E	BE 2C2C	00200	LDX	LEFT
	0000	00210	END	

00000 TOTAL ERRORS

BONK 2C26
DOWN 2C29
KONK 2C27
LEFT 2C2C
LOUD 2C26
RIGHT 2C2A
SHOUT 2C27
START 2C22

Program Listing 4. Sample Assembly Program

Instant CoCo

by Amee Eisenberg

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 CLOAD-ing 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.

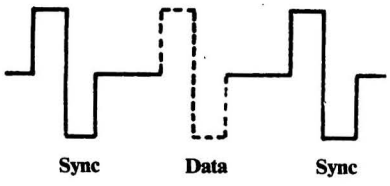

Fig. 1. The Ideal Cassette-Loading Waveform

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.

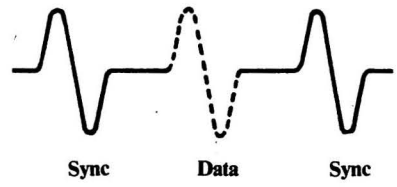

Fig. 2. What You Actually Get

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

ARTICLE NAME/AUTHOR	FILE	PAGE #	SYSTEM
Copyright Statement	TITLE	—	All
I've Got the Biorhythm/Smock	BIO	50	16K Ext.
Circuit Drawer/Wilson	CDRAW	56	32K Ext. or Disk
Tax Program/Gregg	TAX83	62	16K
Cassette Index Label/LaBonville	INDXCRD	76	16K Ext.
Utility/Johnson	COMCHANG	78	16K Disk Basic
Utility/Johnson	DISPATCH	78	16K Disk Basic
Utility/Sprouse	DISPLAY	84	32K Disk Basic
Go/Holden	GO	92	16K Ext.
Side B			
Bowlstat/Kinney	BOWLSTAT	96	16K Ext.
Morse Code/Yeater	CODE	100	16K Ext.
Ramaster/Lewis	RAMASTER	107	16K
Educated Guest/Santee	ENGLISH	118	16K Ext.
Educated Guest/Santee	COMPASS	118	16K Ext.
Elmer's Arcade/Ramella	BROKEN	17	4K

Instant CoCo Directory

TEN MOST-ASKED QUESTIONS about DYNACALC™

THE ELECTRONIC SPREAD-SHEET FOR 6809 COMPUTERS

1. What is an electronic spread-sheet, anyway?
Business people use spread-sheets to organize columns and rows of figures. DYNACALC simulates the operation of a spread-sheet without the mess of paper and pencil. Of course, corrections and changes are a snap. Changing any entered value causes the whole spread-sheet 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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Not at all. DYNACALC can be used for just about any type of job. Not only numbers, but alphanumeric messages can be handled. Engineers and other technical users will love DYNACALC's sixteen-digit math and built-in scientific functions. You can build worksheets as large as 256 columns or 256 rows. There's even a built-in sort command, so you can use DYNACALC to manage small data bases — up to 256 records.

3. What will DYNACALC do for ME?
That's a good question. Basically the answer is that DYNACALC will let your computer do just about anything you can imagine. Ask your friends who have VisiCalc™, or a similar program, just how useful an electronic spread-sheet program can be for all types of household, business, engineering, and scientific applications. Typical uses include financial planning and budgeting, sales records, bills of material, depreciation schedules, student grade records, job costing, income tax preparation, checkbook balancing, parts inventories, and payroll. But there is no limit to what YOU can do with DYNACALC.

4. Do I have to learn computer programming?
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5. Do I have to modify my system to use DYNACALC?
Nope. DYNACALC uses any standard 6809 configuration, so you don't have to spend money on another CPU board or waste time learning another operating system.

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Very. Except for a few seldom-used commands, DYNACALC is memory-resident, so there is little disk I/O to slow things down. The whole data array (worksheet) is in memory, so access to any point is instantaneous. DYNACALC is 100% 6809 machine code for blistering speed.

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The Educated Guest

The program jumps,
the program hops
The program skips
and then it stops:
To figure out
what next is showing
You need to know
just where you're going.

by Charles H. Santee

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

F—The first item of a set of all questions to be asked before advancing to a new set.
L—The last item in each set of questions.
R—The number of times each question is presented before checking to see if the user is ready for the next set.
NI—The total number of items to be asked (in all sets).
S—L−F+1=. The number of items in any set of questions.
Q—S * R= The total number of times questions are presented for a set of items.
C1—The first criterion to be met before advancing to a new set.
C2—A second (more difficult) criterion. If the user masters material at this second criterion level, the program advances further than if only the first criterion is met.
I1—The number of items the program advances if the first criterion is met.
I2—The number of items the program advances if the second criterion is met.

Table 1.

System Requirements

16K RAM
Extended Color Basic

```
5 CLEAR 1000
10 ' ###### F = FIRST ITEM
L = LAST ITEM     R = NUMBER OF T
IMES EACH ITEM IS REPEATED      I
 = INCREMNT IN DIFICULTY
15 '##### C1 = FIRST CRITERION
 C2 = SECOND CRITERION
 I1 = INCREMENT FOR FIRST
 I2 = INCREMENT FOR SECOND
20 CLS:F=1:L=4:I=2:R=1:NI=0
22 READ D$:IF D$<>"*" THEN NI=NI
+1:GOTO 22
24 NI=INT(NI/2):RESTORE
25 C1 = 75:C2=100:I1 = 2:I2 = 4
30 GOSUB 40:GOTO 90
40 CLS:FOR A=1 TO 4:PRINT @A*96+
32,STRING$(32,131):POKE 1056+A*9
6,ASC(RIGHT$(STR$(A),1)):NEXT:RE
TURN
90 RESTORE:IF F=1 THEN 110
100 FOR A=1 TO F-1:READ X$,X$:NE
XT A
110 S=L-F+1:Q=S*R
120 FOR A=1 TO S:READ C$(A),M$(A
):C(A)=0:NEXT
130 M=0:T=0
140 FOR N= 1 TO Q
150 P=RND(S)
160 PRINT@0,STRING$(128," ");:PR
INT@0,"";:PR$=C$(P):GOSUB 500:C(
P)=C(P)+1
190 GOSUB 290
200 IF C(P)=R THEN C$(P)=C$(S):M
$(P)=M$(S):C(P)=C(S):S=S-1
210 NEXT N
220 PC=INT(M/T*100)
225 PLAY "O3T6L6FGAGFCEFP4O4FGAG
FCEG"
230 CLS:PRINT@256,PC;"% CORRECT
ON THE FIRST TRY":PRINT:PRINT"
TRY AGAIN (Y/N)?";
240 X$=INKEY$:IF X$="N" THEN END
 ELSE IF X$<>"Y" THEN 240
250 IF PC=>C1 AND PC<C2 THEN F=F
+I1:L=L+I1
260 IF PC=C2 THEN F=F+I2:L=L+I2
270 IF F>NI THEN CLS4:PRINT@128,
"YOU HAVE FINSIHED ALL THE
 QUESTIONS IN THIS PROGRAM
 VERY GOOD JOB
";:PLAY "T4L4O3CEGO2L2CO3CO2C":E
ND
275 IF L>NI THEN L=NI
280 GOSUB 40:GOTO 90
290 LS$=M$(P)
295 NA=1
300 LS=INSTR(LS$,"/"):IF LS=0 TH
EN  A$(NA)=LS$:GOTO 315

310 A$(NA)=LEFT$(LS$,LS-1):LS$=R
IGHT$(LS$,LEN(LS$)-LS):NA=NA+1:G
OTO 300
315 SL=0
320 FOR C=NA TO 1 STEP -1
330 Z=RND(C):IF Z=1 AND SL=0 THE
N CA$=RIGHT$(STR$(C),1):SL=1:CA=
C
340 T$=A$(C):A$(C)=A$(Z):A$(Z)=T
$
350 NEXT C
360 FOR C=1 TO NA
370 PR$=A$(C):PRINT@C*96+64,"";:
GOSUB 500
380 NEXT C
390 FT=1
400 REM
410 X$=INKEY$:IF X$="" THEN 410
ELSE IF X$<"1" OR X$>"4" THEN PR
INT@132,"PRESS number TO ANSWER"
;:PLAY"O1T4L2GC":PRINT@132,"pres
s NUMBER to answer";:PLAY"O1T4L2
GC":PRINT@132,STRING$(24,131);:G
OTO 410
420 IF X$<>CA$ THEN FT=0:PRINT@1
40,"try again";:PLAY"T4L4O1GCP1"
:PRINT@140,STRING$(20,131);:GOTO
 400
430 T=T+1:M=M+FT
450 FOR C=1 TO 4
455 IF C<>CA THEN PRINT@C*96+64,
STRING$(63,32);
457 NEXT C
458 FOR B=1 TO 2
459 PRINT@CA*96+32,"";:IF B=1 TH
EN PRINT STRING$(32,128);:POKE C
A*96+1056,ASC(RIGHT$(STR$(CA),1)
)
460 FOR E=1 TO 64:LL=1087+96*CA+
E:POKE LL,PEEK(LL)+64*((PEEK(LL)
>64)*2+1):NEXT E
465 PLAY "O2L4T50CEDFGAB"
470 NEXT B:PLAY"P1O3T4L8CEG"
480 GOSUB 40
490 RETURN
500 PP=30
510 IF LEFT$(PR$,1)=" " THEN PR$
=RIGHT$(PR$,LEN(PR$)-1):GOTO 510
520 IF LEN(PR$)<30 THEN PRINTTAB
(1);PR$;:RETURN
530 IF MID$(PR$,PP,1)<>" " THEN
PP=PP-1:GOTO 530
540 PRINTTAB(1);LEFT$(PR$,PP):PR
$=RIGHT$(PR$,LEN(PR$)-PP):PP=30:
GOTO 510
600 RETURN
630 DATA "A noun IS A WORD USED
TO TAME A PRESON, PLACE, THING,

OR IDEA.  WHICH PHRASE SHOWS THE
 NOUN IN BLACK?"
640 DATA "THE man WAS SMALL/the
MAN WAS SMALL/THE MAN was SMALL/
THE MAN WAS small"
650 DATA "A pronoun IS A WORD US
ED IN PLACE OF ONE OR MORE NOUNS
.  WHICH PHRASE SHOWS THE PRONOU
N IN BLACK?"
660 DATA "he IS GOING TO THE SHO
W/HE is GOING TO THE SHOW/HE IS
GOING to THEN SHOW/HE IS GOING T
O THE show"
670 DATA "AN adjective IS A WORD
 USED TO MODIFY A NOUN OR PRONOU
N.  WHICH PHRASE SHOWS AN ADJECT
IVE IN BLACK?"
680 DATA "SHE IS A tall GIRL/she
 IS A TALL GIRL/SHE is A TALL GI
RL/SHE IS a TALL GIRL"
700 DATA "A verb IS A WORD THAT
SHOWS ACTION OR HELPS TO MAKE A
STATEMENT.  WHICH PHRASE SHOWS A
 VERB IN BLACK?"
710 DATA "HE hit THE BALL/he HIT
 THE BALL/HE HIT the BALL/HE HIT
 THE ball"
720 DATA "WHICH PHRASE SHOWS A n
oun IN BLACK?"
730 DATA "I LIVE IN THE city/the
 WOMAN WAS HAPPY/FIND the BUILDI
NG/IT is MY BOOK"
740 DATA "WHICH PHRASE SHOWS A p
ronounb IN BLACK?"
750 DATA "he IS THE ONE I SAW/CA
N SHE do IT/WE ARE together/YOU
CAN do IT"
760 DATA "WHICH PHRASE SHOWS THE
 verb IN BLACK?"
770 DATA "WILL YOU play WITH ME/
you CAN HIT THE BALL/HE CAN RUN
very FAST/HE IS A happy MAN"
780 DATA "WHICH PHRASE SHOWS THE
 adjective IN BLACK?"
790 DATA "THEY HAVE blue EYES/SH
E is SMALL/THE MAN IS very LARGE
/you CAN FIND THE CORRECT ANSWER
"
795 DATA "WHICH PHRASE SHOWS A n
oun IN BLACK?"
800 DATA "THE MAN HAD courage/BE
AUTY is ONLY SKIN DEEP/join THE
CROWD/HE IS A courageous PERSON"
820 DATA "WHICH PHRASE SHOWS AN
pronoun IN BLACK?"
830 DATA "THIS IS his PEN/THAT I
S NOT very FUNNY/CAN YOU see HIM
/try TO WORK HARDER"

840 DATA "WHICH PHRASE SHOWS THE
 adjective IN BLACK?"
850 DATA "some PEOPLE HAVE HOBIE
S/ALL cats EAT FOOD/CAN YOU do I
T/use YOUR IMMAGINATION"
860 DATA "WHICH PHRASE SHOWS THE
 verb IN BLACK?"
870 DATA "I am VERY HAPPY/you WI
LL FIND IT/where IS THE GOLD/THA
T IS correct"
900 DATA "*"
```

END

Program Listing 1. Parts of Speech

R), the question is eliminated from the set. After all questions appear the specified number of times, the program gives a summary of progress.

If the student masters the questions at a specific level, the program adds new items to the end of the set, and deletes some of the earlier items. It then begins with the new set.

Both programs use two criteria. If a student meets the first, the program adds two new items; if he meets the second, four are added. The better a child's skills, the faster he can move ahead.

How to Add New Items

In both programs, there are two different types of DATA statements. The first is a question type, the second an answer type. They are interpreted differently by each program.

In the Parts of Speech program, the question type appears at the top of the program. The answer type consists of four possible responses divided by slashes. The first response in the answer type should be the correct answer to the question. The program 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-

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:

U=UP D=DOWN R=RIGHT L=LEFT
E=UP/RIGHT F=DOWN/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 C1, C2, I1, and I2, to adjust the amount and criteria of program advance.

Set C1 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 ' ###### F = FIRST ITEM
L = LAST ITEM     R = NUMBER OF T
IMES EACH ITEM IS REPEATED      I
 = INCREMNT IN DIFICULTY
15 ' ###### C1 = FIRST CRITERION
 C2 = SECOND CRITERION
 I1 = INCREMNT FOR FIRST
CRITERION      I2 =  INCREMENT
FOR SECOND CRITERION
20 CLS:F=1:L=4:I=2:R=1:NI=16
25 C1 = 75:C2=100:I1 = 2:I2 = 4
30 GOSUB 40:GOTO 90
40 FOR A = 194 TO 450 STEP 32
50 PRINT@A, STRING$(27,161);CHR$
(133)
60 NEXT A
70 PRINT@482, STRING$(27,131);CH
R$(135);
80 RETURN
90 RESTORE:IF F=1 THEN 110
100 FOR A=1 TO F-1:READ X$,X$:NE
XT A
110 S=L-F+1:Q=S*R
120 FOR A=1 TO S:READ C$(A),M$(A
):C(A)=0:NEXT
130 M=0:T=0
140 FOR N= 1 TO Q
150 P=RND(S)
160 PRINT@128,STRING$(64," ");
170 PRINT@130,C$(P):C(P)=C(P)+1
180 LO=335
190 GOSUB 290
200 IF C(P)=R THEN C$(P)=C$(S):M
$(P)=M$(S):C(P)=C(S):S=S-1
210 NEXT N
220 PC=INT(M/T*100)
225 PLAY "O3T6L6FGAGFCEFP4O4FGAG
FCEG"
230 PRINT@128,STRING$(64," ");:P
RINT@130,PC;"% CORRECT":PRINT"
TRY AGAIN (Y/N)?";
240 X$=INKEY$:IF X$="N" THEN END
 ELSE IF X$<>"Y" THEN 240
250 IF PC=>C1 AND PC<C2 THEN F=F
+I1:L=L+I1
260 IF PC>=C2 THEN F=F+I2:L=L+I2
270 IF F>NI THEN CLS4:PRINT@128,
"YOU HAVE FINSIHED ALL THE
 QUESTIONS IN THIS PROGRAM
 VERY GOOD JOB
";:PLAY "T4L4O3CEGO2L2CO3CO2C":E
ND
275 IF L>NI THEN L=NI
280 GOTO 90
290 FOR D=1 TO LEN(M$(P))
300 G$=MID$(M$(P),D,1)
310 H=INT(JOYSTK(0)/22):V=INT(JO
YSTK(1)/22):J=V*3+H+1
320 PRINT@LO,CHR$(145);:GOSUB 50
0:PRINT@LO,CHR$(177);
330 IF PEEK(65280)AND 1 THEN GOT
O 310
340 T=T+1:IF INSTR("HUELORGDF",G
$)<>J THEN PLAY"T4L4O1GC":GOTO 3
10
350 M=M+1
360 PRINT@LO,CHR$(129);
370 ON J GOTO 380,390,400,410,46
0,420,430,440
380 LO=LO-33:GOTO 460
390 LO=LO-32:GOTO 460
400 LO=LO-31:GOTO 460
410 LO=LO-1:GOTO 460
420 LO=LO+1:GOTO 460
430 LO=LO+31:GOTO 460
440 LO=LO+32:GOTO 460
450 LO=LO+33
460 PLAY "L4T4O3CO4C"
470 NEXT D
475 PRINT@LO,CHR$(193);
480 PRINT @128,STRING$(64," ");:
PRINT@130,"GOOD MOVE":PLAY"O2T50
CDEFGABCDAFGABT4O3CP1P1":GOSUB 4
0
490 RETURN
500 PRINT@25,CHR$(92);" ! /"
510 PRINT@57,"- O -"
520 PRINT@89,"/ ! ";CHR$(92)
530 ON J GOTO 540, 550, 560, 570
, 580,590, 600, 610, 620
540 POKE 1049,28:RETURN
550 POKE 1051,ASC("!"):RETURN
560 POKE 1053,ASC("/"):RETURN
570 POKE 1081,ASC("-"):RETURN
580 POKE 1083,15:RETURN
590 POKE 1085,ASC("-"):RETURN
600 POKE 1113,ASC("/"):RETURN
610 POKE 1115,ASC("!"):RETURN
620 POKE 1117,28:RETURN
630 DATA GO UP,U,GO DOWN,D
640 DATA GO RIGHT,R,GO LEFT,L
650 DATA GO NORTH,U,GO SOUTH,D
660 DATA GO EAST,R,GO WEST,L
670 DATAGO NORTHEAST,E,GO SOUTHE
AST,F
680 DATA GO SOUTHWEST,G,GO NORTH
WEST,H
690 DATA GO SOUTH 2 STEPS THEN G
O WEST,DDL
700 DATA GO NORTH 2 STEPS THEN G
O      NORTHEAST,UUE
710 DATAGO NORTH THEN GO SOUTH,U
D
720 DATA GO WEST ONE STEP THEN G
O EAST   TWO STEPS,LRR        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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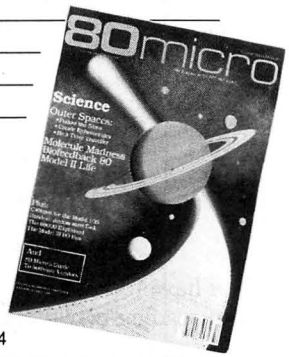

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Reader's Forum

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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

Make Your Drive Run Without Reading or Writing

I have found a way to make a disk-drive motor run without reading or writing. To turn on the motor in the drive, type POKE &HFF40,60. To turn off the motor, type POKE &HFF40,0. This seems to have no effect on reading or writing to the disk, and has never caused a problem. Keeping the motor running prevents I/O errors and also saves the time it takes for the drive to reach running speed. The motor is turned off after any disk operation, such as a DIR command.

Jason Foodman
Charlotte, NC

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

Easier Numeric Variables

There is an easier way to use numeric variables with the PLAY command than converting them to strings with the STR$command. The command sequence =A; can be used in the PLAY string (where A is a numeric variable). You must use the semicolon for this to work.
Example 1:

```
10 FOR A=1 TO 12
20 PLAY "N=A;"
30 NEXT A
```

Instead of:

```
10 FOR A=1 TO 12
20 A$=STR$(A)
30 PLAY A$
40 NEXT A
```

Example 2 plays the scale (octaves 1 to 5)

```
10 FOR OC=1 TO 5:FOR NO=1 TO 12
20 PLAY "L16;O=OC;N=NO;"
30 NEXT NO,OC
```

Instead of:

```
10 FOR OC=1 TO 5:FOR NO=1 TO 12
20 O$=STR$(OC): N$=STR$(NO)
30 PLAY "L16;O"+O$+"N"+N$
40 NEXT NO,OC
```

As you can see, this method can save a lot of typing. It also saves memory.

John R. Strong
Fairmount, IN

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 X$="COLOR COMPUTER" (The variable X$ can be any string you choose, so long as its length is no more than 32 characters)
20 L=LEN(X$): X=(32-L)/2
30 PRINT TAB(X) X$
```

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 X$ 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

Doctor ASCII

by Richard E. Esposito

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 POKE65495,0. 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
Penticon, 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. Schofer'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. Schofer'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

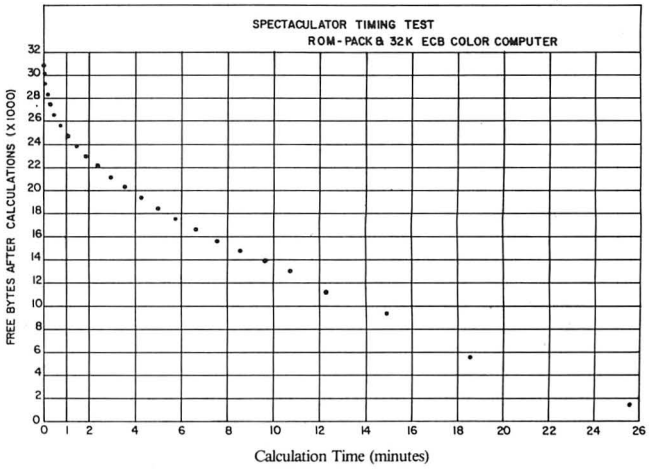

Fig. 1. Spectaculator Calculation Times

A. There are 14 pages in chapter 25, "Assembly-Language Sound," of William Barden's book *TRS-80 Color Computer Assembly-Language Programming*, Radio Shack, #62-2077, $6.95. You should also read the 26 pages in chapter 6, "Sound and Graphics," of Don Inman's book *Assembly-Language Graphics for the TRS-80 Color Computer*, Reston, $14.95. You might also wish to investigate the Votrax chip because you will find that a voice program without it fills up memory rather quickly.

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

```
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=H*A+N
100 H=H*16
120 NEXT I
130 PRINT N
140 END
```

Program Listing 1. Hex-to-Decimal Converter for Color Basic

```
10 DIMX(10)
20 L=0
25 REM *** START OF GAME ***
30 INPUT"SCORE";S
35 REM *** COMPARE SCORE WITH
36 REM     OTHERS AND ENTER IF
37 REM     IN TOP TEN ***
40 GOSUB1000
45 REM *** REPORT TOP TEN ***
50 FOR I=1 TO L
60 PRINTX(I)
70 NEXTI
75 REM *** PAUSE TO SEE ***
80 Q$=INKEY$: IF Q$="" THEN 80
85 REM *** START NEW GAME ***
90 GO TO 30
995 REM *** TOP TEN SCORE
996 REM    SELECTION ROUTINE **
1000 IF L=0 THEN X(1)=S: L=1 :RE
TURN
1010 FOR I=1 TO L
1020 IF S>X(I) THEN GOTO 1060
1030 NEXT I
1040 IF L<10 THEN L=L+1: X(L)=S
1050 RETURN
1060 IF I=10 THEN X(10)=S :RETUR
N
1070 IF L<10 THEN L=L+1
1080 FOR J=L TO I+1 STEP -1
1090 X(J)=X(J-1)
1100 NEXTJ
1110 X(I)=S
1120 RETURN
```

Program Listing 2. Score Display Routine

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 GOTO120. 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 by using a GOTO statement and the data stored in the variables at the time of the stoppage is preserved. Once you type RUN, all variables are reinitialized and any data stored in them is lost. During a stoppage, you are not limited to only a restart with a GOTO.

Run Listing 3. When it stops type S = SQR(S) followed by GOTO130. The program will then redo the calculations on line 130 using the old values of F and N, but the new value of S, which is the square root of the old one.

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?

Harry Wheeler
Simi Valley, CA

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 Telewriter-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?

G. Herbert Gill
Joplin, MO

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 Telewriter-64, save your Basic programs in ASCII and load them into Telewriter-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 Telewriter 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).

```
10 PRINT"HOW MANY";
20 INPUT N
30 DIM M(N)
40 FOR I=1 TO N
50 PRINT"M("I")=";
60 INPUT M(I)
70 NEXT I
80 S=0
90 FOR I=1 TO N
100 S=S+M(I)
110 NEXTI
120 INPUT F
130 PRINT"AVG=";S/N,"FACTOR=";S*
F/N
```

Program Listing 3.

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?

Jerry R. Crane
Santa Maria, CA

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. With this mod, keep your jumpers set at the 16K position. 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.

Q. I need a Basic program that will:

- Print a vertical column of numbers or words, then move the cursor to the top of the screen.
- Move the cursor down one step at a time, stopping opposite each list item while I enter an appropriate response.
- Edit the list for wrong entries and change them before moving on to the next page.

John C. Knight
Kalamazoo, MI

A. 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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- ☐ 2. 4-7
- ☐ 3. 8-11
- ☐ 4. 11-15
- ☐ 5. Just the ads
- ☐ 6. Nothing

B. What type of program would you most like to see on an instant CoCo cassette? Check one only.
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- ☐ 8. Business
- ☐ 9. Other

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- ☐ 1. 4K
- ☐ 2. 16K
- ☐ 3. 32K
- ☐ 4. 64K
- ☐ 5. MC-10
- ☐ 6. TDP 100
- ☐ 7. Dragon 64K
- ☐ 8. Extended Basic
- ☐ 9. Standard Basic

E. What peripherals and accessories do you plan to purchase during the next 12 months?
- ☐ 1. Printer
- ☐ 2. Modem
- ☐ 3. Plotter
- ☐ 4. Joystick/Paddles/Graphic Tablet
- ☐ 5. Voice Synthesizer
- ☐ 6. Program Recorder
- ☐ 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. Micro
- ☐ 6. 68 Micro
- ☐ 7. Color Micro Journal
- ☐ 8. Computer

H. Do you own a cassette recorder (VCR)?
- ☐ 1. Yes
- ☐ 2. No

I. Do you think HOT CoCo is geared to: (check 3)
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- ☐ 3. Assembly-language programmers
- ☐ 4. Hardware buffs
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- ☐ 6. Disk users
- ☐ 7. Extended basic users
- ☐ 8. Color basic users

J. On a scale of 1 (no interest) to 5 (great interest) rate your interest in the following HOT CoCo columns:
- _ 1. The Basic Beat
- _ 2. Elmer's Arcade
- _ 3. Digressions
- _ 4. Reviews
- _ 5. Reader's Forum
- _ 6. Doctor ASCII
- _ 7. Product News
- _ 8. Graphically Speaking
- _ 9. Re:FLEX
- _ 10. The Educated Guest

K. If you are not a subscriber circle 500.

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2	7	12	17	22	152	157	162	167	172	302	307	312	317	322	452	457	462	467	472
3	8	13	18	23	153	158	163	168	173	303	308	313	318	323	453	458	463	468	473
4	9	14	19	24	154	159	164	169	174	304	309	314	319	324	454	459	464	469	474
5	10	15	20	25	155	160	165	170	175	305	310	315	320	325	455	460	465	470	475
26	31	36	41	46	176	181	186	191	196	326	331	336	341	346	476	481	486	491	496
27	32	37	42	47	177	182	187	192	197	327	332	337	342	347	477	482	487	492	497
28	33	38	43	48	178	183	188	193	198	328	333	338	343	348	478	483	488	493	498
29	34	39	44	49	179	184	189	194	199	329	334	339	344	349	479	484	489	494	499
30	35	40	45	50	180	185	190	195	200	330	335	340	345	350	480	485	490	495	500
51	56	61	66	71	201	206	211	216	221	351	356	361	366	371	501	506	511	516	521
52	57	62	67	72	202	207	212	217	222	352	357	362	367	372	502	507	512	517	522
53	58	63	68	73	203	208	213	218	223	353	358	363	368	373	503	508	513	518	523
54	59	64	69	74	204	209	214	219	224	354	359	364	369	374	504	509	514	519	524
55	60	65	70	75	205	210	215	220	225	355	360	365	370	375	505	510	515	520	525
76	81	86	91	96	226	231	236	241	246	376	381	386	391	396	526	531	536	541	546
77	82	87	92	97	227	232	237	242	247	377	382	387	392	397	527	532	537	542	547
78	83	88	93	98	228	233	238	243	248	378	383	388	393	398	528	533	538	543	548
79	84	89	94	99	229	234	239	244	249	379	384	389	394	399	529	534	539	544	549
80	85	90	95	100	230	235	240	245	250	380	385	390	395	400	530	535	540	545	550
101	106	111	116	121	251	256	261	266	271	401	406	411	416	421	551	556	561	566	571
102	107	112	117	122	252	257	262	267	272	402	407	412	417	422	552	557	562	567	572
103	108	113	118	123	253	258	263	268	273	403	408	413	418	423	553	558	563	568	573
104	109	114	119	124	254	259	264	269	274	404	409	414	419	424	554	559	564	569	574
105	110	115	120	125	255	260	265	270	275	405	410	415	420	425	555	560	565	570	575
126	131	136	141	146	276	281	286	291	296	426	431	436	441	446	576	581	586	591	596
127	132	137	142	147	277	282	287	292	297	427	432	437	442	447	577	582	587	592	597
128	133	138	143	148	278	283	288	293	298	428	433	438	443	448	578	583	588	593	598
129	134	139	144	149	279	284	289	294	299	429	434	439	444	449	579	584	589	594	599
130	135	140	145	150	280	285	290	295	300	430	435	440	445	450	580	585	590	595	600

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Graphically Speaking

RECTANGULAR-COORDINATE SYSTEMS

by Delmar E. Searls

At 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 line 1 of Program Listing 1) corrects this distortion. On my TV, a value of 1.25 for SF produces round circles. This means that five pixels represent a distance of four on the X axis. Consequently, 128 pixels equal a distance of about 102 on the X 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 X value 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:

I. Draw the axes
  A. Draw the X axis
  B. Draw the Y axis

II. Label the axes
  A. Label the X axis
  B. Label the Y axis

III. 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 DRAW 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.

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.

```
0 PI=3.141592:GOSUB1:GOTO1000
1 INPUT"SCALE FACTOR <1.25>";SF:
PMODE4,1:PCLS:IF SF=0 THEN SF=1.
25
2 X0=128:Y0=96:X=0:Y=0:M=-1:GOSU
B10:RETURN
7 :
8 REM **** PLOT SUBROUTINE ****
9 :
10 XX=INT(SF*X+.5):YY=INT(Y+.5):
IFABS(M)=2THENSX=SX+XX:SY=SY-YY:
GOTO12
11 SX=X0+XX:SY=Y0-YY
12 IFSX<0THENSX=0ELSEIFSX>255THE
NSX=255
13 IFSY<0THENSY=0ELSEIFSY>191THE
NSY=191
14 P$=STR$(SX)+","+STR$(SY):IFM>
0THENDRAW"M"+P$ELSEDRAW"BM"+P$
15 IFM=-3THENX0=SX:Y0=SY
16 RETURN
100 :
101 '*************************
102 '*                       *
103 '*  THIS PROGRAM DRAWS   *
104 '*  GRAPHS ON A RECTANG- *
105 '*  ULAR COORDINATE SYS- *
106 '*  TEM.  SCALING AND    *
107 '*  AND TRANSLATION CAN  *
108 '*  BE INCLUDED BY MAKING *
109 '*  CHANGES INDICATED IN *
110 '*  LISTING 2, AND TABLES *
111 '*  1 AND 2.             *
112 '*                       *
113 '*************************
114 :
1000 SCREEN1,0
1490 :
1491 REM **** DRAW COORDINATE AX
ES ****
1492 :
1497 :
1498 REM - DRAW X-AXIS
1499 :
1500 X=100:Y=0:M=-1:GOSUB 10
1510 X=-100:M=1:GOSUB 10
1517 :
1518 REM - TICK MARKS
1519 :
1520 FOR X=-100 TO 100 STEP 20:I
F X=0 THEN 1550
1530 :  Y=2:M=-1:GOSUB 10
1540 :  Y=-2:M=1:GOSUB 10
1550 NEXT X
1597 :
1598 REM - DRAW Y-AXIS
1599 :
1600 X=0:Y=95:M=-1:GOSUB 10
1610 Y=-95:M=1:GOSUB 10
1617 :
1618 REM - TICK MARKS
1619 :
1620 FOR Y=-80 TO 80 STEP 20:IF
```

Listing continued

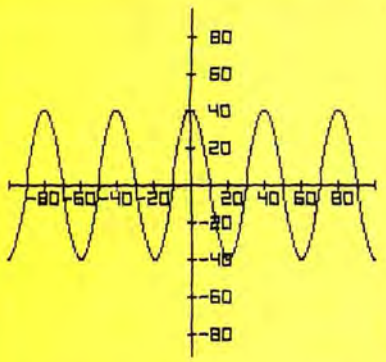


*Fig. 1. A printout of the screen display produced by Program Listing 1. The function is Y=40 * COS(PI * X/20).*

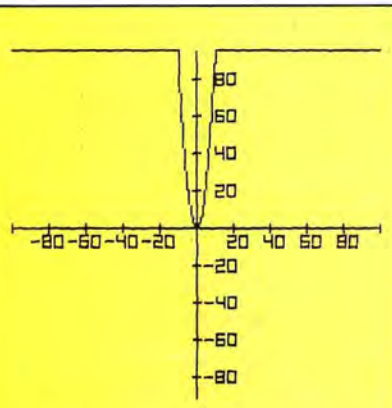


*Fig. 2. Without a clipping routine, Program Listing 1 produces incorrect results for some functions. The graph of Y=X * X rises above the screen limits. Line 13 in the Plot subroutine prevents this from happening.*

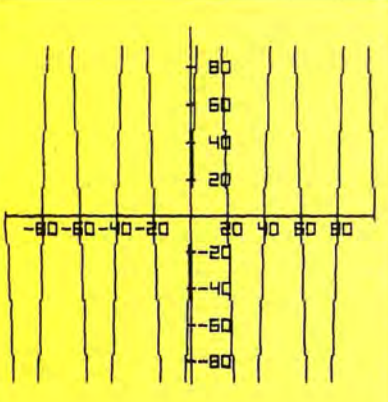


Fig. 3. With a simple clipping routine added to the program, a graph can exceed the screen limits many times and still be plotted correctly. Those portions lying beyond the screen limits are simply discarded.

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 FN Y(X)=200 * 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).

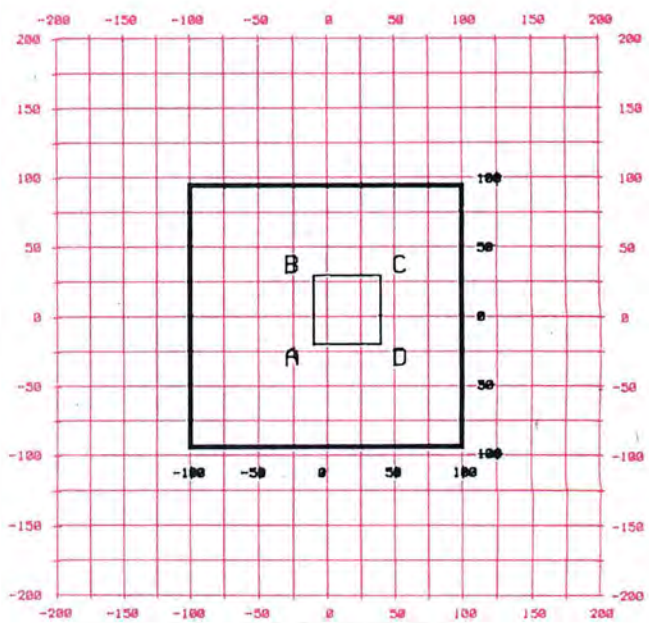
Transformations

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



VERTEX	COORDINATES WORLD	SCREEN
A	(−10,−20)	(−10,−20)
B	(−10,+30)	(−10,+30)
C	(+40,+30)	(+40,+30)
D	(+40,−20)	(+40,−20)

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/XS, and Y=Y/YS
World to screen: X=X*XS, and Y=Y*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 factor for either axis is one. Line 2050 converts the screen's X coordinate to a world coordinate, which is printed out as a label on the X axis. Line 2160 does the same when printing labels 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 this program, you will discover a problem 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:

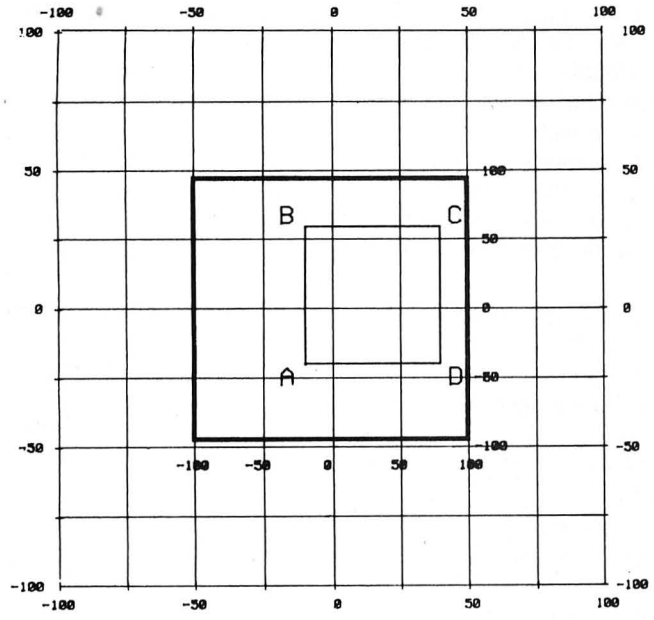
```
2020 INPUT "PRINT LABELS <N>";A$:
SCREEN1,1:IF A$<>"Y" THEN 3000
```

Listing continued

```
Y=0 THEN 1650
1630 :  X=2:M=-1:GOSUB 10
1640 :  X=-2:M=1:GOSUB 10
1650 NEXT Y
1995 :
1996 :
1997 REM **** LABEL THE AXES ***
*
1998 :
1999 :
2000 FOR I=0 TO 9:READ N$(I):NEX
T I : REM - READ STRINGS
2007 :
2008 REM - STRINGS FOR DRAW COMM
AND (USED TO PRINT LABELS)
2009 :
2010 DATA "BM-2,-3R4D6L4U6"
2011 DATA "BM+0,-3D6"
2012 DATA "BM-2,-3R4D3L4D3R4"
2013 DATA "BM-2,-3R4D3NL4D3L4"
2014 DATA "BM-2,-3D3R4NU3D3"
2015 DATA "BM+2,-3L4D3R4D3L4"
2016 DATA "BM+2,-3L4D6R4U3L4"
2017 DATA "BM-2,-3R4D6"
2018 DATA "BM-2,-3R4D6L4U3NR4U3
"
2019 DATA "BM-2,3R4U6L4D3R4"
2027 :
2028 REM - LABEL THE X-AXIS
2029 :
2030 FOR I=-80 TO 80 STEP 20:IF
I=0 THEN 2070
2040 :  X=I-7:Y=-7:M=-1:GOSUB 10
:  REM   BLANK MOVE TO LABEL LOC
ATION
2050 :  A$=STR$(I):N=LEN(A$):  R
EM  CONVERT LABEL TO STRING AND
FIND LENGTH
2060 :  GOSUB 2500
2070 NEXT I
2097 :
2098 REM - LABEL Y-AXIS
2099 :
2100 FOR I=-80 TO 80 STEP 20:IF
I=0 THEN 2140
2110 :  X=6:Y=I:M=-1:GOSUB 10
2120 :  A$=STR$(Y):N=LEN(A$)
2130 :  GOSUB 2500
2140 NEXT I
2150 GOTO 3000
2497 :
2498 REM - DRAW CHARACTERS IN LA
BEL
2499 :
2500 FOR J=1 TO N
2510 :  B$=MID$(A$,J,1):IF B$="
" THEN 2550
2520 :  IF B$="-" THEN DRAW "L2R
4":SX=SX-2:GOTO 2550
2530 :  IF B$="." THEN DRAW "BM-
4,2DLUR":SX=SX-6:GOTO 2550
2540 :  DRAW N$(VAL(B$))
2550 :  X=6:Y=0:M=-2:GOSUB10
2560 NEXT J
2570 RETURN
2997 :
2998 REM **** DRAW THE GRAPH DEF
INED IN LINE 3000 ****
2999 :
3000 DEF FN Y(X)=40 * COS(PI*X/2
0)
3010 X=-100:Y=FN Y(X):M=-1:GOSUB
 10 :  REM   BLANK MOVE
3020 FOR X=-99 TO 100
3030 :  Y=FN Y(X):M=1:GOSUB 10 :
  REM  DRAW LINES TO EACH SUCCEE
DING POINT
3040 NEXT X
3050 SOUND 150,5
3060 GOTO 3060
```

```
3000 DEF FN Y(X)=100*COS(PI*X/20
)
3010 X=-100
3020 Y=FN Y(X):IF ABS(Y)>95 THEN
 X=X+1:IF X>100 THEN 3080 ELSE 3
020
3030 M=-1:GOSUB 10
3040 FOR X=X+1 TO 100
3050 :  Y=FN Y(X):IF ABS(Y)>95 T
HEN X=X+1:GOTO 3020
3060 :  M=1:GOSUB 10
3070 NEXT X
3080 SOUND 150,5
3090 GOTO 3090
```

Program Listing 2. A simple clipping routine can be added by substituting these lines for lines 3000–3060 of Listing 1.



VERTEX	COORDINATES WORLD	SCREEN
A	(-10,-20)	(-20,-40)
B	(-10,+30)	(-20,+60)
C	(+40,+30)	(+80,+60)
D	(+40,-20)	(+80,-40)

SCREEN TO WORLD: X=X/2, Y=Y/2

WORLD TO SCREEN: X=X*2, Y=Y*2

Fig. 4b. This figure illustrates scaling, which in this example is equivalent to viewing the scene from half the previous distance. Notice that the world coordinates for each vertex remain the same, but the screen coordinates have doubled. This graph illustrates translation.

```
40 X=X/XS:Y=Y/YS:RETURN
50 X=X*XS:Y=Y*YS:RETURN

1000 GOTO 1020
1020 CLS:INPUT "SCALE FACTOR FOR X-AXIS <1>";XS:IF XS=0
THEN XS=1
1030 INPUT "SCALE FACTOR FOR Y-AXIS <1>";YS:IF YS=0 THEN
YS=1
1040 SCREEN1,0

2050 :  X=I:GOSUB 40:A$=STR$(X):N=LEN(A$)

2120 :  GOSUB 40:A$=STR$(Y):N=LEN(A$)


3020 GOSUB 40:Y=FN Y(X):GOSUB 50
3025 IF ABS(Y)>95 THEN X=X+1:IF X>100 THEN 3080 ELSE 3020

3050 :  GOSUB 40:Y=FN Y(X):GOSUB 50
3055 :  IF ABS(Y)>95 THEN X=X+1:GOTO 3020
```

Table 1. These changes and additions, when incorporated into Listing 1, allow you to transform the graph by scaling.

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−50 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.

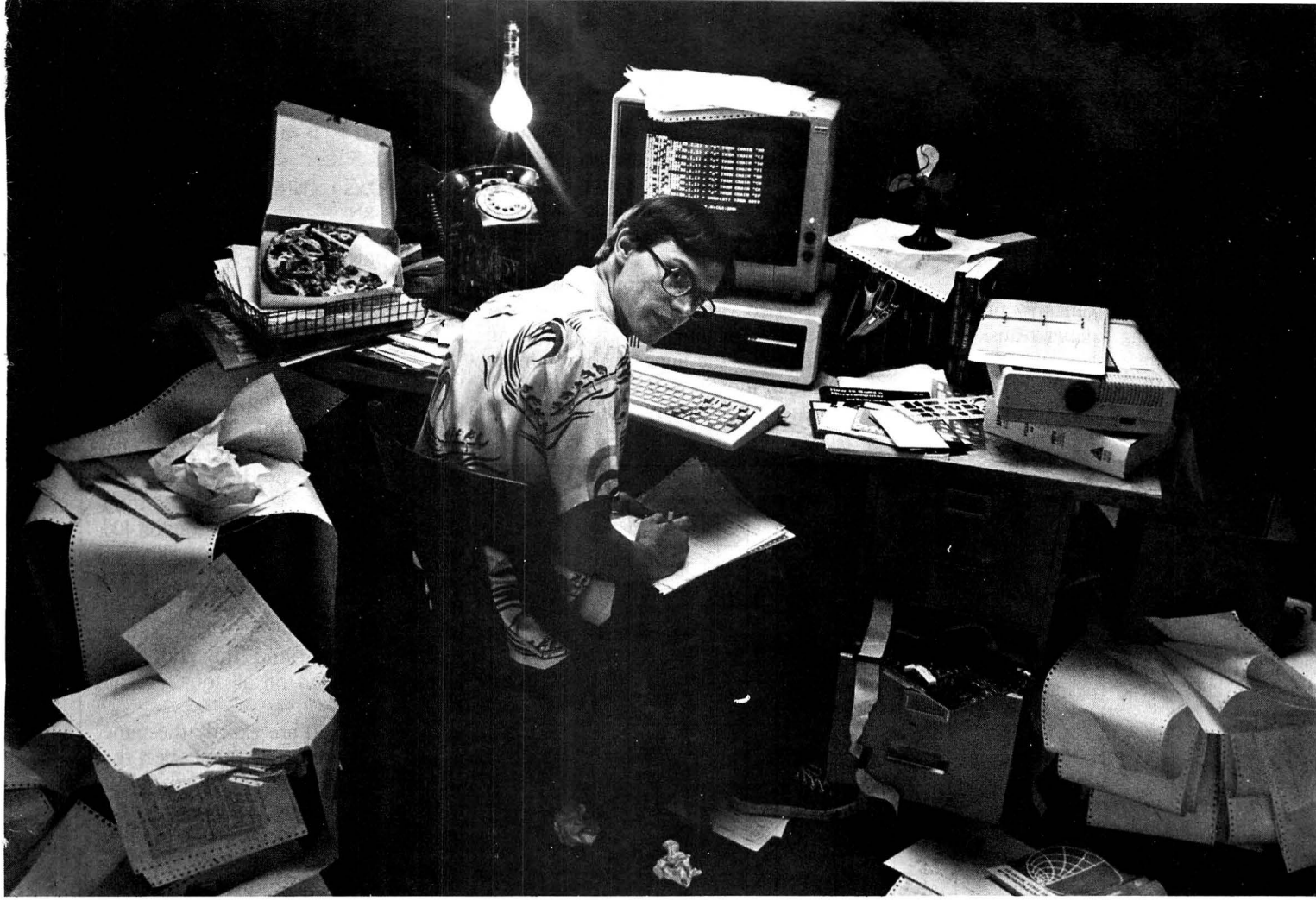
Run the program again using a horizontal translation of 20 and a vertical translation of −60. You are moving the center of the display 20 units to the right and down 60 units relative to the world-coordinate system. This graph is a parabola whose lowest point is in the center of the screen. The labels 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:

```
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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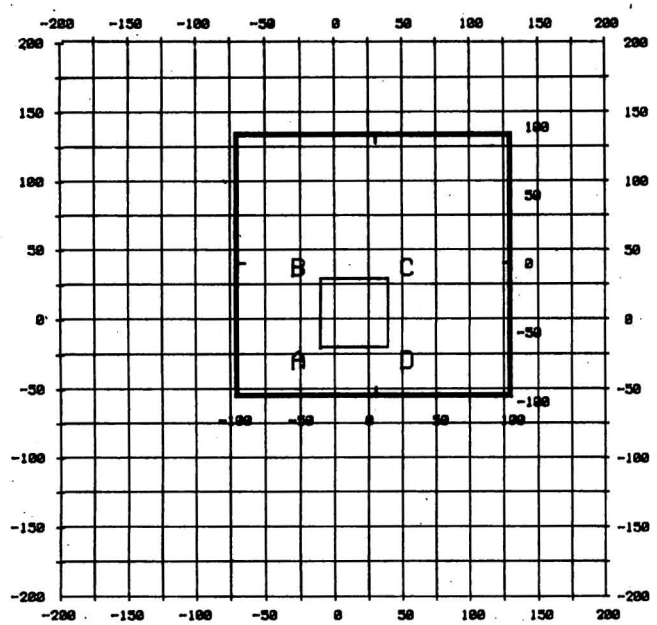
5, and a vertical scale factor of 2. Now alter lines 40 and 50 as indicated:

```
40 X=X/XS : Y=Y/YS : X=X+XT : Y=
   Y+YT : RETURN
50 X=X-XT : Y=Y-YT : X=X*XS : Y=
   Y*YS : 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
```



VERTEX	COORDINATES WORLD	SCREEN
A	(-10,-20)	(-40,-60)
B	(-10,+30)	(-40,-10)
C	(+40,+30)	(+10,-10)
D	(+40,-20)	(+10,-60)

SCREEN TO WORLD: X=X+30, Y=Y+40

WORLD TO SCREEN: X=X-30, Y=Y-40

Fig. 4c. The screen view is now centered over the point whose world coordinates are (30,40). In either transformation the world coordinates of a given point remain constant while the screen coordinates change.

```
40 X=X+XT:Y=Y+YT:RETURN
50 X=X-XT:Y=Y-YT:RETURN


1000 CLS:INPUT "HORIZONTAL TRANSLATION <0>";XT
1010 INPUT "VERTICAL TRANSLATION <0>";YT
```

Table 2. These changes should be included after the changes in Table 1. They allow you to transform the graph by translation.

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 (S0) 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 * I−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–

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```
10 PI=3.141592:GOTO1000
40 X=X/XS+XT:Y=Y/YS+YT:RETURN
50 X=INT((X-XT)*XS+.5):Y=INT((Y-
YT)*YS+.5):RETURN
100 '*************************
101 '*                       *
102 '*  THIS PROGRAM DRAWS   *
103 '*  GRAPHS ON THE COLOR  *
104 '*  GRAPHIC PRINTER.  IT *
105 '*  INCLUDES CLIPPING,   *
106 '* SCALING, & TRANSLATION *
107 '*                       *
108 '*************************
997 :
998 REM **** USER INPUT ****
999 :
1000 CLS:INPUT "HORIZONTAL TRANS
LATION <0>";XT
1010 PRINT:INPUT "VERTICAL TRANS
LATION <0>";YT
1020 CLS:INPUT "SCALE FACTOR FOR
 X-AXIS <1>";XS:IF XS=0 THEN XS=
1
1030 PRINT:INPUT "SCALE FACTOR F
OR Y-AXIS <1>";YS:IF YS=0 THEN Y
S=1
1040 CLS:INPUT "NO. OF STEPS BET
WEEN SUCCESSIVE VALUES OF X <4>"
;SS:IF SS=0 THEN SS=4
1995 :
1996 REM **** DRAW AND LABEL THE
 GRID ****
1997 :
1998 REM - INITIALIZE THE PLOTTE
R
1999 :
2000 PRINT#-2,CHR$(18);"C0":PRIN
T#-2,"A"
2010 PRINT#-2,CHR$(18);"M40,0"
2017 :
2018 REM  -  DRAW THE BLACK BORD
ER
2019 :
2020 PRINT#-2,"X1,25,16"
2030 PRINT#-2,"X0,-25,16"
2040 PRINT#-2,"X1,-25,16"
2050 PRINT#-2,"X0,25,16"
2060 PRINT#-2,"R200,-200":PRINT#
-2,"I":PRINT#-2,"S0"
2097 :
2098 REM - DRAW LABELS ON LEFT (
TOP TO BOTTOM)
2099 :
2100 FOR I=4 TO -4 STEP -1
2110 :  Y=50*I:GOSUB 40:A$=STR$(
Y):N=LEN(A$)
2120 :  PRINT#-2,"M";-210-6*N;",
";50*I-4:PRINT#-2,"P";A$
2130 NEXT I
2197 :
2198 REM - DRAW LABELS ON BOTTOM
 (LEFT TO RIGHT)
2199 :
2200 FOR I=-4 TO 4
2210 :  X=50*I:GOSUB 40:A$=STR$(
X):N=LEN(A$)/2
2220 :  PRINT#-2,"M";50*I-6*N;",
";-217:PRINT#-2,"P";A$
2230 NEXT I
2297 :
2298 REM - DRAW LABELS ON RIGHT
(BOTTOM TO TOP)
2299 :
2300 FOR I=-4 TO 4
2310 :  Y=50*I:GOSUB 40:A$=STR$(
Y)
2320 :  PRINT#-2,"M210,";50*I-4:
PRINT#-2,"P";A$
2330 NEXT I
2397 :
2398 REM - DRAW LABELS ON TOP (R
IGHT TO LEFT)
2399 :
2400 FOR I=4 TO -4 STEP -1
2410 :  X=50*I:GOSUB 40:A$=STR$(
X):N=LEN(A$)/2
2420 :  PRINT#-2,"M";50*I-6*N;",
210":PRINT#-2,"P";A$
2430 NEXT I
2497 :
2498 REM - DRAW HORIZONTAL GRID
LINES
2499 :
2500 PRINT#-2,"C3"
2510 FOR I=7 TO -7 STEP -1
2520 :  Y=25*I:GOSUB 40
2530 :  IF INT(I/2)=I/2 THEN K=1
 ELSE K=-1
2540 :  PRINT#-2,"M";200*K;",";2
5*I:IF Y=0 THEN PRINT#-2,"C0"
2550 :  PRINT#-2,"J";-400 * K;",
0"
2560 :  IF Y=0 THEN PRINT#-2,"C3
"
2570 NEXT I
2597 :
2598 REM - DRAW VERTICAL GRID LI
NES
2599 :
2600 FOR I=7 TO -7 STEP -1
2610 :  X=25*I:GOSUB 40
2620 :  IF INT(I/2)=I/2 THEN K=1
 ELSE K=-1
2630 :  PRINT#-2,"M";25*I;",";20
0*K:IF X=0 THEN PRINT#-2,"C0"
2640 :  PRINT#-2,"J0,";-400*K
2650 :  IF X=0 THEN PRINT#-2,"C3
"
2660 NEXT I
2670 PRINT#-2,"S1":PRINT#-2,"C0"

2997 :
2998 REM **** DRAW THE GRAPH ***
*
2999 :
3000 DEF FN Y(X)=2500/X
3010 X=-200
3020 GOSUB 40:Y=FN Y(X):GOSUB50
3030 IF ABS(Y)>200 THEN X=X+SS:I
F X>200 THEN 3110 ELSE 3020
3040 PRINT#-2,"M";X;",";Y
3050 FOR I=X+1 TO 200 STEP SS
3060 :  X=I
3070 :  GOSUB 40:Y=FN Y(X):GOSUB
 50
3080 :  IF ABS(Y)>200 THEN X=X+S
S:GOTO 3020
3090 :  PRINT#-2,"D";X;",";Y
3100 NEXT I
3110 PRINT#-2,"A"
3120 SOUND 200,1
3130 GOTO 3130
```

Program Listing 3. Because of the greater resolution of the Color Graphics Printer, graphs can be drawn in greater detail and the labels are much neater. The grid is drawn in red and the graph is drawn in black.

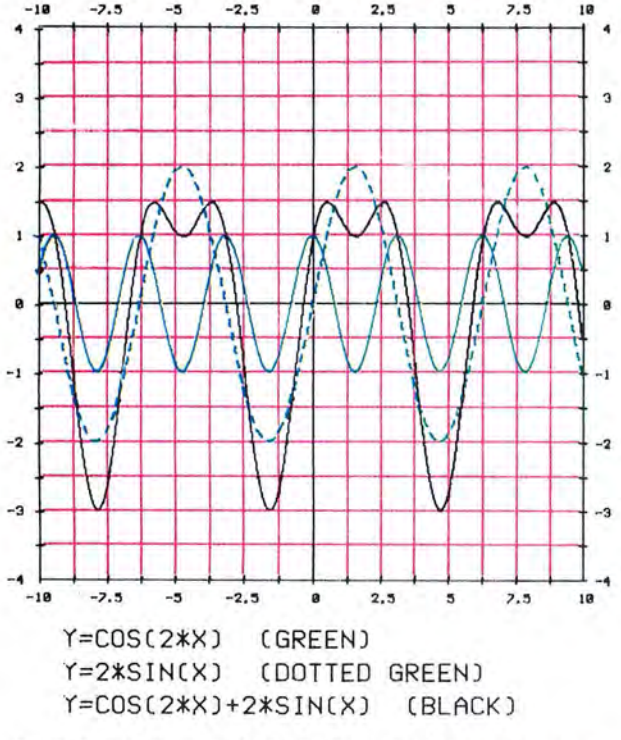

Fig. 5. Graphs drawn on the Radio Shack Color Graphics Printer using Program Listing 3 include the grid lines (in red), better labeling, and sharper detail.

2230 print the labels across the bottom of the grid from left to right. Line 2200 determines the label, and line 2210 sets N equal to half of 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 Y coordinate is fixed at 17 steps below the grid, which places the label's top 10 steps below the grid. Lines 2300–2330 print the labels up the right side of the grid, and

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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 (C0 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 alternating 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 S1 (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.

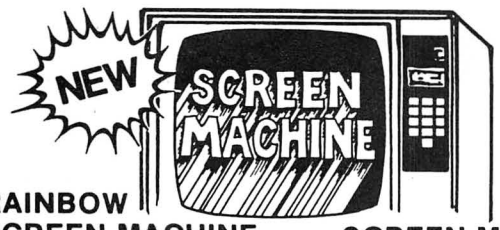
Returning to Listing 2, the plotting routine in lines 3000–3100 is identical to that used before, with a few adjustments to accommodate the higher resolution of the plotter. Line 3110 returns the Color Graphics Printer to text mode, and line 3120 produces a beep signalling completion of the graph.

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. Searls, c/o HOT CoCo, *Pine St., Peterborough, NH 03458.*

From the Creators of Rainbow Writer . . .



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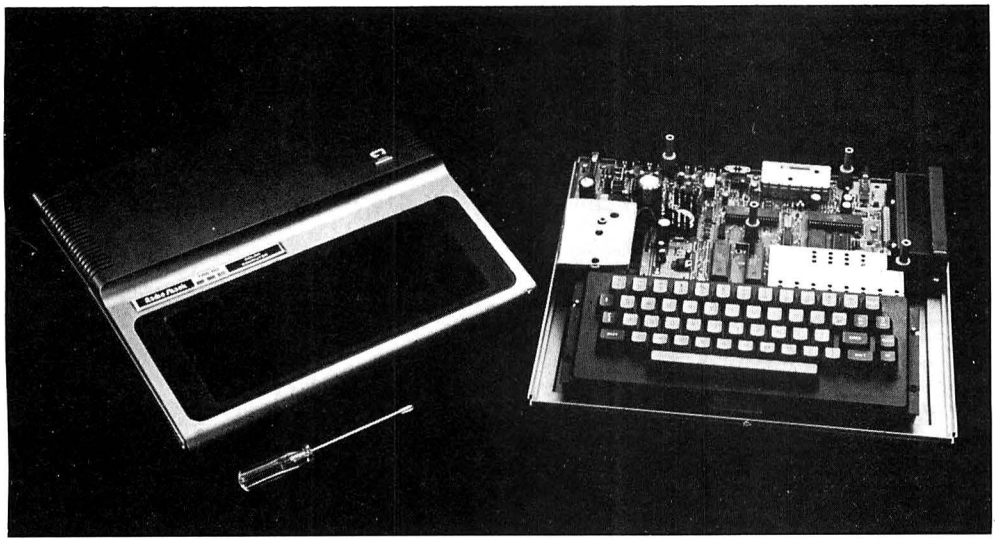
PRODUCT NEWS

edited by Cynthia Smith



Key Tronic Corporation's Full-Travel Keyboard

The information used in the Product News section is supplied through manufacturers' press releases. *HOT CoCo* has not tested or reviewed these products and cannot guarantee any manufacturer's claim.

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.

Reader Service ✓ 550

Paper Tractor

A new device has been announced that is designed to answer the complaint "Why can't I use regular paper in my computer printer?" Paper Tractor carries paper through your printer by the normal tractor mechanism and it carries nonedge-perforated paper.

Paper Tractor is available from Paper Tractor Ltd., 1 South Fairview, Goleta, CA 93117. 805-683-2851.

Reader Service ✓ 551

New From K&K

Here are some new items from K&K Computors.

- 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.
- In Space Quest you venture from planetoid to planetoid and galaxy to galaxy searching for gold, rubies, diamonds, and precious minerals. Strange aliens and thugs await you and your decision to buy, sell, or run. It is written in Basic with machine-language subroutines and high-resolution graphics for $15.95 cassette and $19.95 disk.
- Super Duper is a menu-driven machine-language program that can read or write any type of program on file. It adds an auto-start preloader to almost any machine-language program and displays the starting, ending, and execution addresses for the program or file you are copying. This program is accompanied by a description of how to put the starting address of your machine-language program into the reset vector address. Super Duper requires 16K and a cassette recorder and sells for $19.95.
- Start your day off right with a Biorhythm chart from the CoCo. Check details on your energy, sensitivity, and impending luck (or lack of it). $15.95 cassette, $19.95 disk.

All products are available from K&K Computors, P.O. Box 833, Sterling Heights, MI 48077. 313-739-6936.

Reader Service ✓ 552

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 × 178.

Reader Service ✓ 553

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 descenders 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-

able text merge that allows generation of texts that can include paragraphs, sentences, or addresses from previously created files. An include feature for the disk version permits inclusion of many other files within one large document, and sequentially numbering the pages. In the editor function, changes can be made by either insertion or by typing over the old text. There is automatic screen word-wrap even while inserting new text.

Blocks of text can be copied, deleted, or moved. A type-ahead keyboard buffer means characters will not be lost. The cursor moves up and down from wherever it is located in the text, and does not have to return to the left margin when the arrow keys are pushed. An automatic key repeat function is included, and all I/O errors are trapped and recoverable.

The disk version loads instantaneously and there are no overlay files to slow operation. The amount of free disk space and the disk directory can be displayed, and you can display or change the default disk drive number. Printer font codes are user-definable and all printer format options can be displayed or changed.

Elite*Word word processor is all machine language and requires 32K and Extended Basic for ROM calls. Its price is $59.95 for tape or disk, plus $2 for shipping. Contact Elite Software, Box 11224, Pittsburgh, PA 15238. 412-795-8492.

Reader Service ✓ 554

How Do You Get to Venus?

This scientific program from Moses Engineering is a patched conic trajectory program designed to give first approximations 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.

Reader Service ✓ 555

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 Basic, 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 occupies the upper 3,225 bytes of each bank and manages all bank switching and interbank communications. Also included are graphics viewing, block memory move, and foreground/background multitasking commands through extensions to the Basic interpreter.

The Basic command set is expanded by 15 additional statements and one additional function into either Extended or Disk Basic. You will find eight keyboard commands to allow switching 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 either cassette- or disk-based systems, requires Extended or Disk Basic, and will work on 32K systems with E, F, or modified D boards, as well as with the newer 64K model. It is available on cassette for $39.95 plus $2 shipping from Key Color Software, P.O. Box 360, Harvard, MA 01451. 617-263-1737.

Reader Service ✓ 556

Colour Software Workbench

The Colour Software Workbench is a complete set of software development tools, from the entering of source code through the execution of the resulting machine program. It is comprised of the following software packages:

- Text Editor—a screen-mode, in-memory text editor with movable window into a text file. It is a tool for developing Pascal and Assembly source programs. With the Color Text Editor text files can be read and merged from either cassette, disk, or the printer.
- Pascal Compiler—a fully recursive compiler that processes Pascal program statements into machine-executable binary for the CoCo's 6809 microprocessor. It is equipped with compiler directives and comprehensive source listing aids such as meaningful error messages and optional corresponding Assembly-language representations of all Pascal statements.
- Object Linker—a program that reads the program object files produced by the Pascal Compiler and 6809 macro-assembler and converts them into machine-executable binary image files—load modules suitable for loading with the CoCo's LOADM command.
- Macro-Assembler—a Motorola-compatible macro-assembler that processes Motorola 6809 Assembly-language statements for the CoCo's 6809 microprocessor.
- Symbolic Debugger—when linked to a program developed with the Colour Software Workbench, provides a window into the CoCo's 6809 execution of that program at the machine level.

The Colour Software Workbench requires at least 32K of memory, Extended Disk Basic, and one disk drive, and sells for $150. You can get further details and ordering information from DEFT Systems Inc., P.O. Box 359, Damascus, MD 20872. 1-800-368-3238.

Reader Service ✓ 557

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 right to disk, and add a modification that allows them to run normally 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 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, Woodhaven, NY 11421. 212-441-2807.

Reader Service ✓ 558

Mailing-List Program

JCL Data Processing Services has developed a Mailing List program 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 program are the ability to input up to 1,224 names, to create back-up tapes of your name and address files, to restore corrupted disk files from tape, and to direct output to your printer, CRT, or a disk file. Each address can be individually accessed and modified or deleted. Labels or listings can be printed for all entries on file, or only for entries within a specified zip, town, and so on. It also gives you the option to sort file by any field desired.

The $49 price includes a cassette copy of the Basic source code program, and a comprehensive user's manual. Contact JCL Data Processing Services, P.O. Box 233, Spotwood, NJ 08884.

Reader Service ✓ 559

Multi-Function Subsystem

Magnum Distributing has introduced the CMJ-IF, a multi-function subsystem for the Radio Shack TRS-80 Color Computer and the TDP System 100 Personal Computer. The CMJ-IF plugs into the cartridge port and provides speech synthesis, two parallel ports, 4K or 8K of EPROM/ROM space, two counter timers, 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 communications line is for connection to serial printers or modem, and gives versatility and compatibility. Counter/timers are useful for timing and counting functions (real-time clock) all under software control and access.

The CMJ-IF is priced under $200. Contact Magnum Distributors Inc., 1000 S. Dixie Hwy. W. #3, Pompano Beach, FL 33060. 305-785-2002.

Reader Service ✓ 560

Mark Data Accounting Package

Mark Data Products has released a new double-entry accounting package for the Color Computer. This accounting system is for the small-business man who needs a fast, efficient means to process the information required at tax time.

The system is a family of programs that operate by means of a menu selection scheme. When the operator selects a task, the computer loads a program designed to handle that task from the system disk. The system disk con-

tains all the programs required to create, update, and maintain data files and prepare the necessary accounting reports including a transaction journal, a P&L or income report, and an iterim or trial balance, and balance sheet.

Up to 255 separate accounts can be defined, and a single disk system can hold over 1,400 transactions. A machine-language program is included with the system to automatically enhance the monitor screen to a 51 character by 24 line display. 32K of memory and an 80-column printer with one or more disk drives are required.

The package is available on disk with a detailed operating manual for $99.95 from Mark Data Products, 24001 Alicia Parkway, #207, Mission Viejo, CA 92691. 714-768-1551.

Reader Service ✓ 561

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.

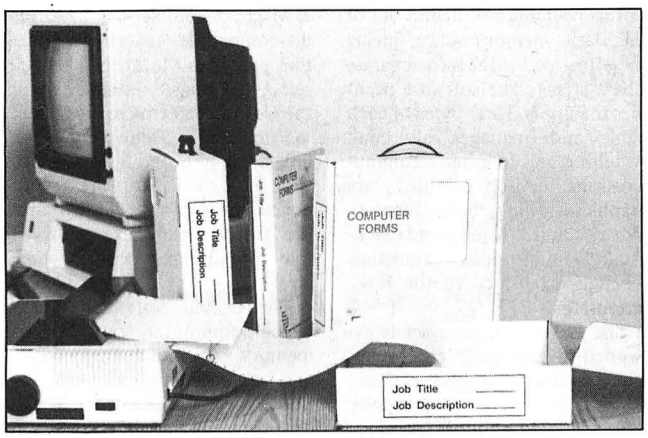
These programs run on Apple, Atari, Commodore 64, IBM-PC, and TRS-80 CoCo and Model III machines. Annual membership for a school is $250, and start-up license fee is $500.

Schools interested should contact Bertamax Inc., 3647 Stone Way North, Seattle, WA 98103. 206-547-4056.

Reader Service ✓ 562

Toward Computer Literacy

Computer Literacy Activities for Elementary and Middle School Students is a collection of 12 introductory activities for computer literacy concepts that is designed especially for elementary and middle school teachers. It contains all the background information necessary for the lessons. In addition to computer literacy, these activities encompass other areas of curriculum, and most do not require computer access.



Brief Case Boxes make paper supplies manageable

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 nonthreatening development of computer literacy. It is also usable as a basis for classroom discussions. The booklet develops 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

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.

A variety of paper weights and qualities is available, enabling each machine user to have a manageable supply of the right type of paper on hand. You can also use them to file the processed forms when the job is completed.

Prices range from $5.20 to $25.45, depending on the kind and weight. Contact Computer Peripheral Products Inc., Denver, CO 80239. 303-322-1202.

Reader Service ✓ 567

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.

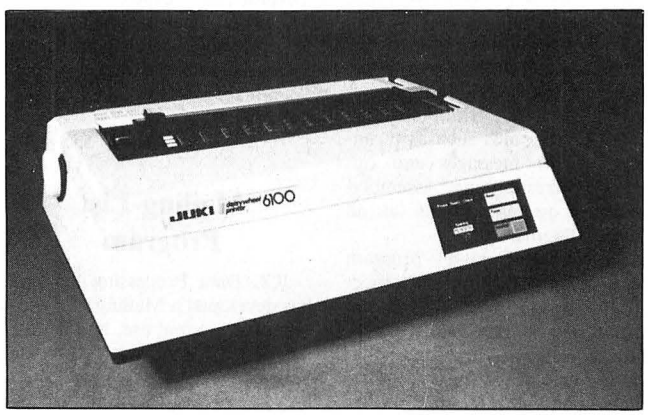
The MDP order-entry system is a family of programs that operate interactively by means of a menu selection scheme. Up to 900 products can be defined, and a single disk system can hold over 600 transactions.

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 traceable invoice of all transactions, and can be expanded.

Order from Mark Data Products, 24001 Alicia Parkway, #207, Mission Viejo, CA 92691. 714-768-1551.

Reader Service ✓ 568



The Juki Model 6100 Printer

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 cps, 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 Selectric ribbons. 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.

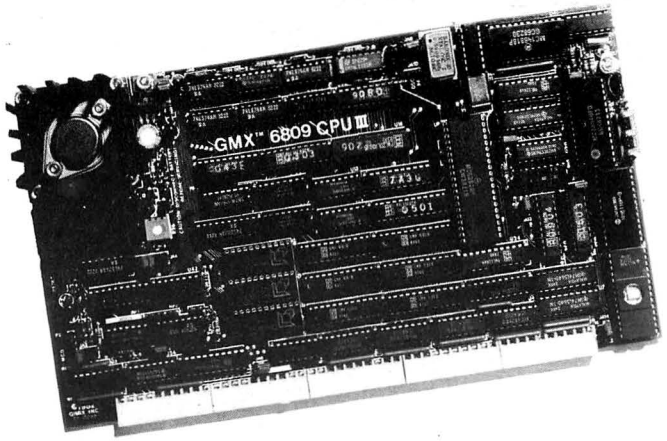
Optional paper-handling accessories include bidirectional tractor and cut sheet feeder.

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.

Reader Service ✓ 569

✓See List of Advertisers on page 130

GIMIX STATE OF THE ART 6809 SYSTEMS FOR THE SERIOUS USER.



GIMIX has 19MB or high performance 47MB Winchester Drive Systems and/or Floppy Disk Drive Systems.

For the user who appreciates the need for a bus structured system using STATIC RAM and powered by a ferro resonant constant voltage transformer.

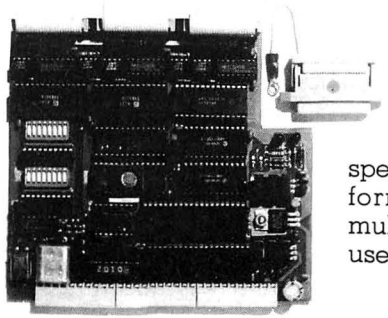
GIMIX has single user systems that can run both FLEX and OS-9 or Multi user systems for use with UniFLEX or OS-9.

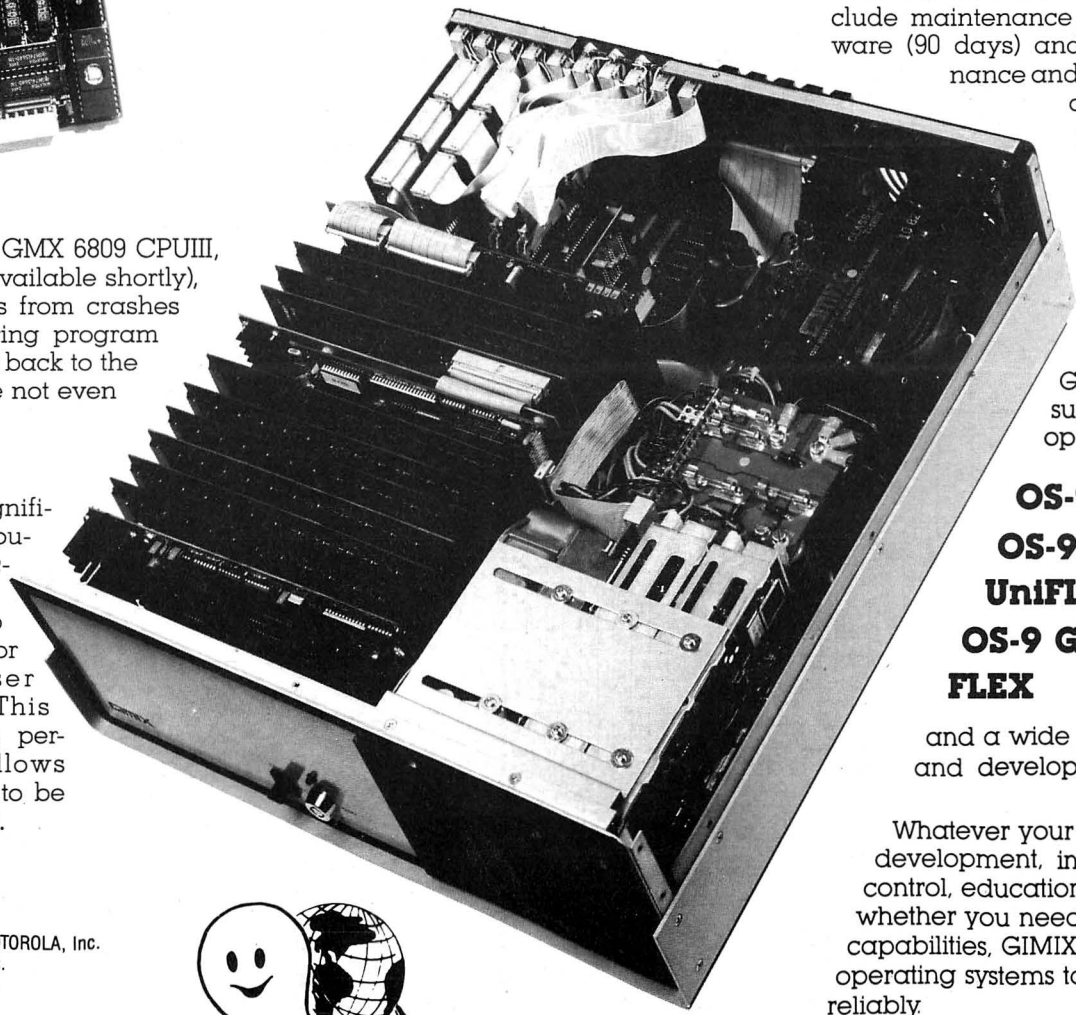
GIMIX versions of OS9 and UniFLEX include maintenance and support by Microware (90 days) and TSC (1 year). Maintenance and support after this period are available at extra cost.

(NOTE: this support and maintenance is only for use with approved GIMIX hardware)

For the ultimate in performance, the Unique GMX 6809 CPUIII, using either OS-9-GMXIII or UniFLEX GMXIII (available shortly), gives protection to the system and other users from crashes caused by defective user programs. e.g. During program development, a programmer who crashes goes back to the shell or the debugger, while the other users are not even aware anything occurred.

The intelligent serial I/O processor boards significantly reduce system overhead by handling routine I/O functions, thereby freeing up the host CPU for running user programs. This speeds up system performance and allows multiple terminals to be used at 19.2K baud.





GIMIX 6809 systems support five predominant operating systems:

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OS-9 GMX II,
UniFLEX,
OS-9 GMX I,
FLEX

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You've invested a lot of time and money into your computer . . . . .
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THE COLOR ACCOUNTANT

Introducing The Color Accountant (from The Programmer's Institute), the only complete personal financial package specifically designed for the TRS-80 Color Computer. This unique package includes:

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