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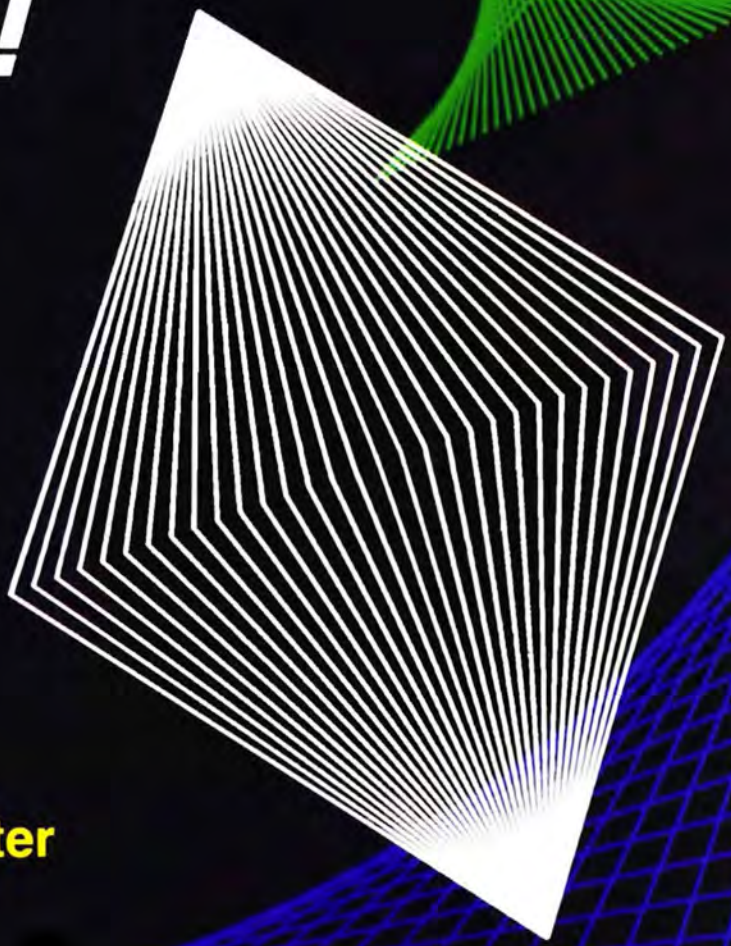

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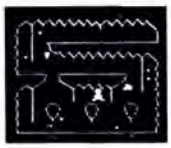

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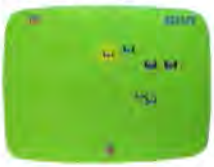

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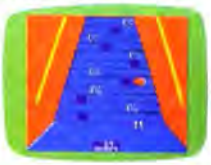

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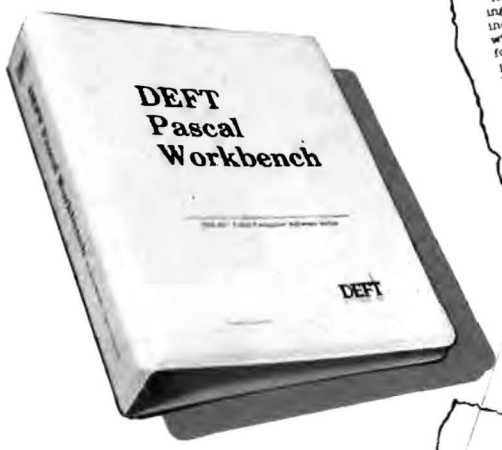

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HOT CoCo Magazine - (March 1985)

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RAINBOW Magazine - (November 1984)

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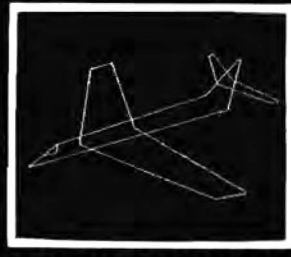

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HOT CoCo

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DIGRESSIONS

Megamemory for the CoCo

Next month's lead article in *HOT CoCo* tells you how to cram 256K of RAM memory into your Color Computer. Several vendors are advertising similar upgrades of their own—one is promising a full 1-megabyte of RAM memory!

Clearly, there is a trend in the making. Experienced CoCo users are expressing dissatisfaction with what Tandy considers a fully expanded CoCo. Replacement keyboards, 80-column cards, video drivers, and serial-to-parallel interfaces are "must-have" accessories for many. The trouble is, if you decide to improve your CoCo with these peripherals, you still have just a 64K RAM machine.

The 256K and larger upgrades are only partial solutions to the memory problem. None offer contiguous RAM—they can't. The CoCo's circuitry is incapable of addressing more than 64K at a time. The 256K upgrades can provide multiple banks of memory, hefty print spoolers, or RAM disk storage. They cannot give you the one large memory area that so much of today's sophisticated microcomputer software requires.

Many of you have had your CoCos for two, three, or even four years, and you have taken much pride in finding ways to compensate for the Color Computer's limitations. But at what point is the average CoCo user willing to expand his machine? Before I answer that, let's define the average CoCo user, using our profile of an average *HOT CoCo* reader.

The average user's CoCo has Extended Color Basic and probably 64K of memory. He is just as likely to own a cassette or disk-based system. The average user does not own a printer, modem, or Multi-Pak Interface, but does own joysticks. The average user has a greater interest in how to use his computer than in how it works. And he is a careful shopper—one who is very value conscious. The average user is just that—a user. He is not someone who can write his own software or build circuit boards.

Based on this data, the average CoCo owner will upgrade his system to 64K, but not beyond unless he sees a legitimate need. It is also likely that he will eventually buy a disk drive and a printer. In order to make using the CoCo easier on himself, the average user might also buy a video monitor and driver, an 80-column card, and Multi-Pak interface.

I don't see the average user going for the higher memory upgrades, though. It is currently an uncharted course, some versions require more work to install than most are willing to do, and there is very little software that can take advantage of the extra memory.

Let's face it. While the 128K, 256K, and even 1-megabyte upgrades are useful and viable products for many advanced CoCo users, they will never be a mainstream product for the average user, considering the state of the art and the CoCo's inherent limitations.

I hope you do experiment with more than 64K of memory if you are interested in it. If you program, you will learn a lot about memory management when you try to adapt software. If you like hardware, it makes for an enjoyable project. But if you are happy with your current setup, you won't find any advantage to giving your CoCo megamemory.—*Michael E. Nadeau*

HOT CoCo is a member of the CW Communications/Inc. group, the world's largest publisher of computer-related information. The group publishes 57 computer publications in more than 20 major countries. Nine million people read one or more of the group's publications each month. Members of the group include: Argentina's *Computerworld/Argentina*; Asia's *The Asian Computerworld*; Australia's *Computerworld Australia*, *Australian PC World*, *Macworld* and *Directories*; Brazil's *DataNews* and *MicroMundo*; China's *China Computerworld*; Denmark's *Computerworld/Danmark*, *PC World* and *RUN* (Commodore); Finland's *Mikro*; France's *Le Monde Informatique*, *Golden* (Apple), *OPC* (IBM) and *Distributique*; Germany's *Computerwoche*, *Microcomputerwelt*, *PC Welt*, *SoftwareMarkt*, *CW Edition/Seminar*, *Computer Business*, *RUN* and *Apple's*; Italy's *Computerworld Italia* and *PC Magazine*; Japan's *Computerworld Japan*; Mexico's *Computerworld/Mexico* and *CompuMundo*; The Netherland's *Computerworld Benelux* and *PC World Benelux*; Norway's *Computerworld Norge*, *PC World* and *RUN* (Commodore); Saudi Arabia's *Saudi Computerworld*; Spain's *Computerworld Espana*, *Microsistemas/PC World*, *Commodore World*; Sweden's *ComputerSweden*, *Mikrodatorn* and *Svenska PC*; the UK's *Computer Management*, *Computer News*, *PC Business World* and *Computer Business Europe*; Venezuela's *Computerworld Venezuela*; the US's *Computerworld*, *Hot CoCo*, *inCider*, *Infoworld*, *MacWorld*, *Micro Marketworld*, *PC World*, *RUN*, *73*, *80 Micro*, *Focus Publications* and *On Communications*.

Instant CoCo is a cassette tape containing the major programs from this issue of *HOT CoCo*. Its purpose is to save you the time and effort of typing long program listings into your Color Computer. You simply load the programs from the Instant CoCo tape using your cassette recorder. The instructions for operating each program are found in the corresponding *HOT CoCo* article. Both Basic and Assembly-language programs are included on the tape.

The Instant CoCo symbol appears in *HOT CoCo*'s table of contents and on the program listing for each article with a listing used on the Instant CoCo tape. As an added extra, each tape also contains a never-before-published Bonus Program, complete with instructions.

The directory below lists all programs included on this month's Instant CoCo cassette. Shown first are the name of the article with a descriptive blurb and its author, followed by the page number in this issue where the article appears. Next comes the file name of the program on cassette. Finally, there is a brief description of the Color Computer system needed to run the program.

This month's Instant CoCo cassette is available for just $11.47, including postage and handling, from **Instant CoCo, 80 Pine St., Peterborough, NH 03458.** See our ad on p. 64 for more details.

Instant CoCo Directory
August 1985

Side A

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Copyright Statement	---	TITLE	All
Mindbusters/Ramella Solve these grid puzzles.	16	GRIDSKID MOSAIC GRADEMKR	16K ECB 16K ECB 16K ECB
Designmaker/Starner Input coordinates to create geometric designs.	26	DESIGN	32K ECB
The Bar-Graph Scene/Clements Liven up reports and term papers.	31	BARGRAPH	32K DECB
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Side B

The AUTO Difference/Mikel	40	AUTONUM	32K CB or DECB
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Label Those Disks Jackets/Ray Organize your program disk library.	71	DSKJCKET	16K DECB

***** BONUS PROGRAM *****

String Art/McArthur There's beauty in the simple line.	---	STRNGART	16K ECB

CB = Color Basic, DECB = Disk Extended Color Basic, ECB = Extended Color Basic
(m) = machine-language program (use CLOADM)

Back Issues

Yes, back issues of *HOT CoCo* are available for all months. This list shows the features in each issue:

June 1983—The CoCo word processor; a serial-to-parallel interface project; and the adventure, Cavehunt.

July 1983—How to upgrade your CoCo to 64K; cure video RFI.

August 1983—Speech synthesis via software; get more colors; build a color monitor driver.

September 1983—Disk utilities; hi-res character generator.

October 1983—Animation techniques; ROM disassembly, part I.

November 1983—Nuclear submarine simulation; ROM-pack primer; banner printer.

December 1983—World capitals quiz program; talking spelling tutor; vocabulary-building program.

January 1984—Programs for the businessman and investor; ins and outs of database management.

February 1984—CoCo-aided circuit design; simulate Extended Basic in Color Basic; change your CoCo's vocabulary.

March 1984—How a disk stores information; create your own wordsearch puzzles; dental/medical bill balancer.

April 1984—Peripherals buyer's guide; how to shop for a disk drive; disk-fix utility; Lisp interpreter.

May 1984—OS-9 review; financial transactions tracker; homebrew spelling checker; CoCo Reversi game.

June 1984—Horse-racing and stock-market simulators.

July 1984—Do-it-yourself lowercase mod; variable cross-referencer; the game, Python.

August 1984—Basic-09 review; database manager program; graphics tutorials; hurricane tracker.

September 1984—Educational software buyer's guide; typing-teacher program; the CoCo as a marketing aid.

October 1984—A collection of sounds for your CoCo; how to make programs auto-execute; printer spooler.

November 1984—Personal money manager program; disk-file protection utility.

December 1984—Disk-drive timer; disk drive maintenance tips; full-featured text-editing program.

January 1985—Spreadsheet program; stock-charting program; make fancy graphics with your printer.

February 1985—Drawing program; user's group list; Space Hawks game.

March 1985—Universal screen-dump program; POKE list; utilities.

April 1985—Telewriter-64 mods; modem comparison; satellite-tracking program.

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SEPTEMBER 1984

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DUAL PROCESSING lets you review & edit while more data is coming in.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

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Compatible with TELEWRITER (ASCII) & other word processors.

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The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

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Banta, *HOT CoCo*, 9/84

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Ellers, *RAINBOW*, 11/84

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How to Use HOT CoCo

Each month *HOT CoCo* provides program listings for you to type into your Color Computer and use. If you are new to computing, read this page for advice that will help you avoid problems often encountered when entering programs manually.

Know the Basics

Before you begin, you should be familiar with the basic operation of your Color Computer. Read the manual and make sure you understand how to enter a program line, save a program to cassette or disk, and make corrections to a program line. The Color Computer manuals are well written, and you will enjoy your CoCo much more if you've read them.

Check the Requirements

The first thing you should do is make sure that the program you want to enter will run on your version of the Color Computer. You need to know the memory requirements, the type of Basic used (Color, Micro Color, Extended Color, or Disk Extended Color Basic), what peripherals might be needed, and in some cases whether a particular ROM version is needed. (See below for an explanation of the different ROMs.)

All this information is provided in the System Requirements box included with each article that has a program listing. This box gives the minimum requirements to use the program. If, for instance, the box reads "16K RAM, Color Basic," the program should also work on 32K or higher, Extended or Disk Extended Color Basic CoCos.

Once you've established that the program will work on your CoCo, read the article thoroughly. Sometimes it will include information vital to typing in the listing.

What You See is What You Get

We print all Basic program listings 32 characters across—just as they appear on your video screen. Type in the listings exactly as it appears in the magazine, being particularly careful with spaces and punctuation. If you do this, the 32-character format will aid in proofreading what you have typed in by letting you match beginning and ending characters on corresponding lines. If you have a line that ends on a character other than what appears in the magazine, go back and check for a typo.

Common Errors

Some characters are easier to confuse than others when you are typing in program listings. And since your Color Computer interprets everything literally, the smallest error can crash a program. Below is a list of characters commonly confused with one another:

zero and the letter O
colon and semicolon
lowercase l and the numeral one
uppercase B and the numeral eight

Weird Characters

The up arrow indicates exponentiation on the Color Computer. Unfortunately, most printers do not have an up arrow. Our printer prints a caret (^) instead. Be sure to type an up arrow in place of all carets in Basic program listings.

Assembly-Language Listings

HOT CoCo often publishes programs written in Assembly language rather than Basic. Assembly listings "talk" to your computer on a much more direct level; Basic requires some translation before your CoCo can execute it. Therefore, Assembly works much faster than Basic. Unfortunately, it is more difficult to learn Assembly-language programming than Basic programming.

But you do not need to know how to program in Assembly to use these programs. You do need, however, something called an editor/assembler. An editor/assembler allows you to manually enter an Assembly listing, and then it "assembles" it into a form that your CoCo can execute. Since editor/assemblers can cost as much as $80, you probably don't need one unless you want to learn Assembly-language programming.

It is possible to hand assemble an Assembly listing, but this is a tedious process that is best left to someone with a little experience with Assembly programming. It also requires a short Basic routine that prepares your CoCo for hand assembly.

We convert some Assembly programs to Basic DATA statements and include a short Basic routine to load and execute the DATA statements. This gives you a program that you can type in just like a Basic listing, yet it operates much like one written in Assembly.

If you want to run one of *HOT CoCo*'s Assembly listings, but it hasn't been converted to DATA statements and you do not own an editor/assembler, check to see if the program is included on our Instant CoCo cassette. All Assembly programs on Instant CoCo are in assembled form, meaning you can load and execute them immediately.

Speaking of DATA Statements

Since DATA statements often consist of numbers only, it is easy to make a mistake typing them in. One wrong number can crash the program or lock up your machine. When this happens, the only way to recover is often to turn off the computer for a few seconds and then turn it back on. Of course, this wipes out your program in memory.

To avoid this, always save what you have typed in before running it. That way, if you did make a mistake, you can load the program from tape or disk to look for the error, rather than retyping the entire listing.

One last thing about DATA statements: Error messages that occur due to a mistyped DATA statement line will refer to the corresponding READ statement line earlier in the program. Yet it is the DATA statement that in incorrect.

If All Else Fails

If you cannot get your typed-in listing to run after checking and double-checking for typos, you can ask us for help. Send a detailed description of your problem along with any error messages given. Ideally we'd like a printout of what you typed. Send a self-addressed, stamped envelope for the fastest reply. Sorry, but we cannot help you if you have modified the orignal program in any way. Write to *HOT CoCo, attn. Technical Editor, 80 Pine St., Peterborough, NH 03458.*

Different ROMS

Radio Shack has updated the Basic ROMs in the Color Computer several times since it was introduced. Below is a list of the ROMs and the problems and benefits you might encounter with each one:

- Color Basic 1.0—Cannot fully use the 64K upgrade and has only a 7-bit serial printer routine, which inhibits sending graphics data to a printer.
- Color Basic 1.1—Fully supports 64K and has an 8-bit serial printer routine for graphics.
- Color Basic 1.2—Executes code faster than previous versions, but changed the way the ROM reads the keyboard. This makes some software written for the older ROMs incompatible with the 1.2 ROM. There is a simple fix, which *HOT CoCo* incorporates into every program in which this problem is encountered.

If you don't know what Color Basic ROM version you have, type EXEC 41175 after you first turn on your computer. The ROM version will be printed on the screen.

- Extended Basic 1.0—Has bugs in the PCLEAR, PRINT USING, and DLOAD statements.
- Extended Basic 1.1—Fixes the abovementioned bugs.
- Disk Basic 1.0—This is in the disk controller cartridge used with the grey CoCos and grey disk drives. The 1.0 Disk ROM is incompatible with CoCo 2's.
- Disk Basic 1.1—Works faster than 1.0, but you can use the 1.1 Disk Basic controller with the older, grey CoCos. Also, many routines have been moved, making some programs written using the 1.0 Disk ROM incompatible with the 1.1 ROM. (See "A Quick Fix for Your Disk ROM," by Mike Meehan, *HOT CoCo*, February 1985, p. 44, for a utility that overcomes this incompatibilty in most cases.)■

Letters To The Editor

Wish List

HOT CoCo's new look is a great improvement. The format is attractive and the articles are cleaner and easier to follow. The pullout section is a stroke of genius. Keep it up!

My suggestions for future issues include information on OS-9, Flex, WordPak, Basic-09, and Pascal. How about a monthly column that discusses all of them? I'd also like to see occasional programming articles on these subjects. My final request is for a utility that would let me run Telewriter-64 with WordPak.

Leonard Buyer
Crownsville, MD

Look for increased OS-9 and Basic-09 coverage in upcoming issues of HOT CoCo.*—eds.*

Don't Clue Me In

As someone who has been reading your magazine for a year, I appreciate your new format. However, one thing in your publication disturbs me: people who want clues to adventure games. No experience rivals the satisfaction of seeing a solution unfold before you. Imagination is the key! I do not understand people who spend $20 to $30 on an adventure game that becomes the mechanical entering of someone else's experience.

Tim Lake
Orlando, FL

We agree. Our Game Tips section was discontinued due to low reader interest and the fact that it was turned into a "cheat sheet" for adventurers. Many adventure players appreciate having the problem solutions in print. To others it was like giving away the World Series scores before the games were played.—eds.

Critical Acclaim

I like the inside of your magazine. The new headings make the articles that I look at first—Doctor ASCII, Letters to the Editor, and Digressions—easier to read. The new, darker and bolder type style increases readability, too. I use the Instant CoCo Directory a lot to make sure I haven't missed any programs in an issue.

I must compliment *HOT CoCo* on its editorial content. But please don't spread it all over the magazine as you did in the April 1985 issue. Reader's Forum started on p. 61 and was continued on pp. 67, 77, and 84! I think letting the publisher have his own page is a very good idea. How about adding a drawing of a computer to signal the end of the articles?

My one complaint on the new format is that when I read about a program, I often refer to the program itself. I don't like having to search for the appropriate program listing.

E. Coons
Myrtle Creek, OR

One Liner

Enclosed is a one-line program that sends a disk directory to a printer. Other versions of this routine exist, but mine enables disk users to obtain an orderly printout of a disk's contents, including a disk name and the number of granules remaining. You can fasten the printout to the disk sleeve or use it in a filing procedure.

```
1 CLS:PRINT@32,"DISK DIRECTORY T
O PRINTER":PRINT:PRINT"TURN PRIN
TER ON":PRINT:INPUT"DISK READY -
 ENTER TITLE";A$:PRINT#-2,A$:POK
E111,254:DIR:PRINT#-2,"FREE =";:
PRINT#-2,FREE(Ø):PRINT:INPUT"ANO
THER ONE?";B$:IFB$<>"Y"THENCLS:E
NDELSE1
```

Michael E. Fahy
Central City, PA

BBS Systems

In *"HOT CoCo*'s BBS Phone Book" (April 1985, p. 46), you say that all you need to become a Sysop is a modem, a disk drive, and the inclination. I have a CoCo 2 and want to set up my own board. I had given up hope of finding the software to make this possible until I read your article. Please publish the names of companies selling BBS systems.

Dusty Belew

You might contact Ceratec Inc., P.O. Box 663, Elgin, TX 78621. They distribute the Colorama BBS program and will soon be releasing an upgraded version.—eds.

Cleanup Routine

Listing 2 of "Demystifying System RAM" (*HOT CoCo*, June 1983, p. 111) is a driver-head cleaning routine. The program does not move the drive head across the cleaning disk as stated. Could anyone send me a routine for moving the driver head through the full 35 or 40 tracks?

Edgar Poulin
2907 Des Ormes St.
Sherbrooke, Quebec
Canada J1L 1G3

The source of the problem might be that the program was written for the Disk ROM 1.0. You need to specify a different address if you have version 1.1. Can anyone supply this information?—eds.

Handicapped Update

My letter about computers for the handicapped (*HOT CoCo*, April 1985, p. 10) got three helpful responses. You have already printed some of the information I received (*HOT CoCo*, July 1985, p. 11). I would like to add the following resources:

Personal Computers and the Disabled
by Peter McWilliams
Quantum Press/Doubleday, 1984
(This book lists associations, services, and more for the disabled.)

American Association for the
Advancement of Science
Project on the Handicapped in Science
(Quarterly bulletin. For further information, write to Susan B. Forman, AAAS Opportunities in Science, 1515 Massachusetts Ave. NW, Washington, DC 20005.)

Howard Batie
400 Maple Court
Herndon, VA 22070
(Write for information on Handi-writer, a device made especially for the CoCo. It allows the user to select words and letters from the screen using a joystick or special five-button device.)

Rehab Technology Inc.
P.O. Box 185
Aviston, IL 62216
(Write for information on their morser, which lets anyone who can operate a single switch communicate. The user sends Morse code that is translated into an alphanumeric display on the TV screen.)

My thanks to Scott Norman, John Dalhaus, and Howard Batie for their assistance.

Dave Meredith
San Francisco, CA

Musical Keyboard

I have been shopping for a musical keyboard that I can attach to a CoCo 2. I would like to find a distributor for a keyboard of this type.

Rian Cocco
Busy Bee Electronics Inc.
102 Pinewoods Ave.
Troy, NY 12180

Baud Correction

I might be able to help Richard Volans with his ink-jet problem (*HOT CoCo*, May 1985, p. 12). The Radio Shack Hi-Res Screen Print Utilty (catalog no. 26-3121) sends graphics to the CGP-220 in the color-scan mode.

Normally, print utilties have a baud rate of 600, but the color-scan mode of the CGP-220 must send RGB (red, green, and blue) information. It takes three times as long to send information for three colors, so set the printer baud rate to 2,400.

Most people keep the printer rate at 600 baud because the CoCo transmits at that rate during startup. When the computer baud rate is slower than the printer baud rate, the printer cannot interpret information sent to it. If the computer baud rate is higher than the printer baud rate, the printer does fine. Be sure, however, that the baud rate is set to 2,400 before you turn the printer on. After you execute the utility, the right arrow accesses the utility. Press 0, 1, or 2 to turn on the appropriate color sets.

David R. Chess
New Stanton, PA

Disk Homespread

The Homespread program (HOT CoCo, *January 1985, p. 30) was written for cassette-based systems. To make the program more efficient for disk users, we have modified it so that you can save to and read from disk. If you would like a copy of the adaptation, which also contains all updates to the program, please send us your copy of Homespread on cassette or disk along with return postage.—eds.*

Assembly 101 Bug

We printed an error in June's Assembly 101 column (HOT CoCo, *June 1985, p. 83). Please delete the semicolon (;) from the LDA #128 instruction in line 0002.—eds.*

Clubhouse

Have a Color Computer Club? Let prospective members know about it through a letter to the Editor.

Nova Scotia

The Halifax Dartmouth Colour Computer Users' Group meets the second Monday of the month at 7:30 p.m. in the Findlay Community Centre. Dartmouth, NS. New members are welcome.

A. Knight
Dartmouth, NS

Tennessee

The newly formed Foothills Micro-Computer Club meets every other Tuesday night at 6:30 p.m. at the Blount County Public Library. Although most club members are CoCo users, people who own other TRS-80 computers are welcome.

Aaron Sentell
Maryville, TN

Oklahoma

The Central Oklahoma Computer Organization is a 278-member CoCo users' group. It meets at 9 a.m. on the second Saturday of each month at 10th Street and Hudson in Oklahoma City.

Robert Helms
Midwest City, OK

Australia

The Latrobe Valley Color Computer Users' Group now has 45 members and is growing. For more information, contact me at 051-34-5175 or write to me at the address below.

W. George Francis
31 Donald St.
Morwell, Victoria
Australia 3840

Valley City, ND

I would like to announce the formation of the National Musica 2 Users' Group (MUG). If you are interested, please send us your name and address, and let us know how MUG can benefit you.

Solveig Pederson
711 Third St. SE
Valley City, ND 58072

Washington, DC

We have started a CoCo/MC-10 users' group, Direct Access CoCo Club, in the Washington, DC area. We offer a monthly newsletter and useful tape programs. Send a self-addressed envelope for a free newsletter and more information.

Allen Snook
President, DAC3
5203 Wheeler Road
Oxon Hill, MD 20745

On Line

Are you operating a BBS? Send us a note to let our readers know about your service.

Youngstown, OH

The new number for the Maxi CoCo BBS 5.0 is 216-793-7353. We operate at 300 baud, 24 hours a day, 7 days a week. Our Sysop is Curt Nickel.

William Wills
Youngstown, OH

Flexnet Revamped

Please advise your readers that Flexnet of Oklahoma City no longer operates as before.

The Central Oklahoma Computer Organization purchased their hardware and software in January. The BBS now operates as CoConet 24 hours a day. The system contains CoCo and Flex programs, which you can download without paying a user-connect charge. The on-line number is 405-376-1494.

Fred Cundeiff
Oklahoma City, OK

Ventura, CA

I have established The Californian of Ventura BBS. The system operates 24 hours a day, 7 days a week and has a variety of menu selections. The number is 805-656-7390. The system is dedicated to the CoCo, but other computer users are welcome. To find out what the system runs on, read the intelligence file.

Jack Sanders
Ventura, CA

Michigan

The following Michigan BBSes support the CoCo and other TRS-80 computers:

Andy's MicroCorner	Fraser, MI	313-293-6706
Dragon's Lair	Warren, MI	313-751-4057
Good News BBS	Plymouth, MI	313-459-8375
Livonia Download	Livonia, MI	313-261-0885
The InfoEx	Livonia, MI	313-464-1335
The Serial Port	Mt. Clemens, MI	313-286-0145

They are up 24 hours a day, support 110, 300, and 1,200 baud, and have message bases and downloads.

Andy Dervan
Fraser, MI

Halifax, NS

The Halifax Dartmouth Colour Computer Users' Group BBS operates Monday through Friday from 9:30 p.m. to 9 a.m. The phone number is 902-434-5278. Peter Allen is the Sysop. Please do not call outside of operating hours—this is a business line.

A. Knight
Dartmouth, NS

Atlanta, GA

The new BBS for metropolitan Atlanta operates at night and on weekends. Call 404-255-1791.

David Tidwell
Atlanta, GA

Hamilton, Ontario

The number for Dave's CoCo Datacomm. has changed. The new number is 416-388-6717. The BBS is on line 24 hours a day; Sysop David Pearce is happy to chat if he is available.

D.O. Pearce
Hamilton, Ontario

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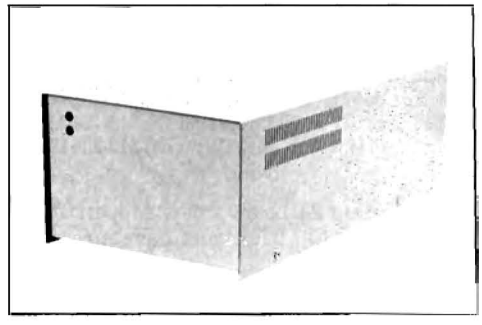

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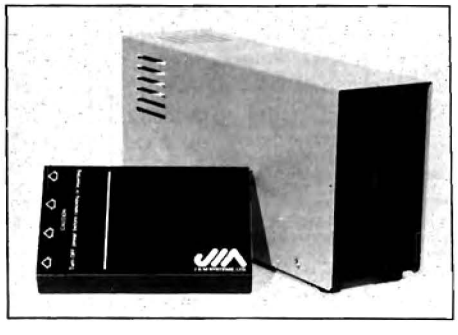

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	In Case with Power Supply	**176.95**
	Dual Drives in One Cabinet	**346.95**
65-4	Dual Sided 80 tk Bare	162.00
	In Case with Power Supply	196.95
	Dual Drives in One Cabinet	356.95
TEAC Half High Drives		
55A	Single Sided 40 tk Bare	125.00
	In Case with Power Supply	166.95
	Dual Drives in One Cabinet	316.95
55B	Dual Sided 40 tk Bare	157.00
	In Case with Power Supply	196.95
	Dual Drives in One Cabinet	356.95
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Tell them "I saw it in HOT CoCo." Circle Reader Service card #93

Doctor ASCII

by Richard E. Esposito and Jesse W. Jackson

Got a problem with your Color Computer? Ask the Doctor to solve it. Write to ***Doctor ASCII, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.*** *Be sure to include a self-addressed, stamped envelope if you want a reply. Due to the volume of mail this column receives, we cannot guarantee that your question will be published.*

Q. Where do I find information on converting Applesoft Basic programs to Extended Basic? I've converted several science programs, but I've had trouble with the strange screen format and POKEs. Is there such a thing as a 6809/6502 cross assembler, and where can I get it?

With the Z-80 CP/M card installed, can I program in Z-80 machine language?

What are memory addresses 16384 to 32767? They contain 255s, but are unchangeable.

How much memory does Tomas Rokicki's Custom Character Generator (*HOT CoCo*, September 1983, p. 104) use? Where can I get more information on Assembly-language game programming?—***Jonathon H. Davidson, Halifax, NS***

A. A good reference on the different Basic dialects is David Lien's *The Basic Handbook* (Compusoft Publishing, 1050-E Pioneer Way, El Cajon, CA 92020, $19.95). *HOT CoCo*'s sister publication, *inCider* magazine, published two articles on Apple // POKEs: The June 1984 issue, p. 17, contained information on using POKEs for memory management and the August 1984 issue, p. 107, discussed display POKEs. Also, the *Apple //c User's Handbook* has an appendix listing useful POKEs.

Computer Systems Consultants Inc. (1454 Latta Lane, Conyers, GA 30207, 404-483-1717/4570) sells their 6502 to 6809 Assembler Translator for $50 under Flex and $75 under OS-9. They also sell a cross assembler for use under Flex or OS-9 for $50 each. The Translator processes 6502 source code (not object code) and converts it into 6809 Assembly code, which you can then assemble on your CoCo.

With a CP/M card in your CoCo, you have a resident Z-80 CPU. With a CP/M editor/assembler, you can write, assemble, and execute Z-80 machine-language programs.

The addresses 16384 through 32767 do not contain any RAM on a 16K machine. Since the 6809 CPU is a digital device, every bit at every address is either a 0 or 1 as far as it's concerned. In this case, it sees 1's for the 255's. If you upgrade to 32 or 64K, this space is filled with RAM.

Tom's character generator uses 1K for code and 6K for screen memory. If you upgrade to 64K memory and enable the all-RAM mode (memory map 1), you can put the code and the screen in the $E000 + range, and as far as Basic programming is concerned, it would use no memory at all. The best source for Assembly-language game programming on the CoCo is this magazine and the other Color Computer magazines: *The Rainbow*, *Undercolor*, and *68 Micro Journal*.

Q. I would like to take a couple of exceptions to your reply to "What are the basic differences between Color and Micro Color Basic?" in the November 1984 *HOT CoCo*.

The MC-10 also supports USR(0). USR(0) has a transfer or pointer address at $4216 to $4217 (16918 to 16919). The MC-10 also contains an OFF command (machine code 166), which is listed in ROM locations $E045 to $E146 (57413 to 57680), the reserved word list.

Tandy offers the MC-10 manual (catalog no. 26-3011) for less than $10.

What does OFF do?—***F.A. Gould, Coatesville, PA***

A. At least five Micro Color Basic commands are not documented in the manual: CLOADM, EXEC, OFF, USR, and VARPTR. The syntax for using these are:

```
CLOADM or CLOADM"file name" or CLOADM"file name" OFFSET
EXEC or EXEC address
A = VARPTR(A$)
```

To use the USR function, first POKE the address of the machine-language program you wish to transfer to in locations 16918 and 16919. Use the syntax:

```
AH = INT(XA/256)
AL = XA - AH*256
POKE 16918,AH:POKE 16919,AL
X = USR(0)
```

where XA is the program's EXEC address.

The token value (166) for OFF appears to be unused, probably due to cost cutting. The ports used for the keyboard and serial functions are built into the MC-10's 6803 microprocessor. Additional latches

or ports would require decoding, a relay, and so on. This would increase both the size and cost of the MC-10. This is probably why there are no joystick ports and also why the sound is a tone generated by 1 bit, not 6 bits digital-to-analog converted as on the CoCo.

Q. I recently bought a Gorilla/Banana serial printer. I also bought the cable for my CoCo. But when I type in the PRINT# – 2 command, the printer doesn't do its job even though the computer gives the OK message.

I'm planning to buy the CoCo Calligrapher by Sugar Software. Will it work with the Gorilla/Banana printer?—***Milagros Rivera Diaz, Rio Piedras, PR***

A. From the description of the cable you gave me, I think that the DIN plug is numbered incorrectly. Looking at the end you plug into the computer, pin 1 is counterclockwise from the key, continuing counterclockwise the pins are 2, 3, and 4. Here's what your cable probably looks like:

CoCo (DIN Plug)			**Your Description**
Signal	Pin #	Pin #	Signal
CD	1	2	TXD
IN	2	20	DTR
GND	3	7	GND
OUT	4 . . /	/ . . 3	RXD

As you can see, the CoCo's output has no where to go! The printer is never busy because it can't get any data to print. The CoCo checks the busy (DTR) line and sends a character if the printer is not busy. You need to connect pin 4 (OUT) of the DIN plug to pin 3 (RXD) of the DB-25P connector to get the data to the printer. The other connections are correct. Here's the cable you need:

CoCo (DIN Plug)			**Gorilla/Banana (DB-25P)**
Signal	Pin #	Pin #	Signal
CD	1 . . /	/ . . 2	TXD
IN	2	20	DTR
GND	3	7	GND
OUT	4	3	RXD

CoCo Calligrapher is advertised to work with the Epson MX-80 and FX-80/100, Gemini 10/15, and 10X/15X, Radio Shack LP VII/VIII and DMP-100/110/120/200/420/510/2100, Gorilla/Banana, and Prowriter 8510 printers. The program requires 32K of memory. ■

Circle Reader Service card #70

NEW!

MAROONED!

By Steve Hartford

Sitting on the back porch one afternoon, you see a strange, flashing UFO descend from the clouds & land out in the corn field. Being the curious type, you run out to investigate and find a spaceship with it's hatch open...as you step inside, the hatch closes and the ship takes off! You must find a way to get back home. A great graphics adventure! 32K & one disk drive required.

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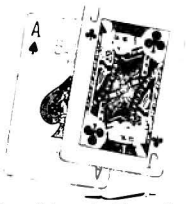

Blackjack Dealer
Feeler Dealer

These two programs help you develop your Blackjack skill and strategy. In **Blackjack Dealer**, the computer deals the cards and plays the dealer's hand against you. **Feeler Dealer** enables you to test your strategy by playing the desired number of hands using your techniques & tendencies. A great teacher for new Blackjack players and a valuable tool for the veteran player. Both programs included. 32K extended.

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Raid On Burdanovka

Your mission, should you decide to accept it, is to steal Russio's newest weapon & save the world. Good luck you'll need it! Advanced text adventure with 50 rooms. 32K

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Mindbusters

by Richard Ramella

Grid And Bear It

I had a friend who believed chess was given to humans by ancient four-fingered spacefarers. "Else," he reasoned, "the 8-by-8 grid would be a 10-by-10 grid for the five fingers on our hands."

"What about the ancient chess games with 10-by-11 squares?" I wondered.

"An evolutionary mistake." he pronounced. I don't know whatever became of my friend. I suspect spacefarers took him away to Andromeda for further study.

The grid pattern of chess and checkers is a mysterious and fascinating vestige of the workings of ancient minds. The grid board is the raw material on which many puzzles are based. The grid is also a familiar pattern on the computer screen. Many arcade games use it, though it is often disguised by tortuous turns or hopping frogs.

This month, we explore the essence of the grid puzzle with three different examples. The first two, Gridskid and Mosaic, owe a debt to chess and checkers. The third, Grade Maker, is a challenging computer version of a game that many of you might remember from grammar school.

Gridskid

Listing 1 is called Gridskid. It draws 64 boxes outlined in blue on the screen. Near the bottom of the second column is a box filled with blue containing a flashing orange cursor. The box adjacent to the blue box in the third column is filled with green. When you press one of the four arrow keys, a bar appears connecting the blue box to the one in the direction of the arrow key. The new box fills with blue. The object of the puzzle is to connect all the boxes and finish by hooking up to the green box.

There is a hitch, however. Each time you change direction, a blue diamond appears in a separate column outside of the grid. At the bottom of the screen there is a line that marks the maximum number of diamonds that the game allows for a win. If you connect all the boxes before the diamonds reach the line, musical tones sound to indicate that you have won. The game ends in a loss if you travel to the green square without covering all the squares or if you try to connect to an already filled-in blue square. You can also continue to play after the diamonds have passed the line.

Mosaic

Listing 2 is called Mosaic, which refers to the random pattern of blue- and orange-colored squares on the program's 8-by-8 board. Only the 16 squares in the center of the board are white. The mosaic colors are not important to the game. Think of each colored square as a checker on a white board.

When you run Mosaic, you'll see a flashing green cursor in the square at the northwest corner of the board. You move the cursor by pressing the N, S, E, or W keys, which correspond to compass directions. The object of Mosaic is to end up with as few colored squares on the board as possible. You eliminate colored squares by jumping over them and landing on a white square. To jump, you place the cursor on a colored square two positions from a white or "empty" board position. The colored square in between disappears when you press the arrow key corresponding to the direction you want to jump. The first colored square ends up in the empty position. The illusion is that you have jumped the playing piece in the middle, the way you would in checkers. Press the break key to exit Mosaic when there are no other possible moves.

Grade Maker

I've never solved the puzzle in Listing 3, Grade Maker, but I trust that you can. The goal of this puzzle is to receive a score of A+ from the computer. Your grade, from F to A+, appears in the upper right corner of the screen when you have completed the puzzle.

When you run Grade Maker, it draws a grid pattern of 6-by-6 points and gives you a choice of starting positions. Look closely at the point in the northwest corner—it is flashing. Press the arrow keys to move the flashing cursor to the point on which you want to start and then press the enter key. Now when you press an arrow key, the program draws a line from the dot that contains the cursor to the dot in the direction of the arrow key. The object is to draw lines on the grid in this manner, completing as many squares as possible. The game does not, however, allow you to retrace a line and ends when your line arrives at an intersection from which there is no exit. It does permit you to cross over lines. Grade Maker scores your attempts by awarding points for each completed wall of a grid square.

System Requirements
16K RAM
Extended Color Basic

Puzzle Contest IV

This month's contest does not have a program listing. The eight numbered items below are related by a common theme. Your problem is to work on the letters or meanings of each clue to find the answers they represent.

1. Once followed rear admiral
2. HAL OB
3. Without clarity
4. Eplap
5. UST-91
6. John Wayne African movie minus first
7. Birthday in the Emerald City
8. I CANE. ■

See program listings on page 43

Ed. note—To enter Puzzle Contest IV, type or print as many numbered answers to the puzzle as you have been able to find on a sheet of paper along with your name and address. Mail your entry to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. Entries must be postmarked no later than August 31, 1985. In case of a tie, the winner will be determined in a fair and random manner. The winner's name and answers will be printed in a later issue of HOT CoCo. *The winner will receive a free one-year subscription to the magazine.*

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
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THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

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

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

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

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

TELEWRITER-64

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

64K COMPATIBLE

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

64 COLUMNS (AND 85!)

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

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

RIGHT JUSTIFICATION & HYPHENATION

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

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

FEATURES & SPECIFICATIONS:

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

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

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

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

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

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

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

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

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

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

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

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.)

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The Computer Room

by Scott L. Norman

Can Your CoCo Organize Your Life?

Have you ever noticed how often the personal computer is touted as the perfect way to keep track of a busy schedule? Entrust your appointments, homework assignments, birthdays, and whatever to a calendar program, and *zap!* Your affairs will be organized forever.

Don't bet on it. Computerized calendars can certainly be useful, but they're no better than any other software when it comes to remaking your lifestyle. It takes discipline to keep any sort of calendar up to date, and having to turn on the computer and load a program just to record your next appointment with the dentist might not appeal to you.

Convenient access is the key. When you need a calendar or appointment book, you generally need it immediately, and that conflicts with bringing a computer program up from a cold start. Paper and pencil come to life faster.

I find electronic calendars most useful when they're accessible from some other application. That might mean keeping several specialized ones around. For example, I keep a calendar of writing-related matters on my Telewriter program disk, so that I can check manuscript deadlines and similar items before or after a working session without swapping disks. If I wanted another calendar to keep track of dates associated with my professional responsibilities in project management, I might put it on the same disk as my DynaCalc spreadsheets.

It would be even better if I could temporarily suspend the operation of an applications program to check the associated calendar, but that seems beyond the reach of my present system. That's unfortunate; the Apple Macintosh and IBM PC let you install calendars, address books, and other helpful functions as "desk accessories" that you can call up without leaving the major program. That's class.

Don't get me wrong. I think calendar programs can be useful, but I think it's important to realize that there are plenty of everyday situations in which they have little to offer. With that in mind, I'll look at a couple of well-tested CoCo calendars.

Date-O-Base

This easy-to-use, low-cost veteran comes on either tape or disk. It can record up to a dozen one-line mini-memos (each 28 characters or fewer) for any day between the years 1700 and 2099 and can display either the memos themselves or a picture of a calendar page for any selected month. The calendar image features little markers indicating which dates have entries associated with them, and there are convenient search options for retrieving specific memos.

Date-O-Base can handle up to 400 memos in a tape file, and 4,000 in a disk file (subject to a limit of 300 memos per month). I suspect that the difference reflects the fundamental difficulty of using tape as the storage medium for applications requiring random access to data; the whole file probably has to be kept in RAM. I have only used the disk version, so some of my comments might not apply to tape systems.

The main routine is a four-gran Basic file called DCAL. It creates two other files in which your notes are stored and indexed. Since it always assigns the same names to these files, you cannot keep several independent calendars on a single disk; my liking for small, special-purpose calendars on different disks seems quite appropriate. You can rename the main program file for your convenience, however.

Date-O-Base contains its own facilities for printing memos and their associated dates, but you'll have to interface it to a graphics print routine if you want a printout of the calendar pages. The vendor, Custom Software Engineering, sells a product called Graphic Screen Print Routine that does the job admirably. It comes with complete instructions for modifying the Date-O-Base code.

When I installed it on my Telewriter disk, I added a POKE 150,1 instruction to program line 1 of DCAL. This, of course, is to send data from my CoCo to my printer at 9,600 baud—my usual practice. I also edited line 8, which sets up the menu screen, so that my calendar comes up with "Writing Deadlines" as a title. That gets my attention.

The program's single menu gives you five choices:

- Display Month—draws the specified calendar page in PMODE 4 (the print routine reverses contrast to give a black-on-white printout). You can then enter a date within the month to see any existing memos, or to add some. Your keyboard date selection is not echoed to the graphics screen, unfortunately.
- Display/Change Memos—the fast way to enter data; it bypasses the calendar-drawing step and goes right to the text screen for the date you specify. The calendar display will be properly updated with memo markers when you next call it up.
- Search Memos—finds entries on the basis of any character string you specify. You can AND or OR selection criteria together, or you can ask to see all memos for the interval between two dates.
- Delete Memos—wipes out all the entries for specified months at one shot. While all other DCAL operations require you to specify dates in month/day/year format, this one only needs the month and year. This can be confusing, and can lead to keyboard errors. Fortunately, there is an opportunity to verify your selection before you harm your files.
- Date Computation—quickly finds the interval between any specified dates in DCAL's range.

The text searcher will find a target character string wherever it occurs: "irth" in the middle of "birthday", for example. It will *not* match uppercase letters to lowercase, however, and Date-O-Base will not accept lowercase commands. (You can't use just the Y or the N when the program prompts you for yes/no responses, either.)

The program is flexible enough to accept several forms of date entry. For example, you can enter September as Sep, Sept, or September (the instructions don't point out that you can use more than three letters, by the way), or as month 9 or 09. Single-digit dates can have a leading zero or not, and you can refer to years in the twentieth century by giving just their last two digits.

You can't fool Date-O-Base by giving it out-of-range dates. An entry of May 32 always earns you a prompt for a date between 1 and 31, for instance, and the program recognizes leap years properly—including three out of four turn-of-the-century years that do not qualify. In the same way, the time interval routine gives the proper answer in several forms—days, weeks/days, months/days, and years/months/days—while keeping track of the number of days per month.

Date-O-Base is a very convenient little package, restricted only by the limited size available for an individual memo.

Don't Forget!

This calendar from Computerware uses Macintosh-like icons to perform many operations. You also have the option of using either the keyboard or a joystick (or that other MacRage—a mouse) to move cursors around the screen.

Dont' Forget! serves a different purpose from Date-O-Base, and personally I find it

less useful. The Computerware product is strictly a year-at-a-time appointment calendar. Each day's video page has space for four "special occasion" reminders of up to 40 characters each, two 45-character "memos," and 15 hourly appointment slots assigned to the hours between 6 a.m. and 9 p.m.

Unfortunately, the latter only have room for 11 characters apiece, which restricts them to messages like "Meet w/Max." My memory usually requires more prodding than that: What was it that Max and I were going to discuss, anyway?

The program can take advantage of a two-drive system. With a program disk in drive 0 and a blank data disk in drive 1, it will set up a 68-gran calendar file. It can obviously store loads of data, but it doesn't lend itself to casual, desk-accessory operation. Running Don't Forget! is roughly equivalent to using a simple database manager. This is fine if you are prepared to devote the necessary time to maintaining your calendar, but you should be aware of it.

Don't Forget! uses two high-resolution displays: a monthly calendar and a daily appointment schedule. You select months, dates, times, or those other special text areas by moving the cursor to the proper place and hitting the enter key. Control can be a little tricky when you use either the joystick or mouse. You don't have random access to any point on the appointment schedule, either; the cursor scans through things in a preset order. Fortunately, it moves along at a good clip.

At the top of the daily-schedule screen are eight icons: a Help screen, scissors, a trash can, a disk, a keyboard, two overlapping rectangles, a clipboard, and a printer. The scissors, clipboard, rectangles (known as the "duplicator" icon), and trash can are all involved in cut-and-paste editing and copying of data. You must select the keyboard before you can type information into any text field, but only after you have selected the field itself. The disk icon lets you save a day's worth of data or copy it to another day, and the printer produces four kinds of printouts, ranging from a daily schedule to a blank monthly calendar on which you can scribble your appointments when away from the computer. The help icon calls up brief instructions for any of the other icons.

Everything works, but some of the operations are a little involved for my taste: that two-stage text-entry process, for example. I also find it necessary to resort to trickery to perform such a simple task as erasing all the data for one particular day. The easiest way seems to be to copy the entire blank schedule from some other day to the target date in one shot (there is a special option for this).

Don't Forget! has keyword-search capability, available from the printer icon. The search starts at whichever day is currently selected, and will dutifully find fragments of text like the "niv" in "anniversary". What you get is a printout of the whole schedule for each day on which a match is found; there is no provision for previewing the results on the screen.

Coming Attractions

You haven't seen the last of calendar programs here in *The Computer Room*. Grantham Software's Calindex, a program for coordinating multiple calendars, is said to be on its way to me even as this is being written. I plan to give it a good workout at my office; you see, I have a real problem finding conflict-free days on which various members of my staff are available for business trips or meetings. Calindex may help.

It sounds like another full-time applications program, however. Meanwhile, I still haven't found my ideal computerized equivalent of the faithful, unobtrusive desk calendar. Maybe someone will write one someday using OS-9's foreground and background modes. ■

Scott Norman is the manager of solid-state science at GTE Laboratories in Waltham, MA. Write to him at 8 Doris Road, Framingham, MA 01701.

Products Mentioned in The Computer Room

- Date-O-Base
  Custom Software Engineering Inc.
  807 Minutemen Causeway (D-2)
  CoCoa Beach, FL 32931
  $16.95 tape, $19.95 disk
- Graphic Screen Print Routine
  Custom Software Engineering Inc.
  $7.95–$9.95, depending on printer
- Don't Forget! version 1.3
  Computerware
  P.O. Box 668
  4403 Manchester Ave.
  Encinitas, CA 92024
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REVIEW

by Fred Blechman

The SG-10:

A Super Star

Star Micronics' new dot-matrix printer does it all for less.

Star Micronics recently released a new printer with the fanfare of a two-page advertisement announcing in big letters: "20 percent faster, costs 20 percent less." If that were the whole story it would be interesting enough. But unlike some ads in which the large print giveth and the small print taketh away, the rest of the ad's copy describes this inexpensive printer's other good features, such as a near-letter-quality print mode. As a long-time owner of four other Star Micronics printers (Gemini-10X, Delta-10, STX-80, and Power Type), I was curious to see how they incorporated new features in a package with a lower price.

Introducing The SG-10

The Star SG-10 is identical in appearance to the Gemini-10X, except for the shape of its plastic cover and the three control buttons on its right side. It is about 15-inches wide, 12½-inches deep, and 6-inches high. It weighs little more than 15 pounds and uses 100 watts of power. The SG-10 is sold with a one-year warranty, excluding print head and ribbon.

The interface that comes with the printer is the standard Centronics-compatible parallel interface, which requires a serial-to-parallel inter-

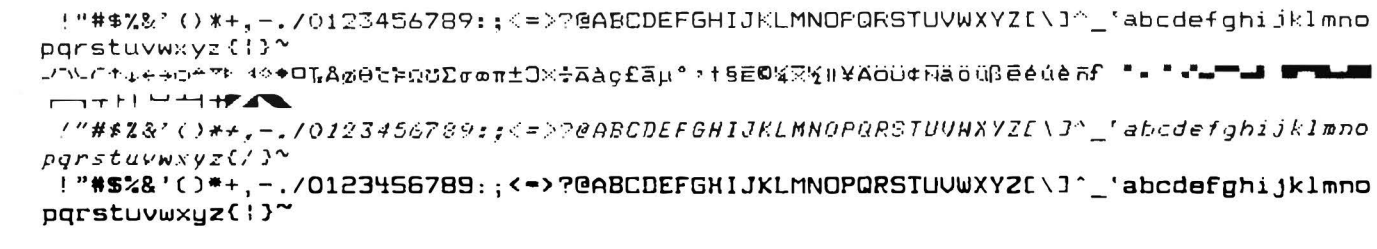

Fig. 1. SG-10 Self-Test. Star Character Set

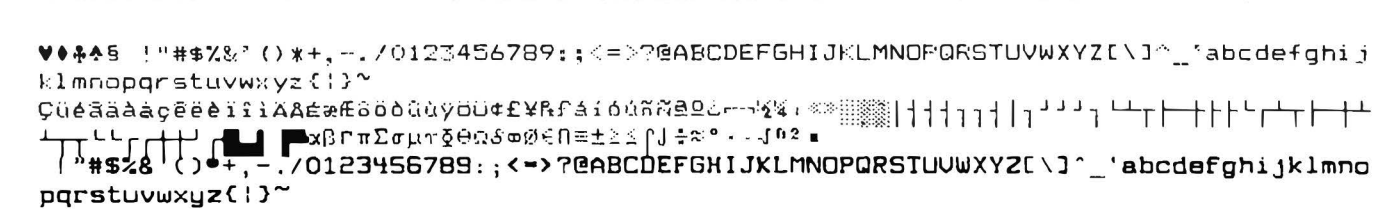

Fig. 2. SG-10 Self-Test, IBM Character Set

face designed for the Color Computer's DIN-plug port. These are readily available from several companies that advertise in *HOT CoCo*. Star Micronics also offers an RS-232C serial-interface option for about $80. It requires installation inside the SG-10 and complex interfacing. Unless you have a specific application that requires a serial connection, my advice is to stick with the parallel interface.

The SG-10 prints at a speed of 120 cps (characters per second) in the 10-cpi (characters-per-inch) mode. It prints at about 30 cps in its NLQ (near-letter-quality) mode. The nine-pin print head that comes on the printer produces 96 standard, italic, or NLQ ASCII characters; 88 standard, italic, or NLQ international characters; and 240 user-defined characters. In the bit-image graphics mode, the SG-10 can produce 240 dots per inch horizontally and 216 dots per inch vertically for a density of 51,840 dots per square inch.

Special Features

The SG-10 has a 2K internal buffer that speeds up short printing tasks by releasing the computer for other activities when there are fewer than 2,000 characters left to print. You can use both friction- and sprocket-feed paper at a paper-feed setting of 12 lines per second when you use a 1/6-inch line spacing. Line spacing can also be 1/8- or 7/72-inch standard, or specified increments of 1/72, 1/144, and 1/216 of an inch. You can print 80, 96, 136, 40, 48, or 68 characters on an 8-inch line.

The SG-10 has several special features in addition to its NLQ printing mode. A paper-cutting edge built into the plastic cover permits you to tear off partial pages. The printer's two DIP (dual in-line package) switches are easy to get at because they are mounted on the outside. A built-in self-test lets you verify printer operation without even connecting the printer to a computer. You can combine as many as 16 codes into a single "macro" code. You can even create your own "download characters" for printing logos, special foreign-language characters, or scientific characters.

Printing And Formatting

The SG-10 is fast and efficient. It is bidirectional and logic seeking, which means that it prints forward and backward and scans the next line to determine how far to go before reversing direction for the backward stroke. The "throughput," or actual printing rate, of the SG-10 is significantly increased by these measures for cutting down on wasted head-travel time. The SG-10 also has a long-life, 100-million-character, user-replaceable, nine-pin print head designed for a "100-percent duty cycle," or continuous use.

The SG-10 produces 9- by 11-pin dot-matrix characters (including true lowercase descenders) and 6- by 6-pin Star block graphics. The print sizes are 5, 6, 8.5, 10, 12, and 17 cpi. The printer also supports proportional spacing, emphasized printing (18 by 9 dots), double-strike printing (18 by 18 dots), and a combination of the last two (36 by 27 dots).

Subscripts and superscripts are available in normal and double-strike printing modes at 10, 12, and 17 cpi. (Scripting characters are half height and printed high or low on the line.) Software commands also control continuous underlining, backspacing, left and right margin set, programmable vertical and horizontal tabbing, perforation skip, and line spacing (to as little as 1/216 of an inch).

Paper Shuffling

The SG-10 and the Gemini-10X have the same paper-handling capabilities. You can use single sheets, roll paper, or perforated-sprocket paper. The printer comes with an easily adjustable and removable tractor unit. The paper-roll holder and shaft included with the 10X are not supplied with the SG-10 and do not appear to be available as an option. However, the 10X roll holder fits perfectly on the SG-10. The ribbon is a standard ½-inch black ribbon on 2-inch spools (no special cartridge). Only the upper half is used so you can flip it over to double the ribbon life without re-inking.

Two wire paper separators keep the incoming paper from getting tangled with the outgoing paper. You load paper typewriter fashion into a slot behind the roller. A friction-feed lever lets you position single-sheet or roll paper before it is locked, and a knob on the right side allows you to move the paper backward or forward. You can use up to three sheets of paper (the original plus two carbonless) from 4 to 10 inches wide. An

adjustment lever allows you to set the print-head gap to handle different paper thicknesses.

The tractor unit snaps easily into place. You can position and lock the left and right sprocket mechanisms to accommodate various paper widths. The mechanisms have flip-up covers that expose the sprocket teeth. Loading sprocket paper is an easy task on the SG-10.

You cannot insert or remove paper with this printer without taking off the large, but light plastic cover mentioned above. It serves as a sound muffler, dust shield, paper-cutting bar, and cosmetic blind for concealing the ribbon/head mechanism. A smaller "friction cover" is also available from Star Micronics (part no. 83020290) for $5.95. This lid fits over the ribbon and head area only. You don't need to remove it to load and retrieve paper. It can also be used as a cutting bar. Because its cutting edge fits closer to the printing area than that of the large cover, it can be a paper saver if you like to use a lot of partial sheets.

Printer Controls

The Star SG-10 uses four top-mounted LED (light-emitting diode) indicators, three top-mounted switches, a side-mounted on/off switch, two side-mounted DIP switches, an end-paper sensor switch, and a knob for operator controls. The knob is for moving the paper manually while the printer is off. (A clutch mechanism is engaged when the printer is on.) The three green LEDs show when the power is on, when the printer is ready, and when it is on line (under computer control).

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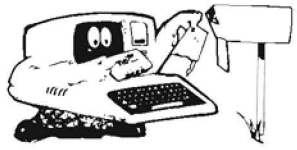

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If the paper is not in place, the red paper-out indicator comes on and a 2-second beep sounds.

In front of the LED indicators there are three flat-membrane switches that control form feed, line feed, and on-line status. These are convenient features for use with sprocket-feed paper because you can, for example, fast forward to the next fan-fold perforation just by pressing the form-feed button.

The two DIP switches (one has eight and the other has four small toggles) allow you to preset various printer functions, such as page length, normal or italic mode, normal or NLQ mode, line-feed parameters, 10 or 17 cpi, and international character sets for the U.S., France, Germany, England, Denmark, Sweden, Italy, and Spain. You can also select most of these functions with software commands.

Holding the line-feed button down when you turn on the printer starts a self-test that prints out the complete Star character set. (See Fig. 1.) The SG-10 has a second, IBM-style character set you activate with a DIP switch. (See Fig. 2.) It offers playing-card suits and border symbols but excludes italics.

Print Quality

I found the SG-10 print quality to be very good in the normal printing mode. However, it is plainly a dot-matrix printer in this mode. (You can see the individual dots of which the characters are composed.) The darkness of the type is dependent on ribbon quality. The printer uses fabric ribbons, which are not as dark or crisp as mylar-film ribbons, but the characters are easy enough to read.

In the NLQ mode, the print is outstanding. I could not distinguish individual dots even with a seven-power magnifier. The NLQ characters use a special serif type font. They look like fully formed typewriter characters. They are very dark, and their edges are sharply defined. Although you sacrifice considerable speed in the NLQ mode, the results are closely equivalent to using a slower, noisier, and more expensive daisy-wheel printer, the only advantage of which is a choice of fonts.

Documentation

The 238-page SG-10/15 Users Manual is nothing short of excellent. It covers the wide-carriage SG-15 as well as the SG-10. It is fully illustrated with several charts and tables. And it details the operation of all the various printer capabilities with lots of Basic program examples. Dot graphics and user-designed characters, difficult concepts to explain, are well described in this manual. It's only shortcoming is the lack of an index.

Summary

There are lots of printers on the market from which to choose, but in the SG-10's price range most are slow, yield poor-quality printing, and have few features to recommend them. The SG-10 is offered by many dealers in combination with several brands of computers because of its versatility, low price, and excellent performance. It offers many features found on more expensive printers and has features all its own. It prints quickly, efficiently, and consistently. At its price, with the features it offers, this printer is a bargain. ■

The Star SG-10 Printer is manufactured by Star Micronics Inc., 200 Park Ave., New York, NY 10166, 214-631-8560. It requires a serial-to-parallel interface to fit the Color Computer and sells for $299. The SG-10 is also sold by several advertisers in this magazine.

Reviews

edited by J. Scot Finnie

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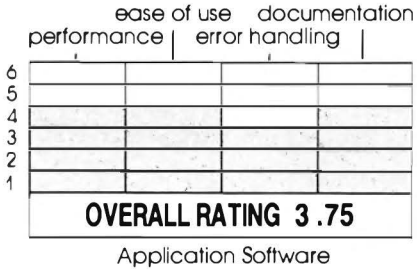
Review-Ratings Key

6	Unsurpassed
5	Excellent
4	Above Average
3	Acceptable
2	Needs Improvement
1	Unsatisfactory

Ed. note—The overall ratings that appear in the review-rating graphs are an average of the ratings for all the categories rounded to the nearest quarter of a rating point.

The Animator Picture

by Bobby Ballard



Application Software

Rarely does new software come along that performs and educates at the same time. The Animator, from Triad Pictures, is a tool for creating animations on your Color Computer. It is also a great way for animation newcomers to learn the basics.

The Animator comes on cassette along with separate demonstration and lesson tapes. Its manual is bound in an inexpensive plastic cover, but don't judge the book by its cover. The Animator's software is so simple to use that the manual provides minimal program instruction. Triad Pictures chose, instead, to create a manual that teaches you animation; it offers a complete course on the fundamentals of animation. The program gives you the chance to try it out.

The Equipment

When you load The Animator, it displays a title screen with three color blocks for adjusting your television set or monitor. Then it greets you with a short tune and title graphics. A menu appears called Directory, which resembles a directory to a professional animation studio with all of the appropriate departments and tools. There is the Background Studio, Cel Animation Department, Camera Department, Sound Effects Studio, Lab (for I/O), and even the Screening Room—where you can shout "Roll'em" and show off your latest masterpiece to the adoring public. If you get bad reviews, you can also exit from the main menu back to Basic.

If you change your mind about leaving the program, type "RUN" and you'll see a short greeting, "Welcome back to the Studios." All your work is left intact if you did not load and run another large program while you were away.

The Animator is set up more like a traditional animation studio than a computer-animation studio. Within The Animator, your CoCo functions similarly to the tools found traditionally in an animation studio, such as

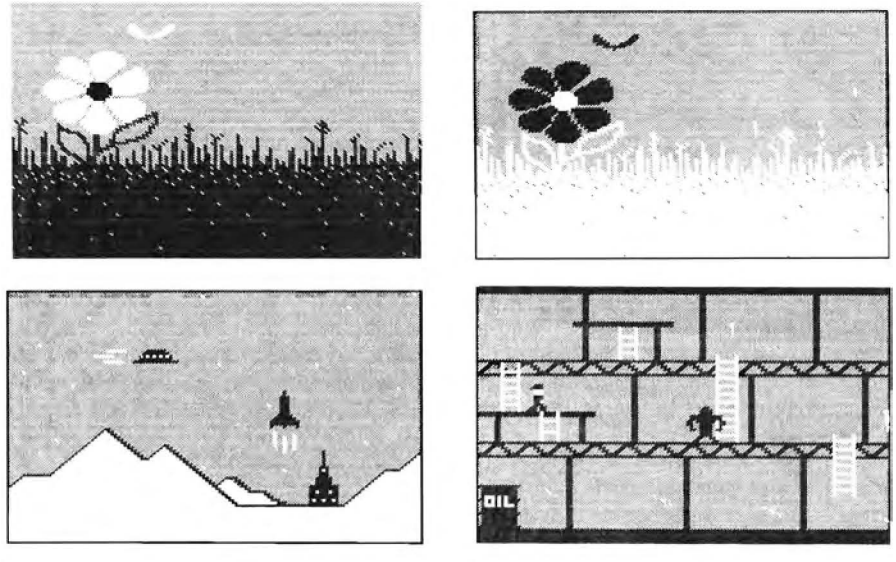


Fig. 1. Screen Dumps From The Animator Provided By Triad Pictures

film, cels, sound effects, and rotoscopes. Professional computer-animation studios use somewhat different sets of terminology and equipment, but learning the traditional techniques is a good way to get started.

The Animator can accept graphics tape files from other sources as long as they are PMODE 3 and stored in the standard binary format. Although the manual does not explain the procedure, a call to Triad Pictures revealed both the necessary information and helpful product-support people. The background is page 1 and 2 and the cels are stored on pages 3 and 4. According to Triad, you can load your artwork and then load The Animator. This allows quicker drawing with other software or an X-Pad followed by The Animator to "shoot your film."

How It Works

I'm impressed with the overall quality of the animation this program produces. It gives you speed without flicker. It has smoothness without that GET-and-PUT look. And the four-color, high-resolution PMODE 3 screen looks great in motion. However, you can't expect the professional animation found in movies. Given the small amount of memory to act as film, there are some limitations. The size of the cels, for instance, permits only small objects to be animated. I would like the size to be adjustable. If, for example, an animation requires only four cels, you should be able to increase its size, though a work needing 32 cels (the maximum) would have smaller cels. It would also be nice to be able to tumble an object by spinning one cel on an imaginary axis.

Some drawbacks to note are the following. In the Background studio, there are a few dangerous commands that the manual warns you about, but the warnings don't prevent an occasional accident. A second prompt for the erase and paint commands would be a welcome addition, and an undo feature would save frustration. The only remedy is to make a lot of backups, a chore that would be improved if the The Animator were available on disk.

The Animator includes a machine-language sound-effects library, variable run speeds, stop action, and a set of lessons on animation techniques to help you get professional results. These lessons are supported in the manual and on additional tapes with how-to examples and finished samples. If you need full-screen animation, Triad Pictures will upgrade your package to its Animator Commercial program, which has special features, such as longer film length, faster film speed, and semi-graphics. With The Animator, your film is limited in length to about a minute and a half, though it can be run continuously in a loop.

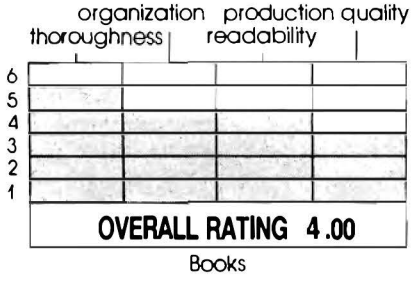
Summary

Creating animations, even on a computer, is tedious work that can sometimes be frustrating. If you enjoy animation or want to learn more, I recommend The Animator. Its educational value alone is worth the price. I doubt that anyone will be disappointed by the results of this software. And educators should find this to be a valuable tool for students. ■

The Animator is produced by Triad Pictures, P.O. Box 1299, Sequim, WA 98382, 206-683-6459. It requires 32K (not upgraded) and Extended Color Basic and comes on cassette. It sells for $29.95 plus $3 for shipping.

How To Use Your Radio Shack Printer

by Bobby Ballard



How to Use Your Radio Shack Printer, by William Barden, Jr., is a new Tandy release. The author's name is familiar to many CoCo owners because he has written many fine books and articles covering a range of subjects on the Color Computer. And except for a few minor points, this latest Bill Barden book is an excellent source on its subject—Radio Shack Printers.

How to Use Your Radio Shack Printer attempts the seemingly impossible by including all current Radio Shack printers and some older models, as well. Barden has filled the book with invaluable charts, diagrams, and reference materials for the printers it covers. But despite its attributes, one wonders why Radio Shack publishes a separate book, for an extra fee, about how its printers work.

A How-To Manual

The book is divided into three sections. The first deals with the fundamentals of printing and includes a brief history of computer-printing technology. It also discusses communication protocol between computer and printer, ASCII codes, programming printers, and the capabilities of each model and style.

The second section is dedicated to word processing. It covers printing text, word-wrap, margin justification, and proportional spacing. This is not just a section of definitions; it has plenty of examples with tips on getting better-looking text from your computer. Barden addresses dot-matrix and daisy-wheel techniques separately unless it is appropriate to discuss them together.

The third section covers the vast world of graphics printing. From that you might conclude that this section focuses on dot-matrix printers. But the examples include how to get graphics capabilities from your daisy-wheel printer, too. The three chapters in this section are titled, " Graphics Printing," "Screen Printing," and "Creative Graphics." You'll also find information in this section to help you create your own character sets and symbols using the graphics mode.

How to Use Your Radio Shack Printer has more than 200 pages, an index, and an appendix of decimal, hexadecimal, and binary conversions. The book also provides tips and advice on the subject at hand in small, gray boxes in its margins.

Tandy has improved the production quality of this book over that of some of its past offerings. In particular, greater attention was paid to proofreading. This might be because the manual is published in connection with Microtrend/Valleyware of San Diego. But whatever the reason, it is a welcome change.

The biggest flaw of the book results from the promises spelled out on its cover that are not fulfilled inside. From information on the cover, I expected *How to Use Your Radio Shack Printer* to include a complete discussion of plotters. But it barely covers how a plotter works. You can get the same information on plotters by asking a few questions of a knowledgeable salesman. Early in the first chapter, Barden states that the princi-

Reviews continue on page 74

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by Thad Starner

DESIGNMAKER

Create an array of striking designs.

If you have always wanted to explore the CoCo's graphic capabilities, now is your chance. The Designmaker program lets you play with graphics to your heart's content without programming a single line. I estimate that there are over 18 billion possibilities with which to experiment. Figures 1 through 8 show eight of my creations.

Using The Program

The program consists of four routines: two design routines—First Designmaker and Second Designmaker—and two optional print routines for the CGP-115 printer. (See Table 1 for a breakdown of the program's structure.)

Type in the Listing; load and then run the program. You must immediately decide which design routine you wish to use. Select option 1 for the simpler version. You supply 10 items of information that control the spacing between lines; the creation of lines or circles; the placement of graphics; resolution; color set; and the initiation of the fast screen dump.

Option 2 offers more design versatility. By defining an additional five parameters, you control such details as the starting and ending position of your designs and flashing graphics.

To pause during the drawing sequence (in either version of Designmaker), press the spacebar; press it again to resume. If you do not wish to complete a design, press the spacebar and then the enter key. You return to the first prompt of the design sequence. To change from First Designmaker to Second Designmaker (or vice-versa), press the clear key after pressing the spacebar.

Do not press the spacebar once your design is complete—this might cause the program to hang up. Use the enter and clear keys to return to the beginning of the design sequence and the program's opening prompt, respectively.

The first graphics routine is a fast screen dump. It runs while the design prints on the screen. You choose this option by answering Y to the prompt, "Just Lines Hardcopy?", in both design routines. As the prompt suggests, the fast print routine works only for graphics designed using lines.

The second graphics routine prints both lines and circles, but it is slow. You initiate it by pressing the spacebar to pause and then pressing the letter H. To make printing go smoothly, feed about four inches of paper through the printer before you begin printing. Never press the spacebar and H while the printer is drawing.

Prompts For First Designmaker

Step (2–30): controls the space between lines and circles. It is best to use 2 through 8.
0–256: determines the ending location of lines and circles (horizontal axis).
0–192: determines the starting location of lines and circles (vertical axis).
0–192: determines the ending location of lines and circles (vertical axis).
Mode (0–4): selects resolution. Mode 0 has the lowest resolution; mode 4 the highest.
Screen (0 or 1): selects the graphics color set.
Overlap (1–192): determines what portion of the design is displayed. For a full design, select 192. Type in 96 for half a design, 144 for three-fourths, and so on.
Lines (Y/N): Y produces lines; N does not.
Circle (Y/N): Y produces circles; N does not. You can answer Y to both the line and the circle prompts. If you answer N to both, no graphics are produced.
Just Line Hardcopy (Y/N): Respond with N to print on the screen. Respond with Y to get a fast screen dump.

Prompts For Second Designmaker

Step (2–30): controls space between lines and circles. It is best to use 2 through 8.
0–256: determines the starting location of lines and circles (horizontal axis).
0–256: determines the ending location of lines and circles (horizontal axis).
0-192: determines the starting location of lines and circles (vertical axis).
0–192: determines the ending location of lines and circles (vertical axis).

System Requirements

32K RAM
Extended Color Basic
CGP-115 Printer Optional

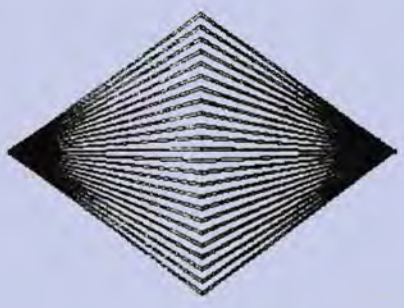

Fig. 1. First Designmaker: 4, 128, 96, 96, 4, 1, 192, Y, N

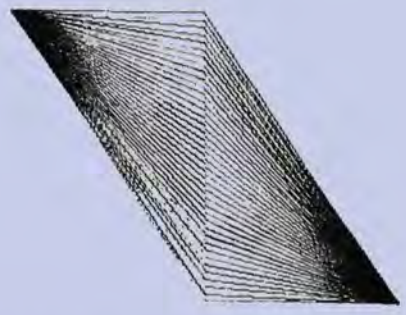

Fig. 2. First Designmaker: 5, 128, 0, 192, 4, 1, 192, Y, N

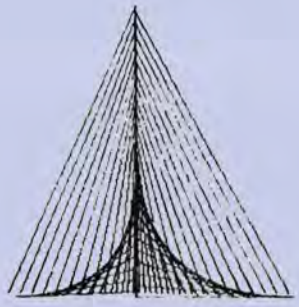

Fig. 3. Second Designmaker: 4, 86, 86, 192, 192, 4, 1, 86, 192, 0, 192, N, Y, Y, N

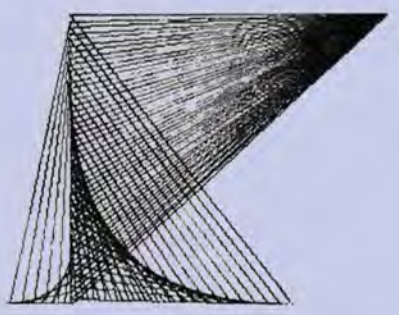

Fig. 4. Second Designmaker: 4, 45, 45, 0, 192, 4, 1, 256, 192, 0, 192, N, Y, Y, N

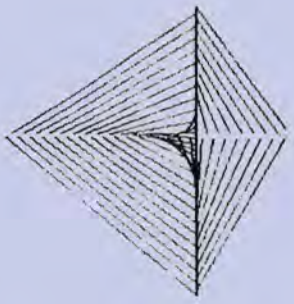

Fig. 5. Second Designmaker: 4, 128, 128, 0, 86, 4, 1, 128, 192, 0, 192, N, Y, Y, N

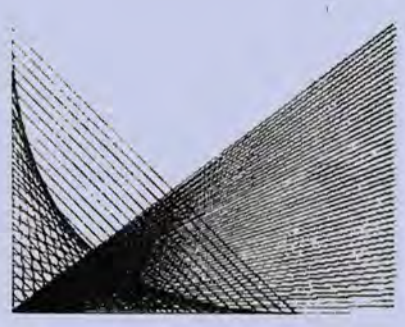

Fig. 6. Second Designmaker: 4, 256, 0, 192, 192, 4, 1, 0, 192, 0, 192, N, Y, Y, N

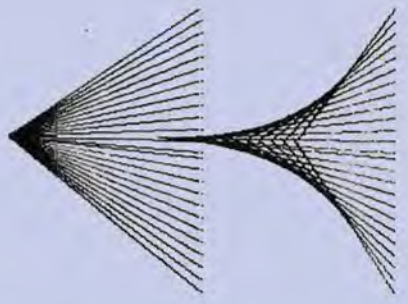

Fig. 7. Second Designmaker: 4, 128, 256, 86, 86, 4, 1, 0, 98, 0, 192, N, Y, Y, N

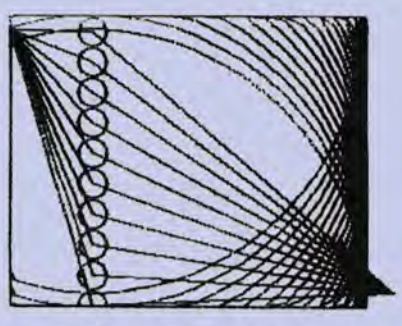

Fig. 8. First Designmaker: 10, 55, 10, 182, 4, 1, 192, Y, Y

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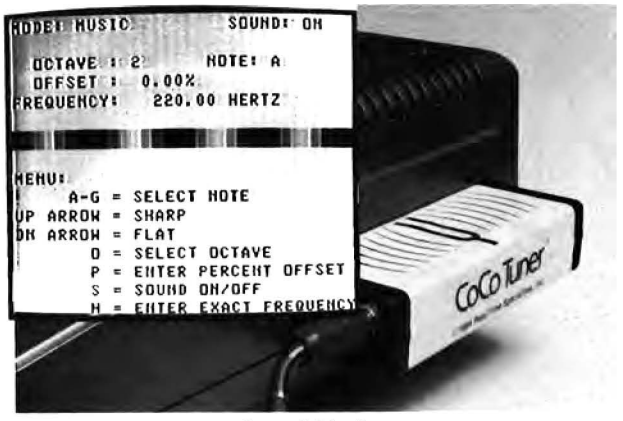

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Mode (0–4): selects resolution. Mode 0 has the lowest resolution; mode 4 the highest.
Screen (0 or 1): Selects the graphics color set.
Overlap (1–192): determines what portion of the design is displayed. For a full design, select 192. Type in 96 for half of a design, 144 for three-fourths, and so on.
Starting Position: allows you to further define the portion of the design displayed. The starting position value must be less than the overlap value. If you use 192 for overlap and 92 for starting position, for example, the computer begins the design at the halfway point. Similarly, if you use 144 for the overlap and 48 for the starting point, the design begins as if it had completed a quarter of the design and ends before it completes the last quarter.

10–80, 520, 550, 1160, 1210	Set Up And Linking For The Design Routines
90–240, 280–390, 420, 450–510, 540	First Designmaker
560–830, 870–970, 1000, 1030–1150, 1180–1200	Second Designmaker
250–270, 400–410, 430–440, 840–860, 980–990, 1010–1020	Fast Screen Dump
530, 1170, 1220–1330	Slow Print Routine

Table 1. Program Structure

Ending Position: must be greater than or equal to the overlap. In most cases use the same value. Use a different value to force the program to end certain lines in a different location from where they normally would.
Flashing (Y/N): Y means the lines are only visible on the screen as they are being drawn. If, however, you are using the fast screen-dump routine, you can still print the entire design.
Permanent (Y/N): Answering N and pressing the spacebar while the design is forming causes the program to skip the next line.
Lines (Y/N): Y lets you design with lines.
Circle (Y/N): Y lets you design with circles. You can answer Y to both the line and circle prompts. If you answer N to both, no design is made.
Just Line Hardcopy (Y/N): N prints on the screen only. Y selects the fast screen dump. ■

See program listing on page 44

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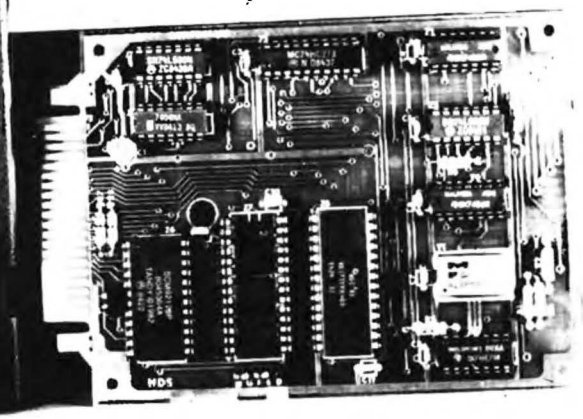

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by David Clements

The Bar-Graph Scene

Enhance your reports with these versatile graphics.

System Requirements
32K RAM
Disk Extended Color Basic
Disk Drive
C. Itoh Prowriter Printer Optional
Screen-Dump Utility Optional

Bargraph is a menu-driven Basic program that plots four different bar graphs on the PMODE 4 screen: vertical, horizontal, stacked, and side by side. (See Figs. 1 through 4.) You can enter data manually or load information saved previously. In addition to printing bar labels for your data, the program can print a title, subtitle, x-axis (horizontal) label, and y-axis (vertical) label for your graph. Titles, which can be enlarged to double-sized print, and subtitles are centered at the top of the display.

The program automatically prints graph values. If you wish, it will also scale your graph, making it easier to understand. You can further increase legibility by selecting the most appropriate presentation—a normal screen (D = dark print on a light background) or reversed screen (L = light print on a dark background).

Modifications

The program as written contains a save-to-disk feature and a print routine for C. Itoh's Prowriter. To use a cassette system or another printer, modify the program. Bargraph does not, however, include a screen-dump routine. You must purchase or develop one and incorporate it into the program.

I used GSPRP from Custom Software Engineering Inc., 807 Minuteman Causeway, Cocoa Beach, FL 32931. It is a versatile machine-language program that allows you to position standard or double-size print. If you use GSPRP, specify &H7D90 as the starting address. If you use another screen-dump program or a different printer, change lines 10, 50, and 1570–1680. If you do not wish to produce printouts of your graphs, change line 50 to: GOTO20000.

An alternative to changing the program to accommodate a different printer is to load your printer utility, load the saved graph, type a command sequence to set up the graphics screen, press the break key, and execute your printer utility:

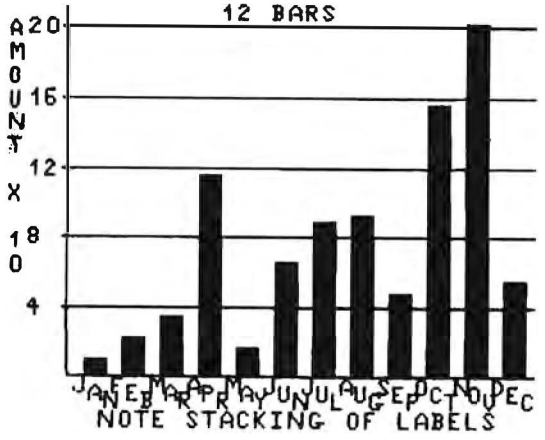

Fig. 1. Sample Vertical Graph

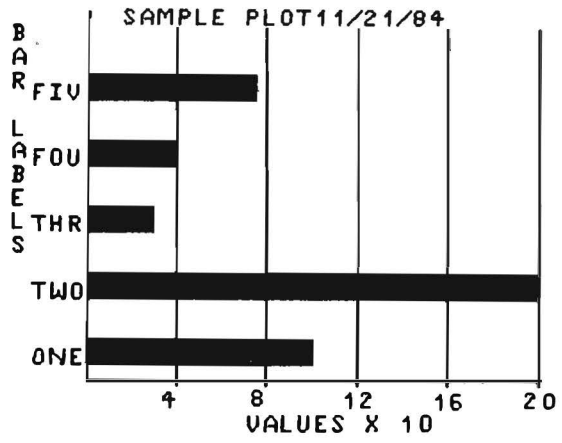

Fig. 2. Sample Horizontal Graph

```
LOADM "printer/BIN"
LOADM "filename/EXT"
10 PMODE 4:SCREEN 1,1:GOTO10
BREAK
EXEC address
```

I increased the drawing speed of the high-resolution screen by using the high-speed POKE—POKE65495,0. If your CoCo does not accept this command, delete it from lines 405, 605, 705, 805, and 1090.

Data Entry

All data entry is menu-driven and is specific to the graph selected. For each graph, type the category or label after the label prompt, and then supply the amount or value. Press the enter key to submit data. The program truncates labels for the side-by-side graph to four characters and labels for the other graphs to three characters. If there are more than five entries for the vertical or stacked graphs, the labels are printed on a slant.

The vertical graph plots a maximum of 12 vertical bars, and the horizontal graph accommodates a maximum of eight horizontal bars. The stacked graph permits a maximum of 12 vertical bars, with up to three values per bar. The side-by-side graph permits a maximum of four groups of data, with up to three bars per group. By following the menu prompts, you can, for example, select three groups of two bars, four groups of three bars, or two groups of three bars.

Continue typing data until you reach the maximum allowance for the graph you have chosen, or terminate data entry by pressing the enter key in response to a category prompt. After you submit all data, it appears on a text screen for review. You can save the data once you have verified it.

The next prompt asks whether you want your graph scaled. A positive response causes lines, or tic marks, to be drawn across the y-axis (vertical, stacked, and side-by-side graphs) or the x-axis (horizontal graphs). These marks are positioned proportionally, according to the data values submitted. If the values you submit exceed two digits, the plotted values of the tic marks are reduced by factors of 10, 100, 1000, and so on. In such cases, the value label tells you to multiply by the appropriate factor to interpret the graph. The program then draws your graph on the screen using the previously selected background and print colors.

Titles And Labels

After the graph is drawn, press any key to return to the text screen and title menu. The title can be small, 32 characters maximum; or large, 15 characters maximum. If you choose a small title, you can also have a subtitle. X-axis labels can contain up to 30 characters and y-axis labels up to 11 characters. The y-axis label for horizontal graphs is truncated to 15 characters. Uppercase letters; numbers; and special characters, %, –, $, /and = , are the only characters supported by the DRAW string. Suppress titles and labels by pressing

Lines 1–30	Credits, Memory Allocation, and Logo
40–235	Hi-Res Text Drawing, Load Screen Dump, Introductory Setup, and Data Entry
400–490	Vertical Graph Plotting and Tic Marks
500–540	Graph Save, Printout, and Exit Routines
600–665	Side-by-Side Graph Plotting
700–750	Stacked Graph Plotting
800–897	Horizontal Graph Plotting and Tic Marks
1040–1395	Graph Title and Label Format/Input
1490–1550	Disk Save Routines for Data and Graphs
1570–1680	Print Selections for GSPRP Program
3000–3530	Vertical Graph Input
4000–4530	Horizontal Graph Input
5000–5530	Stacked Graph Input
6000–6530	Side-by-Side Graph Input
7000–7055	Max/Min Value Determination Input
8000–8050	Instructions
9000–10110	DRAW Strings for Hi-Res Text

Table 1. Program Structure

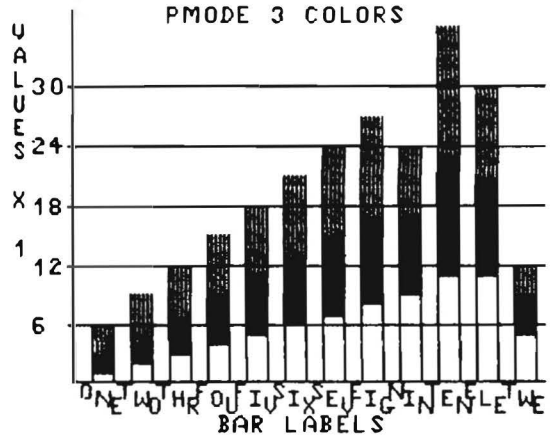

Fig. 3. Sample Stacked Graph

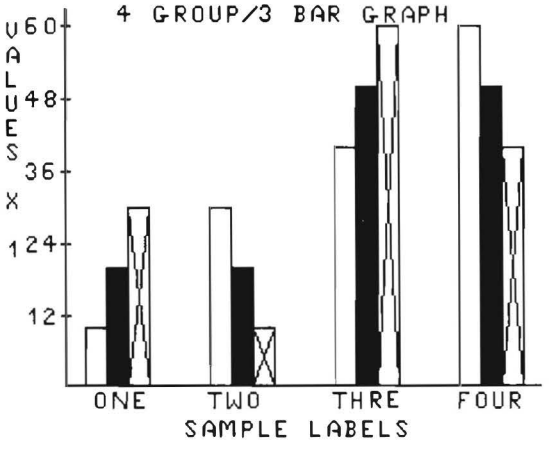

Fig. 4. Sample Side-by-Side Graph—Note Truncated Labels

BG	Background Color
CC	Flag for GSPRP Screen Dump
FI$	Graph Name (/BAR Added)
HX	Flag for Horizontal Graph
I	Data Entry Counter
K	Plotting Counter
L$	Hi-Res Draw Strings
LA$	Bar Label Input
MG	Scaling Factor for Graph Plotting
MXMG	Scaled Max. Value for Graph Plotting
NB	Number of Bars, SBS Graph
NE	Number of Stacks, Stacked Graph
NF$	Data Save File Name (/Ext Added)
NG	Number of groups, SBS Graph
PR	Hi-Res Print Color
SC$	Flag for Tic Marks
V	Amount/Value Input
VS	Stacked and SBS Value Input
WI	Width of Graph Bars
X$	String for Hi-Res Printing
XA$	X-axis Label
XB$	Bar Label Position
XL$	X-axis Label Position
XM	X-axis Plot Values
XS	X-axis SBS Plot Values
XT	X-axis Plot Value of Bar
XV	X-axis Tic Plot Values
XV$	XV Converted to String
YA$	Y-axis Label
YL$	Y-axis Label Position
YM	Y-axis Plot Values
YS	Y-axis SBS Plot Values
YT	Y-axis Plot Value of Bar
YV	Y-axis Tic Plot Values
YV$	YV Converted to String

Table 2. Program Variables

the enter key in response to all prompts.

The completed graph remains on the screen until you press any key, except the break, clear, or shift keys. Once a key is depressed, a new menu appears and you can save or print your graph. When your printout is complete (or if you answer N to the prompt, "Want Hard Copy?," an exit menu appears on the screen. If you choose to end your session, the program executes a cold-start POKE—POKE 113,3:EXEC40999.

Other Features

The program contains limited error trapping. All file names are suppressed to eight characters and the appropriate extension is added automatically to avoid errors in loading saved information:

- •VER: data saved for vertical graphs
- •SBS: data saved for side-by-side graphs
- •HOR: data saved for horizontal graphs
- •STK: data saved for stacked graphs
- •BAR: saved graphs

Pressing Q after entering the saved graph, hi-res text print, data-save, or printer routines returns you to the bar-graph selection menu or the next line in the program. Typing 99 for the number of groups in the side-by-side graph data-entry menu causes the program to exit the data-entry menu.

There is room for you to experiment with the program. Perhaps one of my techniques will help you make your own changes. When I began working with the side-by-side and stacked graphs, I realized that I needed three different bar markings. In Fig. 4, I used an empty bar, a filled bar, and an empty bar containing an enlarged X. Instead of using an X in the stacked graph, I entered PMODE 3, designated a color, filled the graph bar, and returned to PMODE 4 before plotting. The code to do this is in line 740. Make the appropriate changes in line 660.

I am open to your suggestions for improving my program. And, if you have difficulty running it, please contact me. Enclose a complete description of your problem and a stamped, self-addressed envelope for my reply. ■

See program listing on page 45

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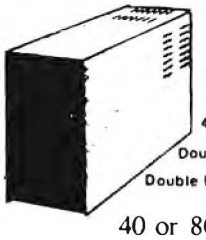

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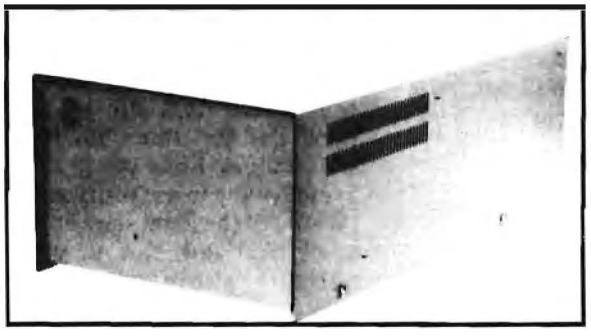

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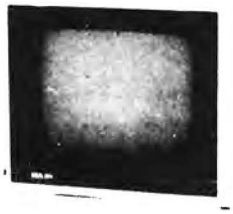

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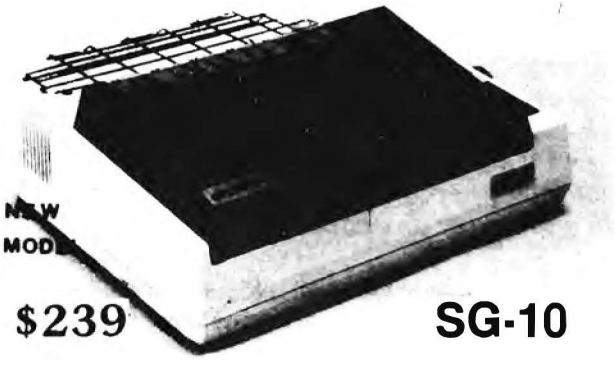

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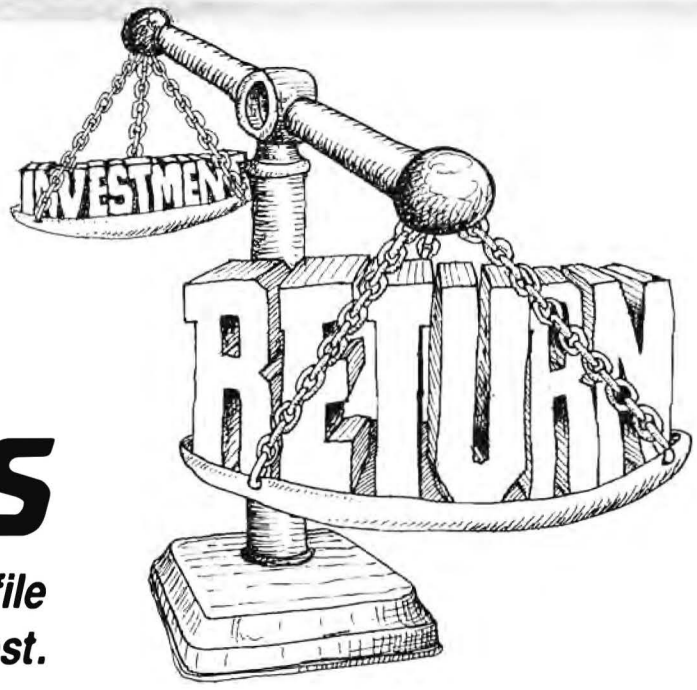

Financial Analysis

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In an economy of ups and downs, it is important for an investor to monitor the financial well-being of many companies. Armed with a corporation's financial report and its market price per share, you can use the accompanying financial-statement program to evaluate the firm's financial health. You can then analyze the relative merits of investing in different corporations and produce printouts of their financial statements for your portfolio. A word of caution, however: The companies you are comparing should be in the same field. Otherwise you'll be equating apples and oranges.

10–80	Title Page
90–120	Enter Data
130–380	Correct Data
390–560	Input Subroutines
570–580	Calculations
590–690	Menu
700–1140	Detailed Display
1150–1420	Chart Display
1430–1920	Printout
1930–1960	End Routine
1970–1980	<ENTER> To Continue Routine

Table 1. Program Structure

The Program

Table 1 outlines the program structure for Listing 1. Type in Listing 1, enter PCLEAR1, and load the program. The opening screen reminds you that you need the company's financial report before you can begin. Press the enter key to continue; the screen prompts you to submit 18 items of financial data. (See Table 2.) Pressing Y after reviewing items 1 through 9 allows you to make changes. Press N to proceed to entries 10 through 18.

When you finish reviewing the financial data, the following menu appears:

1 Detailed Display
2 Chart Display
3 Send To Printer
4 Enter New Data
5 Change Data
6 Quit

Pressing option 1 brings up a glossary of the 23 financial indicators (Table 3) that the program calculates from the data you provide. Option 2 displays two screens showing the values of these indicators for the company you are analyzing. When you select 3, you get a printout of the 23 indicators, but first you must supply a company name and a statement date. (Figure 1 shows a sample printout.) Option 4 returns you to the program's data-entry level; option 5 returns you to the data-editing level. Press 6 to quit. When you confirm your desire to exit, the screen clears and the program ends. ■

See program listing on page 48

Address correspondence to Bruce S. Lyon, 1787 Kimberly Circle #58, Salt Lake City, UT 84116.

Total Assets: the sum of all assets
Operating Expenses: the sum of expenses related to operations, such as rent and utilities
Total Income: all income from operations
Net Income: the income left after total expenses are subtracted
Total Stockholders' Equity: the total equity held by owners
Dividends Paid: the amount of payments made to owners
Total Current Assets: the sum of assets that can be realized within one year
Operating Profit: the profit before taxes
Net Sales: the net sales after discounts and returns
Total Taxes: the sum of all taxes
Total Current Liabilities: the total liabilities that can be realized within one year
Long Term Debt: other liabilities that won't be realized within one year
Total Liabilities: the sum of all liabilities
Depreciation: the total depreciation expenses incurred
Shares Outstanding: the number of shares of common stock outstanding
Market Price: the price per share at which stock sells
Quick Assets: cash and assets that can quickly be converted into cash
Accounts Receivable: the total of receivables outstanding

Table 2. Glossary For Input

System Requirements

16K RAM
Extended Color Basic
80-Column Printer Optional

Return On Equity: measures the ability to earn income
Retention Rate: the percentage of earnings retained by the company
Reinvestment Rate: the rate of return from reinvesting the retained earnings
Return On Total Assets: measures management's ability to earn a profit on the total assets employed
Operating Profit Margin: the margin of profit before taxes, based on net sales
Pretax Profit Margin: the margin of profit before taxes, based on total income
Tax Rate: the rate of taxes paid on income
Current Ratio: the ratio of current assets to current liabilities
Capital Structure: the sum of owner equity or stockholders' equity and long-term debts
Cash Flow: the sum of net profit and depreciation
Earnings Per Share: profit per share of common stock
Equity Turnover: the number of times that equity is turned over
Net Profit Margin: the percentage of profit earned, based on net sales
Equity-to-Debt Ratio: shows the equity compared to the liabilities
Creditors' Equity: the percentage of equity owned by creditors through debts
Owners' Equity: the percentage of equity owned by stockholders through debts
Dividend Yield: the rate earned by stockholders, based on current market price
Price-Earnings Ratio: shows the price per share compared to earnings
Acid-Test Ratio: also called the quick ratio. The percentage of assets that can quickly be converted to cash
Accounts Receivable Turnover: indicates how long it takes to collect debts
Book Value Per Share: the price per share of common stock in the company's books
Operating Expense Ratio: the percentage of operating expenses, based on net sales
Debt Ratio: the percentage of assets financed through borrowing

Table 3. Glossary For Output

```
-------------------------------

FINANCIAL STATEMENT ANALYSIS
EXAMPLE INCORPORATED
For the Period Ending
DECEMBER, 1984

-------------------------------

BALANCE SHEET DATA:

Quick assets        $    19400      Total liabilities  $    67000
Current assets      $   135000      Owner's equity     $   125000
Total assets        $   135000      Long term debts    $    66000
Accounts receivable $    11200      Shares outstanding $    10000
Current liabilities $     4500

INCOME STATEMENT DATA:

Total income        $   300000      Operating profit   $    11700
Net sales           $   150000      Total taxes        $     2300
Operating expences  $   290600      Net income         $     9400
Depreciation        $     6800

OTHER DATA:

Dividends paid      $     4000      Market price/share $    15.00

ANALYSIS DATA:

Return on equity          7.52%     Net profit margin         6.27%
Retention rate           57.45%     Equity-to-debt            1.87:1
Reinvestment rate         4.32%     Capital contribution:
Return on assets          6.96%       Creditor's equity      34.90%
Oper. profit margin       7.80%       Owner's equity         65.10%
Pretax prof. margin       3.90%     Dividend yield            2.67%
Tax rate                 19.66%     Price-earning ratio      15.96:1
Current ratio            30.00:1    Acid-test ratio           4.31:1
Capital structure   $   191000      Acc. rec. turnover     13 TIMES
Cash flow           $    16200      Book value/share   $     12.50
Earnings per share  $     0.94      Oper. expence ratio       1.94:1
Equity turnover          120.00%    Debt ratio                0.50:1
```

Fig. 1. Sample Printout

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TUTORIAL

by Leon G. Wigrizer

Tandy's Model 100 computer can be a valuable companion to your CoCo.

Computer Mating: CoCo And Model 100

As a CoCo user of two years, I have enjoyed the wonders of Telewriter-64 and the ease of Colorcom/E in everyday business. Recently, I undertook a new position with major responsibilities and the need to hire staff. However, no staff was immediately available and the work had to move.

I had to do record keeping and word processing constantly and get the printed data out quickly. My one prayer was a lap computer with the ability to dump it all to the CoCo for Telewriter-64 to work its magic. The new lower prices on the Tandy Model 100 made up my mind. However, I went to three Radio Shack Computer Centers and no one could tell me how to make the two work together or even if it was possible.

Because necessity is the mother of invention, I did my own research and experimentation. My work paid off as I now have the "perfect" system for a very reasonable price.

Though I used Telewriter-64 and Colorcom/E, any CoCo word-processing and terminal programs that can buffer ASCII files should work. Some commands and syntax might be different, but the general procedures outlined here should also apply to programs of similar ability.

I carry my Model 100 in my briefcase and use it for notes, letters, files, and so on. It keeps my appointment book, too. At night I tie it to the CoCo and send the day's work to the CoCo for correction and printing—top quality with minimum cost.

The steps are important. I plug an RS (Radio Shack) #26-1497 cable into the RS-232C plug in the back of the model 100. That cable plugs into the RS #26-1496 null modem adapter. To connect to the CoCo you use an RS #26-3014 interface cable to connect the null modem into the CoCo serial port.

If you have the time and experience with a soldering iron, you can make these cables for a much lower cost. I purchased the ready-made versions to get on line fast.

After you turn on both computers, load Colorcom/E into your CoCo and leave it at all the default settings. Be certain to set the slide switch on the left side of the Model 100 to ORIG. Then place the Model 100 cursor over Telcom and press its enter key.

First, reset the communication parameters of the Model 100 to activate the RS-232C interface. To do this, press key F3 and the let-

ters STAT will appear at the F3 location. Type 37,11E,10 and press enter. Second, press key F4 for TERM (terminal) status. This will also rename the functions of the F1 through F4 keys. Third, press F3 for "Up." Enter the name of the Model 100 file that you wish to send to the CoCo, and the Model 100 will ask you for "width." I use 55. After that reply, press enter on the Model 100 and the program is quickly sent to the CoCo.

After the transfer has ended, press F8 on the Model 100 and answer the prompt with Y and press enter. The CoCo will then be ready for a disk write of the transferred data. Use the W prompt in Colorcom/E and follow instructions on the screen. I press the one key to reply to the first question and then at the prompt enter the CoCo file name that I want to use.

Once you have the data on the disks, remove the disks and exit the Colorcom/E program. At this point you will have the data on a disk in ASCII format. Load the Telewriter-64 program, and then, using the Basic option in the disk menu, load the ASCII disk-read option by typing RUN "S/ASC". Follow the instructions for the S/ASC routine in the Telewriter-64 manual. At this point "read-in" the document in ASCII and make your corrections. Save the data to disk using the regular disk operating menu, and you are finished.

I can transfer files from the CoCo to the Model 100 in the same way. However, the switch on the left side of the Model 100 has to be set to ANS and you must press F2 for "Down" after pressing F4 (TERM) in the Telcom program. At the CoCo end, run the Colorcom/E program and use the R command (and answer the prompts) to put the file into the buffer. Press the spacebar to get back into the transmit position. Send the full buffer by pressing control-2.

The ability to use a mobile word-processing machine with the benefits of a full-scale program later—and vice-versa—makes me a more productive executive. In my option this is a perfect arrangement. Try it—you'll benefit. ■

Address correspondence to Leon G. Wigrizer, Apartment 316, 309 Florence Ave., Jenkintown, PA 19046.

by Jeff Mikel

The AUTO Difference

Let Basic do your line numbering.

```
 10 'Picture yourself as you type
 20 'in a long Basic program. You
 30 'press the enter key after
 40 'typing line 1120 and then
 50 'notice you left out the first
 60 'digit. The computer stores
 70 'this line as 120, erasing the
 80 'correct line 120 in the
 90 'process. Frustration mounts
100 'because you have to retype
110 'both line 1120 and 120.
```

Wouldn't it be nice if this never happened again?

The AUTO Command

My program adds an AUTO function to Basic's vocabulary, so your CoCo numbers lines for you. The proper syntax is AUTO (start line number, increment). The examples below show possible parameters:

- AUTO 10,10—start at line 10 and increment by 10.
- AUTO 18—start at line 18 using the current increment.
- AUTO ,6—start at end of program and increment by six.
- AUTO—start at end of program using current increment.

If you use AUTO for the first time without specifying the starting line or the increment, it starts at 10 and increments successive lines by 10.

Program Listing 1 is the Basic version of Autonum. Use it if you do not have an editor/assembler. Program Listing 2 provides the source-code listing for people using an editor/assembler.

The Basic Driver

After entering Program Listing 1, save and then load your program. If all goes well when you run it, you get the OK prompt; otherwise you must find your mistake.

Once the program executes properly, CSAVE it and type NEW to erase memory. When you type AUTO, the number 10 appears on the screen; subsequent lines are incremented automatically unless you press the break key. To reinstate AUTO after pressing the break key, retype the command.

To generate the object code for use with the Basic driver, CLOAD and run the listing, type NEW, and then type CSAVEM "AUTONUM", 32200,32667,32200. To load the object code back into memory, type:

```
CLEAR 200,32200:CLOADM "AUTONUM"
:EXEC
```

Source-Code Listing

Type Program Listing 2 using an editor/assembler. I recommend that you set the origin of the program at the top of RAM (random-access memory). The program uses 469 bytes, so subtract 469 from your machine's highest RAM value. Save the listing on tape and then assemble the program using the A/IM/AO switches. Type and enter ZBUG and save the code with the P command: P AUTONUM 7DC8 7F9A 7DC8.

Call up Basic, CLOADM the program, and type EXEC. The computer responds with OK, unless you have made a mistake. Once the program executes properly, type NEW and you are ready to use AUTO.

Program Explanation

When you first run the program, it scans

System Requirements
32K RAM
Color Basic or Disk Basic
Editor/Assembler Optional

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memory for the area that the Basic interpreter uses to store reserved word lists. The interpreter scans four 5-byte blocks to find the number of words in the lists, the location of the lists, and the location of the routine that finds the address of a reserved word's function. Color Basic's reserved words are at addresses 288 to 292, Extended Color Basic's are at addresses 298 to 302, and Disk Extended Color Basic's are at addresses 308 to 312. You can add your own words by filling the first unused block with the necessary data.

The Start routine finds the first unused blocks and stores AUTO's data there. The Check routine enables Basic to find and execute the Auto routine.

When you invoke the AUTO command, the program sets up a RAM hook, an area in RAM to which ROM (read-only memory) transfers control. Usually the RAM hook transfers control back to ROM. However, if you change the address to which RAM points, you can make Basic execute a routine in RAM.

Because the keyboard input routine calls a RAM hook before it executes, you can expand or change the input routine. My program modifies the RAM hook so that the Numout routine, which prints the line number automatically, executes before keyboard input is allowed.

The program returns two error messages—bad line number and bad increment value. The first indicates that the current line number value exceeds 63999; the second means the increment value is either zero or greater than 63999. In either case, you exit the autonumbering mode. Type AUTO to reenter this mode.

Getting the program up and running should't be difficult; however some of you are bound to encounter problems. If you can't seem to eliminate a bug, please write me for assistance. If you do write, include a description of the problem, a complete program listing, and a stamped, self-addressed envelope for my reply. ■

See program listings on page 50

Address correspondence to Jeff Mikel, 3300 Gate Court, Rex, GA 30273.

Circle Reader Service card #223

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Designmaker 44
The Bar-Graph Scene 45
Financial Analysis 48
The AUTO Difference 50
The John-B System 52
Screen Symmetry 53

Mindbusters

(Article on page 16)

Program Listing 1. Gridskid

```
100 REM * GRIDSKID * TRS-80 EXTE
NDED COLOR BASIC / RAMELLA
110 PMODE 1,1: COLOR 3,0: PCLS 1
: SCREEN 1,1: DIM D(8,8): P=200:
 Q=10
120 FOR X=1 TO 8: FOR Y=1 TO 8:
D(X,Y)=0: NEXT Y,X
130 FOR Y=0 TO 175 STEP 25: FOR
X=0 TO 175 STEP 25
140 LINE(X,Y)-(X+10,Y+10),PSET,B
: NEXT X,Y: X=25: Y=150
150 D(2,7)=1: D(3,7)=1: A=2:B=7
160 COLOR 2,0: LINE(50,150)-(60,
160),PSET,BF: DRAW"BM195,160;R12
": COLOR 3,0
170 A$=INKEY$: IF W=63 THEN 240
180 LINE(X+2,Y+2)-(X+8,Y+8),PSET
,BF: FOR T=1 TO 40: NEXT T: LINE
(X+2,Y+2)-(X+8,Y+8),PRESET,B
190 IF A$=CHR$(94) AND B>1 THEN
B=B-1: M=1: LINE(X+5,Y-1)-(X+5,Y
-15),PSET: Y=Y-25: GOSUB 260
200 IF A$=CHR$(9) AND A<8 THEN A
=A+1: M=2: LINE(X+11,Y+5)-(X+25,
Y+5),PSET: X=X+25: GOSUB 260
210 IF A$=CHR$(10) AND B<8 THEN
B=B+1: M=3: LINE(X+5,Y+11)-(X+5,
Y+25),PSET: Y=Y+25: GOSUB 260
220 IF A$=CHR$(8) AND A>1 THEN A
=A-1: M=4: LINE(X-1,Y+5)-(X-15,Y
+5),PSET: X=X-25: GOSUB 260
230 IF M<>MM THEN GOSUB 280: GOT
O 170 ELSE 170
240 IF W=63 AND A=3 AND B=7 THEN
 POKE 223,122: PLAY "T16;O3"+MID
$("CDEFGAB",RND(7),1): GOTO 240
250 IF W<63 THEN LINE(X,Y)-(X+10
,Y+10),PRESET: LINE(X+10,Y)-(X,Y
+10),PRESET: SOUND 1,20: GOTO 25
0
260 LINE(X,Y)-(X+10,Y+10),PSET,B
F: COLOR3,0: IF A=0 THEN RETURN
270 W=W+1: IF D(A,B)=1 THEN 240
ELSE D(A,B)=1: RETURN
280 MM=M: CIRCLE(P,Q),5: PAINT(P
,Q),4,3: PLAY "T64;CABBAGE CABBA
GE": Q=Q+10: IF Q>185 THEN P=P+1
0: Q=10
290 RETURN
300 END
```

Program Listing 2. Mosaic

```
100 REM * MOSAIC * TRS-80 EXTEND
ED COLOR BASIC 16K / RAMELLA
110 CLEAR 256: PMODE 1,1: CLS: C
OLOR 2,1: PCLS 1: PRINT @ 234,"M
 O S A I C"
120 U$=CHR$(94): D$=CHR$(10): L$
=CHR$(8): R$=CHR$(9): V=3
130 SCREEN 1,1: FOR A=0 TO 192 S
TEP 24
140 LINE(A,0)-(A,192),PSET: LINE
(0,A)-(192,A),PSET: NEXT
150 FOR Y=3 TO 175 STEP 24: FOR
X=3 TO 175 STEP 24
160 IF X>27 AND Y>27 AND X<147 A
ND Y<147 THEN 180
170 PAINT(X,Y),RND(2)+2,2: N=N+1
: IF N=3 THEN V=V+1: IF V=4 THEN
 V=3: M=0
180 NEXT X,Y: X=9: Y=9
190 A$=INKEY$
200 COLOR 2,PPOINT(X,Y): LINE(X,
Y)-(X+6,Y+6),PSET,BF
210 GOSUB 380: LINE(X,Y)-(X+6,Y+
6),PRESET,BF: GOSUB 380
220 IF A$="" THEN 190 ELSE IF A$
="N" AND Y>9 THEN Y=Y-24
240 IF A$="S" AND Y<177 THEN Y=Y
+24 ELSE IF A$="W" AND X>9 THEN
X=X-24
260 IF A$="E" AND X<177 THEN X=X
+24
270 IF PPOINT(X,Y)=5 OR INSTR("N
EWS",A$)>0 THEN 190
280 IF A$=U$ AND Y<51 OR A$=D$ A
ND Y>129 OR A$=L$ AND X<51 OR A$
=R$ AND X>129 THEN 190
290 IF Y-24<9 THEN 300 ELSE N1=P
POINT(X,Y-24): IF Y-48<9 THEN 30
0 ELSE N2=PPOINT(X,Y-48)
300 IF Y+24>153 THEN 310 ELSE S1
=PPOINT(X,Y+24): IF Y+48>177 THE
N 310 ELSE S2=PPOINT(X,Y+48)
310 IF X-24<9 THEN 320 ELSE W1=P
POINT(X-24,Y): IF X-48<9 THEN 32
0 ELSE W2=PPOINT(X-48,Y)
320 IF X+24>153 THEN 330 ELSE E1
=PPOINT(X+24,Y): IF X+48>177 THE
N 330 ELSE E2=PPOINT(X+48,Y)
330 L=PPOINT(X,Y): IF A$=U$ AND
N1<>5 AND N2=5 THEN PAINT(X,Y),5
,2: Y=Y-48: PAINT(X,Y),L,2: PAIN
T(X,Y+24),5,2: GOTO 190
340 IF A$=D$ AND S1<>5 AND S2=5
```

Listing continued

```
THEN PAINT(X,Y),5,2: Y=Y+48: PAI
NT(X,Y),L,2: PAINT(X,Y-24),5,2:
GOTO 19Ø
35Ø IF A$=L$ AND W1<>5 AND W2=5
THEN PAINT(X,Y),5,2: X=X-48: PAI
NT(X,Y),L,2: PAINT(X+24,Y),5,2:
GOTO 19Ø
36Ø IF A$=R$ AND E1<>5 AND E2=5
THEN PAINT(X,Y),5,2: X=X+48: PAI
NT(X,Y),L,2: PAINT(X-24,Y),5,2
37Ø GOTO 19Ø
38Ø FOR T=1 TO 1Ø: NEXT T: RETUR
N
39Ø END
```

Program Listing 3. Grade Maker

```
1ØØ REM * GRADEMAKER * TRS-8Ø EX
TENDED COLOR BASIC / RAMELLA
11Ø CLS: CLEAR 2ØØ: PCLS 1: PMOD
E 4,1: COLOR Ø,1: SCREEN 1,1
12Ø U$=CHR$(94): D$=CHR$(1Ø): L$
=CHR$(8): R$=CHR$(9)
13Ø FOR Y=4 TO 189 STEP 37: FOR
X=4 TO 189 STEP 37: PSET(X,Y,Ø):
 NEXT X,Y
14Ø FOR X=4 TO 189 STEP 37: PSET
(X,3,Ø): PSET(X,19Ø,Ø): NEXT
15Ø FOR Y=4 TO 189 STEP 37: PSET
(3,Y,Ø): PSET(19Ø,Y,Ø): NEXT: X=
4: Y=4
16Ø A$=INKEY$
17Ø IF A$=U$ AND Y>4 THEN Y=Y-37
 ELSE IF A$=D$ AND Y<189 THEN Y=
Y+37
18Ø IF A$=L$ AND X>4 THEN X=X-37
 ELSE IF A$=R$ AND X<189 THEN X=
X+37
19Ø PRESET(X,Y): FOR T=1 TO 1Ø:
NEXT T: PSET(X,Y,Ø): IF A$=CHR$(
13) THEN 2ØØ ELSE 16Ø
2ØØ A$=INKEY$
21Ø IF PPOINT(X-1,Y)=Ø AND PPOIN
T(X+1,Y)=Ø AND PPOINT(X,Y-1)=Ø A
ND PPOINT(X,Y+1)=Ø THEN 27Ø
22Ø IF PPOINT(X,Y-1)=5 AND Y>4 A
ND A$=U$ THEN LINE(X,Y)-(X,Y-37)
,PSET: Y=Y-37
23Ø IF PPOINT(X,Y+1)=5 AND Y<189
 AND A$=D$ THEN LINE(X,Y)-(X,Y+3
7),PSET: Y=Y+37
24Ø IF PPOINT(X-1,Y)=5 AND X>4 A
ND A$=L$ THEN LINE(X,Y)-(X-37,Y)
,PSET: X=X-37
25Ø IF PPOINT(X+1,Y)=5 AND X<189
 AND A$=R$ THEN LINE(X,Y)-(X+37,
Y),PSET: X=X+37
26Ø GOTO 2ØØ
27Ø FOR Y=22 TO 17Ø STEP 37: FOR
 X=22 TO 17Ø STEP 37
28Ø IF PPOINT(X,Y-18)=Ø THEN LIN
E(X,Y)-(X,Y-1Ø),PSET: GOSUB 42Ø
29Ø IF PPOINT(X,Y+19)=Ø THEN LIN
E(X,Y)-(X,Y+1Ø),PSET: GOSUB 42Ø
3ØØ IF PPOINT(X-18,Y)=Ø THEN LIN
E(X,Y)-(X-1Ø,Y),PSET: GOSUB 42Ø
31Ø IF PPOINT(X+19,Y)=Ø THEN LIN
E(X,Y)-(X+1Ø,Y),PSET: GOSUB 42Ø
32Ø NEXT X,Y
33Ø R=INT((S-42)/1Ø): IF R<1 THE
N R=1
34Ø Z$="BM22Ø,5Ø;": IF R=1 THEN
B$="U15R1ØL1ØU1ØR2Ø"
35Ø IF R=2 THEN B$="U25R1ØF7D12G
7L1Ø"
36Ø IF R=3 THEN B$="F7R1ØE7G7L1Ø
H7U2ØE7R1ØF7"
37Ø IF R=4 THEN B$="R1ØE5U7H5L1Ø
R1ØE5U7H5L1ØD33"
38Ø IF R=5 THEN B$="U15R15L15E2U
5E2U5R7D5F2D5F2D15"
39Ø DRAW Z$+B$
4ØØ IF S>92 THEN DRAW"BM245,3Ø;U
5D1ØU5L5R1Ø"
41Ø GOTO 41Ø
42Ø S=S+1: SOUND RND(13)*RND(13)
,1: RETURN: END
```

Designmaker

(Article on page 26)

```
1Ø CLS
2Ø PRINT"WELCOME TO THE WORLD OF
":PRINT"COMPUTER GRAPHICS"
3Ø PRINT"PRESS (1) OR (2)"
4Ø INPUTA(9)
5Ø IF A(9)<1 OR A(9)>2 THEN 4Ø
6Ø CLS
7Ø ON A(9) GOSUB 9Ø,56Ø
8Ø GOTO 3Ø
9Ø ' FIRST DESIGNMAKER
1ØØ INPUT"STEP(2-3Ø**LOWER THE B
ETTER**)";A
11Ø IF A<2 OR A>3Ø THEN 1ØØ
12Ø INPUT"Ø-256";B
13Ø IF B<Ø OR B>256 THEN 12Ø
14Ø INPUT"Ø-192";C
15Ø IF C<Ø OR C>192 THEN 14Ø
16Ø INPUT"Ø-192";D
17Ø IF D<Ø OR D>192 THEN 16Ø
18Ø INPUT"MODE(Ø-4)";E
19Ø IF E<Ø OR E>4 THEN 18Ø
2ØØ INPUT"SCREEN(Ø OR 1)";F
21Ø IF F<Ø OR F>1 THEN 2ØØ
22Ø INPUT"OVERLAP 192-FULL 96-1/
2 DESIGN";K
23Ø IF K<1 OR K>192 THEN 22Ø
24Ø INPUT"LINES";I$:INPUT"CIRCLE
S";J$
25Ø INPUT"JUST LINES HARDCOPY (Y
/N)";YN$
26Ø IF YN$<>"Y" AND YN$<>"N" THE
N 25Ø
27Ø IF YN$="Y" THEN PRINT#-2,CHR
$(18)
28Ø PMODE E,1
29Ø PCLS
3ØØ SCREEN 1,F
31Ø FOR Y=1 TO K STEP A
32Ø B$=INKEY$
33Ø S=S+1
34Ø R=192-Y
35Ø IF S/2=INT(S/2) THEN T=Y ELS
E T=R
36Ø IF J$<>"Y" THEN 39Ø
37Ø CIRCLE(B,T),C
38Ø CIRCLE(B,Y),D
39Ø IF I$<>"Y" THEN 46Ø
4ØØ IF YN$="N" THEN 42Ø
41Ø PRINT#-2,"M";256",";192-D:PR
INT#-2,"D";B","192-T
42Ø LINE(256,D)-(B,T),PSET
43Ø IF YN$="N" THEN 45Ø
44Ø PRINT#-2,"M";Ø",";192-C:PRIN
T#-2,"D";B","192-T
45Ø LINE(Ø,C)-(B,T),PSET
46Ø IF B$=CHR$(32) THEN 49Ø
47Ø NEXT Y
48Ø FF=1
49Ø A$=INKEY$
5ØØ IF A$=CHR$(13) THEN 1ØØ
51Ø IF FF<>1 AND A$=CHR$(32) THE
N 47Ø
52Ø IF A$=CHR$(12) THEN 55Ø
53Ø IF A$="H" THEN GOSUB 122Ø
54Ø GOTO 49Ø
55Ø FF=Ø:RETURN
56Ø ' SECOND DESIGNMAKER
57Ø INPUT"STEP(2-3Ø**LOWER THE B
ETTER**)";A
58Ø IF A<2 OR A>3Ø THEN 57Ø
59Ø INPUT"Ø-256";B
6ØØ IF B<Ø OR B>256 THEN 59Ø
61Ø INPUT"Ø-256";Q
62Ø IF Q<Ø OR Q>256 THEN 61Ø
63Ø INPUT"Ø-192";C
64Ø IF C<Ø OR C>192 THEN 63Ø
65Ø INPUT"Ø-192";D
66Ø IF D<Ø OR D>192 THEN 65Ø
67Ø INPUT"MODE(Ø-4)";E
68Ø IF E<Ø OR E>4 THEN 67Ø
69Ø INPUT"SCREEN(Ø OR 1)";F
7ØØ IF F<>Ø AND F<>1 THEN 69Ø
73Ø INPUT"Ø-256";Z
74Ø IF Z<Ø OR Z>256 THEN 73Ø
75Ø INPUT"OVERLAP 192-FULL 96-1/
2 DESIGN";K
76Ø IF K<1 OR K>192 THEN 75Ø
77Ø PRINT"STARTING POSITION LESS
 THAN":INPUT"OVERLAP (LESSER THE
 BETTER";GH
78Ø IF GH>K OR GH<Ø THEN 77Ø
79Ø PRINT"ENDING POSITION MUST B
E":PRINT"> OR = TO OVERLAP AND L
ESS":INPUT"THAN 193";DD
8ØØ IF DD<K OR DD>192 THEN  79Ø
81Ø INPUT"FLASHING(Y/N)";N$
82Ø INPUT"PERMANENT(Y/N)";R$
83Ø INPUT"LINES(Y/N)";I$:INPUT"C
IRCLES(Y/N)";J$
84Ø INPUT"JUST LINES HARDCOPY (Y
/N)";YN$
85Ø IF YN$<>"Y" AND YN$<>"N" THE
N 84Ø
86Ø IF YN$="Y" THEN PRINT#-2,CHR
$(18)
87Ø PMODE E,1
88Ø PCLS
89Ø SCREEN 1,F
9ØØ FOR Y=GH TO K STEP A
91Ø B$=INKEY$
92Ø S=S+1
93Ø R=DD-Y
94Ø IF S/2=INT(S/2) THEN T=Y ELS
E T=R
95Ø IF Z>256 OR Z<Ø OR R>256 OR
R<Ø THEN 112Ø
96Ø IF T>256 OR T<Ø THEN 112Ø
97Ø IF I$<>"Y" THEN 1Ø4Ø
98Ø IF YN$="N" THEN 1ØØØ
99Ø PRINT#-2,"M";B",";192-T:PRIN
T#-2,"D";Z",";192-C
1ØØØ LINE(Z,C)-(B,T),PSET
```

```
1Ø1Ø IF YN$="N" THEN 1Ø3Ø
1Ø2Ø PRINT#-2,"M";R",";192-D:PRI
NT#-2,"D";Q",";192-T
1Ø3Ø LINE(R,D)-(Q,T),PSET
1Ø4Ø IF J$<>"Y" THEN 1Ø6Ø
1Ø5Ø CIRCLE(B,T),C: CIRCLE(Q,R),
D
1Ø6Ø IF B$=CHR$(32) THEN 118Ø
1Ø7Ø IF N$="N" THEN 11ØØ
1Ø8Ø LINE(Z,C)-(B,T),PRESET
1Ø9Ø LINE(R,D)-(Q,T),PRESET
11ØØ IF T<1 OR T>256 THEN 112Ø
111Ø SOUND T,1
112Ø NEXT Y
113Ø A$=INKEY$
114Ø IF Y<192 AND A$=CHR$(32) TH
EN 119Ø
115Ø IF A$=CHR$(13) THEN 56Ø
116Ø IF A$=CHR$(12) THEN 121Ø
117Ø IF A$="H" THEN GOSUB 122Ø
118Ø GOTO 113Ø
119Ø IF R$="Y" THEN 112Ø
12ØØ GOTO 1Ø8Ø
121Ø RETURN
122Ø PRINT#-2,CHR$(18)
1221 PRINT#-2,"MØ,Ø"
123Ø FOR ZY=Ø TO 192
124Ø PRINT#-2,"RØ,-1"
125Ø FOR ZX=Ø TO 256
126Ø IF PPOINT(ZX,ZY)=5 THEN 132
Ø
127Ø PRINT#-2,"R1,Ø"
128Ø NEXT
129Ø PRINT#-2,"R-257,Ø"
13ØØ NEXT
131Ø RETURN
132Ø PRINT#-2,"J1,Ø"
133Ø GOTO 128Ø
```

The Bar-Graph Scene

(Article on page 31)

```
1Ø CLEAR5ØØ,&H7D65:FORKK=&H7D65
TO &H7D8B:READXX:POKEKK,XX:NEXTK
K:POKE346,2Ø1:DEFUSRØ=&H7D65:GOT
O3Ø
2Ø IK$=INKEY$:IFIK$=""THEN2ØELSE
RETURN
3Ø CLS(6):PRINT@235,"bar graph";
:POKE1Ø24+238,128:PRINT@298,"VER
SION 1.1";:XJ=USRØ(XJ):FORZZ=1TO
5ØØ:NEXT:GOTO5Ø
38 '
39 'DRAW HI-RES TEXT
4Ø FOR X1=1TO LEN(X$):Y1=ASC(MID
$(X$,X1,1))-32:DRAW"XL$(Y1);":NE
XT:RETURN
5Ø LOADM"GSPRP":DEFUSR1=&H7D9Ø:D
EFUSR2=&H7D92:GOTO2ØØØ
65 CLS:PRINT"DO YOU NEED INSTRUC
TIONS(Y/N)?":SOUND14Ø,1:GOSUB2Ø:
IFIK$="Y"THENGOSUB8ØØØELSE IFIK$
<>"N"THEN65
67 CLS:PRINT:PRINT"  DO YOU WANT
 LIGHT PRINT ON          DARK BA
CKGROUND OR               DARK
PRINT ON                 LIGHT
BACKGROUND?":PRINT:PRINT"PRINT T
YPE? <D>ARK OR <L>IGHT":SOUND14Ø
,1:GOSUB2Ø
68 IFIK$="D"THEN PR=Ø:BG=1 ELSE
PR=1:BG=Ø
7Ø DIML$(6Ø),YM(1Ø),YV(1Ø),LA$(1
2),V(12),YT(12),X(12),VS(12,3),X
S(5,4),YS(4,3):CC=Ø:GOTO9ØØØ
78 '
79 'DATA ENTRY SELECTION MENU
8Ø CLS:PRINT@3,"SELECT TYPE OF D
ATA ENTRY":PRINT:PRINT
85 PRINTTAB(8);"1) MANUAL":PRINT
TAB(8);"2) SAVED DATA":PRINTTAB(
8);"3) SAVED GRAPH"
9Ø PRINT:PRINT:PRINT"      SELECT
 ONE":SOUND14Ø,1:GOSUB2Ø
93 IFIK$="Q"THEN21Ø
95 IK=VAL(IK$):IFIK<1ORIK>3THENS
OUND5,3:GOTO8Ø
98 RETURN
158 '
159 'INPUT SAVED GRAPH
16Ø CLS:INPUT"GRAPH NAME";FI$:IF
FI$="Q"THEN21Ø ELSE FI$=LEFT$(FI
$,8)+"/BAR":LOADMFI$:SCREEN1,Ø:G
OSUB2Ø:RETURN
21Ø CLS:PRINT"  SELECT THE TYPE
OF BARGRAPH";:PRINT:PRINT:PRINT
215 PRINTTAB(7);"1. VERTICAL":PR
INTTAB(7);"2. HORIZONTAL":PRINTT
AB(7);"3. STACKED":PRINTTAB(7);"
4. SIDE BY SIDE"
22Ø PRINT@394,"SELECT ONE";:SOUN
D14Ø,1:GOSUB2Ø
225 IK=VAL(IK$):IFIK<1ORIK>4THEN
SOUND5,3:CLS:PRINT"        MUST
CHOOSE 1-4":FORZZ=1TO5ØØ:NEXT:GO
TO21Ø
23Ø ON IK GOSUB3ØØØ,4ØØØ,5ØØØ,6Ø
ØØ
235 GOTO21Ø
398 '
399 'VERTICAL GRAPH PLOT
4ØØ PMODE4,1:SCREEN1,Ø:COLORPR,B
G:PCLS
4Ø5 POKE65495,Ø
41Ø LINE(28,13)-(28,169),PSET:LI
NE(28,169)-(249,169),PSET
415 FORK=1TOI-1
42Ø YT(K)=169-INT(V(K)*149/MAX):
NEXT
425 X(1)=37:D=INT(235/I)
43Ø FORK=2TOI-1
435 X(K)=X(K-1)+D:NEXT
44Ø FORK=1TOI-1
45Ø LINE(X(K),YT(K))-(X(K)+WI,YM
),PSET,BF:NEXT
458 '
459 'TICK MARKS FOR VERTICAL GRA
PHS
46Ø KK=1
465 MG=INT(MAX/KK):IFMG>9THEN KK
=KK*1Ø:GOTO465
47Ø MXMG=MG*KK
475 FORIC=1TO5
48Ø YV(IC)=INT(MXMG*IC/5):YM(IC)
=169-INT(YV(IC)*149/MAX)
483 IFSC$<>"Y"THEN LINE(26,YM(IC
))-(3Ø,YM(IC)),PSET:GOTO49Ø
485 LINE(26,YM(IC))-(249,YM(IC))
,PSET
49Ø NEXT
498 '
499 'EXIT/CHANGE ROUTINE
5ØØ POKE65494,Ø:GOSUB 2Ø:GOTO1Ø4
Ø
51Ø CLS:PRINT:PRINTTAB(7)"SAVE G
RAPH?":SOUND14Ø,1:GOSUB2Ø:IFIK$=
"Y"THENGOSUB155Ø
52Ø CLS:PRINT:PRINTTAB(8)"WANT H
ARD COPY?":SOUND14Ø,1:GOSUB2Ø:IF
IK$="Y"THENGOSUB157Ø
53Ø CLS:PRINT@1Ø8,"eND":PRINT@17
2,"bAR MENU"
532 PRINT@389,"ENTER YOUR SELECT
ION"
534 SOUND14Ø,1:GOSUB2Ø:PRINT@336
,IK$:IFIK$="E"THEN POKE113,3:EXE
C4Ø999ELSEIFIK$="B"THEN54ØELSEIF
IK$="M"THEN LOAD"GRAPH",R ELSE53
Ø
54Ø CLS:PRINT"WANT TO REVERSE PR
INT AND BACK- GROUND (Y/N)?":SOU
ND14Ø,1:GOSUB2Ø:IFIK$="Y"THEN TE
=PR:PR=BG:BG=TE:GOTO21Ø ELSE GOT
O21Ø
598 '
599 ' SBS GRAPH PLOT
6ØØ PMODE4,1:SCREEN1,Ø:COLORPR,B
G:PCLS
6Ø5 POKE65495,Ø
61Ø LINE(28,13)-(28,169),PSET:LI
NE(28,169)-(249,169),PSET
615 XS(1,1)=37:X(1)=47:D=INT(235
/NG)
62Ø FORJ=1TO NB
625 FORK=1TO NG
63Ø YS(K,J)=169-INT(VS(K,J)*149/
MAX)
635 XS(K+1,1)=XS(K,1)+D:X(K+1)=X
S(K+1,1)+5:NEXT:NEXT
64Ø FORK=1TO NG
645 FORJ=1TO NB
655 LINE((XS(K,1)+(J-1)*WI),YS(K
,J))-((XS(K,1)+J*WI),YM),PSET,B:
IFJ=2THEN PAINT(XS(K,1)+1.5*WI,Y
M-5),PR,PR:NEXT:NEXTELSENEXT:NEX
T
66Ø IFNB=3THEN FORK=1TO NG:LINE(
(XS(K,1)+2*WI),YS(K,3))-((XS(K,1
)+3*WI),YM),PSET:LINE((XS(K,1)+3
*WI),YS(K,3))-((XS(K,1)+2*WI),YM
),PSET:NEXT
665 GOTO46Ø
698 '
699 'STACKED GRAPH PLOT
7ØØ PMODE4,1:SCREEN1,Ø:COLORPR,B
G:PCLS
7Ø5 POKE65495,Ø
71Ø LINE(28,13)-(28,169),PSET:LI
NE(28,169)-(249,169),PSET
715 X(1)=37:D=INT(235/I)
72Ø FORK=2TOI-1:X(K)=X(K-1)+D:NE
XT
725 FORK=1TOI-1:VS(K,Ø)=Ø
73Ø FORJ=1TONE:VS(K,J)=VS(K,J-1)
+VS(K,J)
735 YT(J)=169-INT(VS(K,J)*149/MA
X)
74Ø LINE(X(K),YT(J))-(X(K)+WI,YM
),PSET,B:IFJ=2THENPAINT(X(K)+5,Y
T(J)+5),PR,PR ELSEIFJ=3THENPMODE
3:COLOR7:LINE(X(K),YT(J))-(X(K)+
```

Listing continued

```
WI,YT(J-1)),PSET,BF:PMODE4:COLOR
PR,BG
745 NEXT:NEXT
75Ø GOTO46Ø
798 '
799 'HORIZONTAL GRAPH PLOT
8ØØ PMODE4,1:SCREEN1,Ø:COLORPR,B
G:PCLS
8Ø5 POKE65495,Ø
81Ø LINE(36,13)-(36,169),PSET:LI
NE(36,169)-(249,169),PSET
815 FORK=1TOI-1
82Ø XT(K)=36+INT(V(K)*212/MAX):N
EXT
825 Y(1)=162:D=INT(17Ø/I)
83Ø FORK=2TOI-1
835 Y(K)=Y(K-1)-D:NEXT
84Ø FORK=1TOI-1
85Ø LINE(XM,Y(K))-(XT(K),Y(K)-WI
),PSET,BF:NEXT
858 '
859 'TICK MARKS FOR HORIZONTAL G
RAPH
86Ø KK=1
865 MG=INT(MAX/KK):IFMG>9THENKK=
KK*1Ø:GOTO865
87Ø MXMG=MG*KK
875 FORIC=1TO5
88Ø XV(IC)=INT(MXMG*IC/5):XM(IC)
=36+INT(XV(IC)*212/MAX)
885 IFSC$<>"Y"THENLINE(XM(IC),16
7)-(XM(IC),171),PSET:GOTO895
89Ø LINE(XM(IC),2Ø)-(XM(IC),171)
,PSET
895 NEXT
897 HX=1:POKE65494,Ø:GOSUB2Ø
1Ø38 '
1Ø39 ' HIRES SCREEN FORMAT
1Ø4Ø CLS:PRINT"lARGE OR sMALL PR
INT FOR TITLE?":PRINT:PRINT"
LARGE = 15 CHARACTER MAX":PRINT"
    SMALL = 32 CHARACTER MAX":SO
UND14Ø,1:GOSUB2Ø
1Ø43 IFIK$="Q"THEN21Ø
1Ø45 IFIK$="L"ORIK$="l"THENPRINT
@96,SB$ ELSEPRINT@64,SB$
1Ø5Ø PRINT@128,"":PRINT"GRAPH TI
TLE:":LINEINPUTTI$:IFIK$<>"L"AND
IK$<>"l"THEN PRINT"SUBTITLE:":LI
NEINPUTSTI$:TP$=IK$ELSE TP$=IK$
1Ø6Ø PRINT"X AXIS LABEL:":LINEIN
PUTXA$:PRINT"Y AXIS LABEL:":LINE
INPUTYA$:YA$=YA$+CHR$(32)
1Ø7Ø LA$=IK$:SCREEN1,Ø
1Ø8Ø IFTP$="L"THEN TC=16:TS$="S8
":T1S$="24":TI$=LEFT$(TI$,15):X1
$="13"ELSE TC=8:TS$="S4":T1S$="1
8":TI$=LEFT$(TI$,3Ø):X1$="9"
1Ø9Ø POKE 65495,Ø:X$=TI$:IFTI$="
"THEN111Ø
11ØØ P$="BM"+STR$(128-INT(TC*(LE
N(TI$))/2))+","+X1$+";"+TS$+";":
DRAWP$:GOSUB4Ø
111Ø X$=LEFT$(STI$,3Ø):IFSTI$=""
THEN1148
112Ø IFLA$<>"L"THEN P$="BM"+STR$
(128-INT(8*(LEN(X$))/2))+","+T1S
$+";S4;":DRAWP$:GOSUB4Ø
1146 '
1147 'PRINT X - Y AXIS TITLES
1148 X$=LEFT$(XA$,3Ø):IFXA$=""TH
EN116Ø
1149 IFHX=1THENX$=LEFT$(X$,25):X
$=X$+" X"+STR$(KK/1Ø)
115Ø XL$="BM"+STR$(135-INT(8*(LE
N(XA$))/2))+","+"19Ø"+";S4;":DRA
WXL$:GOSUB4Ø
1155 IFHX=1THENY$=LEFT$(YA$,15):
GOTO1163
116Ø Y$=LEFT$(YA$,11):Y$=Y$+"X"+
STR$(KK/1Ø)
1163 FOR K=1TOLEN(Y$)
1164 X$=MID$(Y$,K,1)
1165 YL$="BMØ,"+STR$(15+1Ø*K)+";
S4;":DRAWYL$:GOSUB4Ø
117Ø NEXT
1175 IFHX=1THEN13ØØ
1178 '
1179 'X AXIS BAR LABELS
118Ø FORQ=1TOI-1
1185 X$=LA$(Q):IFLA$(Q)=""THEN12
1Ø
119Ø IFI-1<6THEN XB$="BM"+STR$(X
(Q)-6)+","+"178"+";":DRAWXB$:GOS
UB4Ø:GOTO121Ø
1193 LA$(Q)=LA$(Q)+CHR$(32)+CHR$
(32):X$=LEFT$(LA$(Q),3)
1195 FORIX=ØTO2
1197 X$=MID$(LA$(Q),IX+1,1)
12ØØ XB$="BM"+STR$(X(Q)-6+7*IX)+
","+STR$(176+3*IX)+";":DRAWXB$:G
OSUB4Ø
12Ø5 NEXT
121Ø NEXT
1248 '
1249 'Y AXIS LABELS
125Ø FORIC=1TO5
1255 YV$(IC)=STR$(YV(IC)/(.1*KK)
)
126Ø YV$(IC)=LEFT$(YV$(IC),3)
1265 X$=YV$(IC):IFYV$(IC)=""THEN
1275
127Ø XB$="BM1,"+STR$(YM(IC)+3)+"
;":DRAWXB$:GOSUB4Ø
1275 NEXT
129Ø POKE65494,Ø:GOSUB2Ø
1295 GOTO51Ø
1298 '
1299 'Y AXIS BAR LABEL (HOR)
13ØØ FORQ=1TOI-1
13Ø5 X$=LA$(Q):IFLA$(Q)=""THEN13
2Ø
131Ø XB$="BM1Ø,"+STR$(Y(Q))+";":
DRAWXB$:GOSUB4Ø
132Ø NEXT
1348 '
1349 'X AXIS VALUES (HOR)
135Ø FORIC=1TO5
1355 XV$(IC)=STR$(XV(IC)/(.1*KK)
)
136Ø XV$(IC)=LEFT$(XV$(IC),3)
1365 X$=XV$(IC):IFXV$(IC)=""THEN
1375
137Ø XB$="BM"+STR$(XM(IC)-15)+",
"+"18Ø"+";":DRAWXB$:GOSUB4Ø
1375 NEXT
138Ø HX=Ø
139Ø POKE65494,Ø:GOSUB2Ø
1395 GOTO51Ø
1488 '
1489 'DATA SAVE ROUTINE FOR VERT
ICAL BARGRAPH
149Ø CLS:INPUT"ENTER DATA FILE N
AME";NF$:IFNF$="Q"THEN RETURN EL
SE NF$=LEFT$(NF$,8)+"/VER":OPEN"
O",#1,NF$
15ØØ WRITE#1,I,MAX,MIN
151Ø FORKK=1TO I-1:WRITE#1,LA$(K
K),V(KK):NEXT:CLOSE:RETURN
1518 '
1519 'DATA SAVE SBS BARGRAPH
152Ø CLS:INPUT"ENTER DATA FILE N
AME";NF$:IFNF$="Q"THEN RETURN EL
SE NF$=LEFT$(NF$,8)+"/SBS":OPEN"
O",#1,NF$
1522 WRITE#1,NG,NB,MAX,MIN
1524 FORKK=1TO NG
1526 FORJJ=1TO NB:WRITE#1,LA$(KK
),VS(KK,JJ):NEXT:NEXT:CLOSE:RETU
RN
1528 '
1529 'DATA SAVE FOR STACKED BARG
RAPH
153Ø CLS:INPUT"ENTER DATA FILE N
AME";NF$:IFNF$="Q"THENRETURNELSE
NF$=LEFT$(NF$,8)+"/STK":OPEN"O",
#1,NF$
1532 WRITE#1,I,NE,MAX,MIN
1534 FORKK=1TOI-1:FORJJ=1TONE:WR
ITE#1,LA$(KK),VS(KK,JJ):NEXT:NEX
T:CLOSE:RETURN
1538 '
1539 'DATA SAVE FOR HORIZONTAL B
AR GRAPH
154Ø CLS:INPUT"ENTER DATA FILE N
AME";NF$:IFNF$="Q"THENRETURNELSE
NF$=LEFT$(NF$,8)+"/HOR":OPEN"O",
#1,NF$
1542 WRITE#1,I,MAX,MIN
1544 FORKK=1TOI-1:WRITE#1,LA$(KK
),V(KK):NEXT:CLOSE:RETURN
1548 '
1549 'GRAPH SAVE ROUTINE
155Ø CLS:INPUT"GRAPH NAME";FI$:I
FFI$="Q"THEN RETURNELSE FI$=LEFT
$(FI$,8)+"/BAR":SCREEN1,Ø:SAVEMF
I$,PEEK(188)*256,PEEK(188)*256+6
143,38Ø:RETURN
1568 '
1569 'PRINTER ROUTINES
157Ø CLS:PRINT"HALF AND FULL WID
TH PAGE COPY   ARE AVAILABLE."
158Ø PRINT:PRINT"HALF PAGE COPY
CAN BE LOCATED   RIGHT, LEFT, OR
 CENTER."
159Ø PRINT:PRINT"DO YOU WANT hAL
F OR fULL PAGE?":SOUND14Ø,1:GOSU
B2Ø
1595 IFIK$="Q"THEN53Ø
16ØØ IFIK$="F"ORIK$="f"THEN GOTO
163Ø
161Ø IFIK$="H"ORIK$="h"AND CC=ØT
HEN GOSUB165Ø ELSE LOADM"GSPRP":
CC=Ø:GOSUB165Ø
162Ø SCREEN1,Ø:IFPPOINT(5,19Ø)=1
THEN P=USR2(XP):GOTO53Ø ELSE P=U
SR1(XP):GOTO53Ø
163Ø IFCC=1THEN 162Ø
164Ø S=&H7D9Ø:POKES+37,2:POKES+4
5,95:POKES+62,4:POKES+67,47:POKE
S+197,48:POKES+277,18:POKES+278,
18:CC=1:XP=-125:GOTO162Ø
165Ø CLS:PRINT"POSITION OF GRAPH
 (L/R/C)":SOUND14Ø,1:GOSUB2Ø:XP$
=IK$
166Ø IFXP$="L"THEN XP=-16Ø:RETUR
N
167Ø IF XP$="R"THEN XP=125:RETUR
N
168Ø XP=Ø:RETURN
```

```
17ØØ DATA 198,32,182,1,9Ø,142,4,
Ø,167,128,14Ø,4,31,38,249,142,5,
224,167,128,14Ø,6,Ø,38,249,142,4
,32,167,132,167,31,58,14Ø,6,Ø,38
,246,57
2998 '
2999 'VERTICAL GRAPH DATA INPUT
3ØØØ GOSUB8Ø
3ØØ5 ON IK GOSUB 31ØØ,35ØØ,16Ø
3Ø1Ø IF IK=3GOTO52Ø
3Ø98 '
3Ø99 'MANUAL ENTRY FOR VERTICAL
GRAPH
31ØØ CLS:I=Ø
311Ø I=I+1:IFI>12THEN317Ø
312Ø INPUT"DESIRED LABEL";LA$(I)
:LA$(I)=LEFT$(LA$(I),4)
313Ø IFLA$(I)=""ORLA$(I)="Q"ANDI
>1THEN317Ø
314Ø INPUT"AMOUNT/VALUE";V(I)
316Ø GOTO311Ø
317Ø GOSUB7ØØØ:'DETERMINE MAX AN
D MIN VALUES
318Ø CLS:FORK=1TOI-1:PRINTLA$(K)
;TAB(1Ø)V(K):NEXT
319Ø PRINT:PRINT"MAX = ";MAX,"MI
N = ";MIN
32ØØ PRINT:PRINT"        DATA OK
(Y/N)?";:SOUND14Ø,1:GOSUB2Ø
321Ø IFIK$="N"THEN31ØØ
322Ø CLS:PRINT:PRINTTAB(5)"SAVE
INPUT DATA (Y/N)?":SOUND14Ø,1:GO
SUB2Ø:IFIK$="Y"GOSUB149Ø
3225 CLS:PRINT"   DO YOU WANT TO
 DRAW Y-AXIS          SCALE LINE
S (Y/N)?":SOUND14Ø,1:GOSUB2Ø:SC$
=IK$
323Ø YM=169:WI=1Ø:GOTO4ØØ
35ØØ CLS:INPUT"DATA FILE NAME";N
F$:IFNF$="Q"THEN21Ø ELSE NF$=LEF
T$(NF$,8)+"/VER"
351Ø OPEN"I",#1,NF$:INPUT#1,I,MA
X,MIN
352Ø FORKK=1TOI-1:INPUT#1,LA$(KK
),V(KK):NEXT:CLOSE
353Ø GOTO318Ø
3998 '
3999 'HORIZONTAL GRAPH
4ØØØ GOSUB8Ø
4ØØ5 ONIK GOSUB41ØØ,45ØØ,16Ø
4Ø1Ø IFIK=3GOTO52Ø
41ØØ CLS:I=Ø
411Ø I=I+1:IFI>8THEN417Ø
412Ø INPUT"DESIRED LABEL";LA$(I)
:LA$(I)=LEFT$(LA$(I),3)
413Ø IFLA$(I)=""ORLA$(I)="Q"ANDI
>1THEN417Ø
414Ø INPUT"AMOUNT/VALUE";V(I)
416Ø GOTO411Ø
417Ø GOSUB7ØØØ
418Ø CLS:FORK=1TOI-1:PRINTLA$(K)
;TAB(1Ø)V(K):NEXT
419Ø PRINT:PRINT"MAX = ";MAX,"MI
N = ";MIN
42ØØ PRINT:PRINT"        DATA OK
(Y/N)?";:SOUND14Ø,1:GOSUB2Ø
421Ø IFIK$="N"THEN41ØØ
422Ø CLS:PRINT:PRINTTAB(5)"SAVE
INPUT DATA (Y/N)?":SOUND14Ø,1:GO
SUB2Ø:IFIK$="Y"GOSUB154Ø
4225 CLS:PRINT"   DO YOU WANT TO
 DRAW X-AXIS          SCALE LINES
 (Y/N)?":SOUND14Ø,1:GOSUB2Ø:SC$=
IK$
423Ø XM=36:WI=1Ø:GOTO8ØØ
45ØØ CLS:INPUT"DATA FILE NAME";N
F$:IFNF$="Q"THEN21Ø ELSE NF$=LEF
T$(NF$,8)+"/HOR"
451Ø OPEN"I",#1,NF$:INPUT#1,I,MA
X,MIN
452Ø FORKK=1TOI-1:INPUT#1,LA$(KK
),V(KK):NEXT:CLOSE
453Ø GOTO418Ø
4998 '
4999 'STACKED GRAPH
5ØØØ GOSUB8Ø
5ØØ5 ONIK GOSUB51ØØ,55ØØ,16Ø
5Ø1Ø IFIK=3GOTO52Ø
5Ø98 '
5Ø99 'MANUAL ENTRY STACKED GRAPH

51ØØ CLS:INPUT"NO. OF ENTRIES PE
R BAR (1-3)";NE:IFNE=99THENSOUND
5,3:PRINT:PRINT"RETURNING TO MAI
N MENU":FORZZ=1TO6ØØ:NEXT:GOTO21
Ø
51Ø5 IF NE<1ORNE>3THENSOUND5,3:P
RINT:PRINT"    SELECTION OUT OF
RANGE":FORZZ=1TO6ØØ:NEXT:GOTO51Ø
Ø
511Ø CLS:I=Ø
5115 I=I+1:IFI>12THEN517Ø
512Ø INPUT"DESIRED LABEL";LA$(I)
:LA$(I)=LEFT$(LA$(I),4)
513Ø IF LA$(I)=""ORLA$(I)="Q"AND
I>1THEN517Ø
5135 FORK=1TONE
514Ø PRINT"VALUE FOR STACK";K;:I
NPUTVS(I,K)
5145 V(I)=V(I)+VS(I,K):NEXT
515Ø GOTO5115
517Ø GOSUB7ØØØ
5175 CLS:PRINT"LABEL"TAB(1Ø)"STK
 1"TAB(18)"STK 2"TAB(26)"STK 3"
518Ø FORK=1TOI-1:PRINTLA$(K);
5185 FORJ=1TONE:PRINTTAB(J*7+J);
:PRINTUSING"####.##";VS(K,J);
519Ø NEXT:PRINT:NEXT
5195 PRINT"  MAX =";MAX,"MIN =";
MIN
52ØØ PRINT:PRINT"        DATA OK
 (Y/N)?";:SOUND14Ø,1:GOSUB2Ø
521Ø IFIK$="N"THEN51ØØ
522Ø CLS:PRINT:PRINTTAB(5)"SAVE
INPUT DATA (Y/N)?":SOUND14Ø,1:GO
SUB2Ø:IFIK$="Y"GOSUB153Ø
5225 CLS:PRINT:PRINT"       DO Y
OU WANT Y-AXIS          SCAL
E LINES (Y/N)?":SOUND14Ø,1:GOSUB
2Ø:SC$=IK$
523Ø WI=1Ø:YM=169:GOTO7ØØ
55ØØ CLS:INPUT"DATA FILE NAME";N
F$:IFNF$="Q"THEN21ØELSE NF$=LEFT
$(NF$,8)+"/STK"
551Ø OPEN"I",#1,NF$:INPUT#1,I,NE
,MAX,MIN
552Ø FORKK=1TOI-1:FORJJ=1TONE:IN
PUT#1,LA$(KK),VS(KK,JJ):NEXT:NEX
T:CLOSE
553Ø GOTO5175
5998 '
5999 ' SIDE-BY-SIDE GRAPH
6ØØØ GOSUB8Ø
6ØØ5 ON IK GOSUB61ØØ,65ØØ,16Ø
6Ø1Ø IFIK=3GOTO52Ø
6Ø98 '
6Ø99 'MANUAL ENTRY SIDE-SIDE
61ØØ CLS:INPUT"ENTER NUMBER OF G
ROUPS (1-4)";NG:IFNG=99THEN SOUN
D5,3:PRINT:PRINT"RETURNING TO MA
IN MENU":FORZZ=1TO6ØØ:NEXT:GOTO2
1ØELSEINPUT"ENTER NUMBER OF BARS
 (1-3)";NB
61Ø5 IFNG<1ORNG>4ORNB<1ORNB>3THE
N SOUND5,3:PRINT:PRINT"    SELEC
TION OUT OF RANGE":FORZZ=1TO5ØØ:
NEXT:GOTO61ØØ ELSE61Ø8
61Ø8 CLS
611Ø FORI=1TO NG
6112 PRINT"ENTER LABEL FOR GROUP
";I;:INPUTLA$(I)
6115 FORK=1TO NB
6122 IFLA$(I)="Q"ORLA$(I)=""THEN
61ØØ ELSE LA$(I)=LEFT$(LA$(I),4)
6125 PRINT"VALUE/AMOUNT BAR";K;:
INPUTVS(I,K)
613Ø NEXT:NEXT
6133 I=1
6135 FORK=1TO NG
614Ø FORJ=1TO NB
6145 V(I)=VS(K,J):I=I+1
615Ø NEXT:NEXT
616Ø GOSUB7ØØØ
617Ø I=NG+1:CLS:PRINT"GROUP"TAB(
8)"BAR"TAB(16)"LABEL"TAB(24)"VAL
UE"
6175 FORK=1TO NG
6177 PRINTTAB(2)K TAB(9)"1",LA$(
K)TAB(24);:PRINTUSING"####.##";V
S(K,1)
618Ø FORJ=2TO NB
6185 PRINTTAB(8)J TAB(24);:PRINT
USING"####.##";VS(K,J)
6188 NEXT:NEXT
619Ø PRINT"  MAX =";MAX,"MIN =";
MIN
62ØØ PRINT:PRINT"        DATA OK
 (Y/N)?";:SOUND14Ø,1:GOSUB2Ø
621Ø IFIK$="N"THEN61ØØ
622Ø CLS:PRINT:PRINTTAB(5)"SAVE
INPUT DATA (Y/N)?":SOUND14Ø,1:GO
SUB2Ø:IFIK$="Y"GOSUB152Ø
6225 CLS:PRINT"   DO YOU WANT TO
 DRAW Y-AXIS          SCALE LINE
S (Y/N)?":SOUND14Ø,1:GOSUB2Ø:SC$
=IK$
623Ø WI=1Ø:YM=169:GOTO6ØØ
65ØØ CLS:INPUT"DATA FILE NAME";N
F$:IFNF$="Q"THEN21Ø ELSE NF$=LEF
T$(NF$,8)+"/SBS"
651Ø OPEN"I",#1,NF$
6515 INPUT#1,NG,NB,MAX,MIN
652Ø FORKK=1TO NG
6525 FORJJ=1TO NB:INPUT#1,LA$(KK
),VS(KK,JJ):NEXT:NEXT:CLOSE
653Ø GOTO617Ø
6998 '
6999 'COMPUTE MAX AND MIN VALUES

7ØØØ TEMP=V(1)
7ØØ5 FORK=1TO I-2
7Ø1Ø IFTEMP<V(K+1)THEN TEMP=V(K+
1)
7Ø15 NEXT
7Ø2Ø MAX=TEMP
7Ø3Ø TEMP=V(1)
7Ø35 FORK=1TO I-2
7Ø4Ø IFTEMP>V(K+1)THEN TEMP=V(K+
1)
```

Listing continued

```
7Ø43 NEXT
7Ø45 MIN=TEMP
7Ø55 RETURN
7998 '
7999 'INSTRUCTIONS
8ØØØ CLS:PRINT"THIS PROGRAM WILL
 GENERATE FOUR DIFFERENT TYPES O
F BARGRAPHS.   THEY ARE:":PRINT
8Ø1Ø PRINTTAB(3);"1) REGULAR (VE
RTICAL)":PRINTTAB(3);"2) REGULAR
 (HORIZONTAL)":PRINTTAB(3);"3) S
TACKED":PRINTTAB(3);"4) SIDE-BY-
SIDE"
8Ø2Ø PRINT@483,"PRESS ANY KEY TO
 CONTINUE";:GOSUB2Ø
8Ø3Ø CLS:PRINT"REGULAR VERTICAL
GRAPHS CAN HAVEA MAXIMUM OF 12 B
ARS":PRINT:PRINT"REGULAR HORIZON
TAL GRAPHS CAN   HAVE A MAXIMUM
OF 8 BARS":PRINT:PRINT"STACKED G
RAPHS CAN HAVE A MAX   OF 3 STAC
KS PER BAR AND A TOTAL OF 12 BAR
S":PRINT
8Ø35 PRINT"SIDE-BY-SIDE GRAPHS C
AN HAVE A  MAX OF 4 GROUPS OF 3
BARS"
8Ø5Ø PRINT@483,"PRESS ANY KEY TO
 CONTINUE";:GOSUB2Ø:RETURN
8998 '
8999 ' LTRS & NUMBERS
9ØØØ L$(33)="BM+1,ØU4E2R1F2D4BL3
BU2R2BD2BR3"
9ØØ3 L$(4)="BM+1,-1F1R2E1H4E1R2F
1BL2U2D8BU1BR3"
9ØØ5 L$(5)="BM+1,ØE6BL5D1R1U1L1B
F5D1L1U1R1BD1BR3"'%
9Ø1Ø L$(34)="BM+2,ØU6BL1R3F1D1G1
L1R1F1D1G1L3BR7"
9Ø15 L$(15)="NE6BR7"'/
9Ø2Ø L$(35)="BM+5,-5H1L2G1D4F1R2
E1BD1BR3"
9Ø25 L$(29)="BM+1,ØBU2R3BU2L3BD4
BR7"'=
9Ø3Ø L$(36)="BM+1,ØU6R2F2D2G2L3B
R7"
9Ø35 L$(37)="BM+5,ØL4U6R4BD3BL2L
1BD3BR6"
9Ø4Ø L$(38)="BM+1,ØU6R4BD3BL2L1B
D3BR6"
9Ø45 L$(39)="BM+5,-5H1L2G1D4F1R3
U2L1R3BR3BD2"
9Ø5Ø L$(4Ø)="BM+1,ØU6BR4D6BL3BU3
R3BR4BD3"
9Ø55 L$(41)="BM+5,-6L4R2D6L2R4BR
3"
9Ø6Ø L$(42)="BM+1,-2D1F1R2E1U5BD
6BR3"
9Ø7Ø L$(43)="BM+1,ØU6D3R1E3G3F3B
R3"
9Ø72 L$(44)="BM+1,-6D6R4BR3"
9Ø75 L$(45)="BM+1,ØU6R1F2D1U1E2R
1D6BR3"
9Ø8Ø L$(46)="BM+1,ØU6R1D1F4D1R1U
6D6BR3"
9Ø85 L$(47)="BM+5,-1U4H1L2G1D4F1
R2BR4"
9Ø9Ø L$(48)="BM+1,ØU6R3F1D1G1L2B
R6BD3"
9Ø95 L$(49)="BM+5,-1U4H1L2G1D4F1
R2F2BE2"
1ØØØØ L$(5Ø)="BM+1,ØU6R3F1D1G1L2
R1D1F2BR3"
1ØØØ5 L$(51)="BM+1,-1F1R2E1H4E1R
2F1BD5BR3"
1ØØ1Ø L$(52)="BM+3,ØU6L3R6BR2BD6
"
1ØØ15 L$(53)="BM+1,-6D5F1R2E1U5B
D6BR3"
1ØØ2Ø L$(54)="BM+1,-6D4F2E2U4BD6
BR3"
1ØØ25 L$(55)="BM+1,-6D6R1E2U1D1F
2R1U6D6BR3"
1ØØ3Ø L$(56)="BM+1,ØU1E4U1BL4D1F
4D1BR3"
1ØØ35 L$(57)="BM+1,-6D1F2D3U3E2U
1BD6BR2"
1ØØ4Ø L$(58)="BM+1,-6R4D1G4D1R4B
R3"
1ØØ45 L$(Ø)="BM+1,ØBR7"
1ØØ5Ø L$(14)="BM+1,ØR1BR1"
1ØØ55 L$(17)="BM+2,-4E2D6BR4"
1ØØ6Ø L$(18)="BM+1,-5E1R2F1D1L1G
3D1R4BR3"
1ØØ65 L$(19)="BM+1,-1F1R2E1U1H1E
1U1H1L2G1BD5BR7"
1ØØ7Ø L$(2Ø)="BM+4,ØU6L1G2D1R5BD
3BR3"
1ØØ75 L$(21)="BM+1,-1F1R2E1U1H1L
3U3R5BR3BD6"
1ØØ8Ø L$(22)="BM+5,-6L3G1D4F1R2E
1U1H1L2BR6BD3"
1ØØ85 L$(23)="BM+1,-6R5D2G4BR7"
1ØØ9Ø L$(24)="BM+1,-1U1E1R2E1U1H
1L2G1D1F1R2F1D1G1L2BR6"
1ØØ95 L$(25)="BM+1,ØR3E1U4H1L2G1
D1F1R2BD3BR4"
1Ø1ØØ L$(16)="BM+6,-1U4H1L2G1D4F
1R2BR4"
1Ø1Ø5 L$(13)="BM+2,-3R3BD3BR2"
1Ø1Ø8 SB$=STRING$(31,32)
1Ø11Ø GOTO21Ø
2ØØØØ PCLEAR4:PMODE4,1:GOTO65
```

Financial Analysis

(Article on page 36)

```
1Ø 'FINSTANL 1.1
2Ø 'BRUCE S. LYON  11/11/1984
3Ø CLEAR3ØØ:CLS
4Ø PRINT@34,STRING$(28,"-")
5Ø PRINT@98,"FINANCIAL STATEMENT
 ANALYSIS"
6Ø PRINT@169,"BRUCE S. LYON"
7Ø PRINT@226,STRING$(28,"-")
8Ø PRINT@294,"YOU WILL NEED A CO
PY OF      FINANCIAL REPORTS INCL
UDING      THE BALANCE SHEET AND
THE        INCOME STATEMENT."
9Ø GOSUB198Ø
1ØØ CLS:PRINT"ENTER THE FOLLOWIN
G INFORMATION"
11Ø FORXX=1TO18
12Ø ONXX GOSUB4ØØ,41Ø,42Ø,43Ø,44
Ø,45Ø,46Ø,47Ø,48Ø,49Ø,5ØØ,51Ø,52
Ø,53Ø,54Ø,55Ø,56Ø,57Ø
13Ø NEXTXX
14Ø CLS:PRINT"1ST SET:":PRINT"(1
)TOTAL ASSETS       $";BE
15Ø PRINT"(2)OPERATING EXPENSE $
";BD
16Ø PRINT"(3)TOTAL INCOME       $
";M
17Ø PRINT"(4)NET INCOME         $
";O
18Ø PRINT"(5)TOTAL STOCKHOLDERS
                          EQUITY   $
";P
19Ø PRINT"(6)DIVIDENDS PAID     $
";Q
2ØØ PRINT"(7)TOTAL CUR. ASSETS $
";R
21Ø PRINT"(8)OPERATING PROFIT   $
";S
22Ø PRINT"(9)NET SALES          $
";T
23Ø PRINT:PRINT" >>CORRECT ANY I
NPUT? (1-9/NO)"
24Ø EXEC44539:I$=INKEY$:IFI$="N"
THEN27Ø
25Ø ON VAL(I$)GOSUB4ØØ,41Ø,42Ø,4
3Ø,44Ø,45Ø,46Ø,47Ø,48Ø
26Ø GOTO14Ø
27Ø CLS:PRINT"2ND SET:":PRINT"(1
)TOTAL TAXES        $";U
28Ø PRINT"(2)TOTAL CURRENT LIA.$
";V
29Ø PRINT"(3)LONG TERM DEBTS    $
";W
3ØØ PRINT"(4)TOTAL LIABILITIES $
";X
31Ø PRINT"(5)DEPRECIATION       $
";Y
32Ø PRINT"(6)SHARES OUTSTAND.   $
";Z
33Ø PRINT"(7)MARKET PRICE       $
";BA
34Ø PRINT"(8)QUICK ASSETS       $
";BB
35Ø PRINT"(9)ACC. RECEIVABLE    $
";BC
36Ø PRINT:PRINT" >>CORRECT ANY I
NPUT? (1-9/NO)"
37Ø EXEC44539:I$=INKEY$:IFI$="N"
THEN58Ø
38Ø ONVAL(I$)GOSUB49Ø,5ØØ,51Ø,52
Ø,53Ø,54Ø,55Ø,56Ø,57Ø
39Ø GOTO27Ø
4ØØ PRINT:INPUT"TOTAL ASSETS";BE
:RETURN
41Ø PRINT:INPUT"OPERATING EXPENC
ES";BD:RETURN
42Ø PRINT:INPUT"TOTAL INCOME";M:
RETURN
43Ø PRINT:INPUT"NET INCOME";O:RE
TURN
44Ø PRINT:PRINT"TOTAL STOCKHOLDE
RS":INPUT"          EQUITY";P:RET
URN
45Ø PRINT:INPUT"DIVIDENDS PAID";
Q:RETURN
46Ø PRINT:INPUT"TOTAL CURRENT AS
SETS";R:RETURN
47Ø PRINT:PRINT"ORERATING PROFIT
":INPUT"   (BEFORE TAXES) ";S:RE
TURN
48Ø PRINT:INPUT"NET SALES";T:RET
URN
49Ø PRINT:PRINT"TOTAL TAXES":INP
UT"   (FED, STATE & LOCAL) ";U:R
ETURN
5ØØ PRINT:INPUT"TOTAL CURRENT LI
ABILITIES";V:RETURN
51Ø PRINT:INPUT"LONG TERM DEBT";
W:RETURN
52Ø PRINT:INPUT"TOTAL LIABILITIE
```

```
S";X:RETURN
53Ø PRINT:INPUT"DEPRECIATION";Y:
RETURN
54Ø PRINT:PRINT"NUMBER OF SHARES
":INPUT"   OUTSTANDING";Z:RETURN

55Ø PRINT:PRINT"MARKET PRICE PER
 SHARE":INPUT"   (COMMON) ";BA:R
ETURN
56Ø PRINT:PRINT"TOTAL QUICK ASSE
TS":INPUT"   (CASH, NOTES, ECT.)
 ";BB:RETURN
57Ø PRINT:INPUT"ACCOUNTS RECEIVA
BLE";BC:RETURN
58Ø A=O/P*1ØØ:B=(O-Q)/O*1ØØ:C=(A
*B)/1ØØ:D=O/R*1ØØ:E=S/T*1ØØ:F=S/
M*1ØØ:G=U/S*1ØØ:I=R/V:J=W+P:K=O+
Y:L=O/Z:N=T/P*1ØØ:H=O/T*1ØØ
59Ø AA=P/X:AB=P+X:AC=X/AB*1ØØ:AD
=P/AB*1ØØ:AE=Q/Z/BA*1ØØ:AF=BA/L:
AG=BB/V:AH=T/BC:AI=P/Z:AJ=BD/T:A
K=X/BE
6ØØ CLS:PRINT@2,STRING$(28,"-"):
PRINT@66,"FINANCIAL STATEMENT AN
ALYSIS":PRINT@13Ø,STRING$(28,"-"
)
61Ø PRINT:PRINT"  (1) DETAILED D
ISPLAY"
62Ø PRINT"  (2) CHART DISPLAY"
63Ø PRINT"  (3) SEND TO PRINTER
"
64Ø PRINT"  (4) ENTER NEW DATA"
65Ø PRINT"  (5) CHANGE DATA"
66Ø PRINT"  (6) QUIT"
67Ø EXEC44539:I$=INKEY$
68Ø IFVAL(I$)<1ORVAL(I$)>6THEN67
Ø
69Ø ONVAL(I$)GOTO71Ø,116Ø,144Ø,1
ØØ,14Ø,194Ø
7ØØ GOTO6ØØ
71Ø CLS:PRINT:PRINTUSING"RETURN
ON EQUITY IS ###.##%";A
72Ø PRINT:PRINT">>MEASURES THE A
BILITY TO EARN    AN INCOME.":GO
SUB198Ø
73Ø CLS:PRINT:PRINTUSING"RETENTI
ON RATE IS ###.##%";B
74Ø PRINT:PRINT">>THE PERCENTAGE
 OF EARNINGS      RETAINED BY TH
E COMPANY.":GOSUB198Ø
75Ø CLS:PRINT:PRINTUSING"REINVES
TMENT RATE IS ###.##%";C
76Ø PRINT:PRINT">>THE RATE OF RE
TURN FROM        REINVESTING TH
E RETAINED       EARNINGS.":GOS
UB198Ø
77Ø CLS:PRINT:PRINTUSING"RETURN
ON TOTAL ASSETS IS        ###.#
#%";D
78Ø PRINT:PRINT">>MEASURES MANAG
EMENTS ABILITY    TO EARN A PROF
IT ON THE TOTAL   ASSETS EMPLOYE
D.":GOSUB198Ø
79Ø CLS:PRINT:PRINTUSING"OPERATI
NG PROFIT MARGIN IS       ###.#
#%";E
8ØØ PRINT:PRINT">>MARGIN OF PROF
IT BEFORE TAXES,  BASED ON NET S
ALES.":GOSUB198Ø
81Ø CLS:PRINT:PRINTUSING"PRETAX
PROFIT MARGIN IS ###.##%";F
82Ø PRINT:PRINT">>MARGIN OF PROF
IT BEFORE TAXES,  BASED ON TOTAL
 INCOME.":GOSUB198Ø
83Ø CLS:PRINT:PRINTUSING"TAX RAT
E IS ###.##%";G
84Ø PRINT:PRINT">>RATE OF TAXES
ON INCOME.":GOSUB198Ø
85Ø CLS:PRINT:PRINTUSING"CURRENT
 RATIO IS ####.##:1";I
86Ø PRINT:PRINT">>PERCENT OF CUR
RENT ASSETS TO    CURRENT LIABIL
ITIES.":GOSUB198Ø
87Ø CLS:PRINT:PRINTUSING"CAPITAL
 STRUCTURE IS $##########";J
88Ø PRINT:PRINT">>THE SUM OF OWN
ER EQUITY OR      STOCKHOLDERS E
QUITY AND LONG-   TERM DEBTS.":G
OSUB198Ø
89Ø CLS:PRINT:PRINTUSING"CASH FL
OW IS $##########";K
9ØØ PRINT:PRINT">>THE SUM OF NET
 PROFIT AND       DEPRECIATION."
:GOSUB198Ø
91Ø CLS:PRINT:PRINTUSING"EARNING
S PER SHARE IS $#####.##";L
92Ø PRINT:PRINT">>PROFIT PER SHA
RE OF COMMON      STOCK.":GOSUB1
98Ø
93Ø CLS:PRINT:PRINTUSING"EQUITY
TURNOVER #####.###%";N
94Ø PRINT:PRINT">>TIMES EQUITY I
S TURNED OVER.":GOSUB198Ø
95Ø CLS:PRINT:PRINTUSING"NET PRO
FIT MARGIN IS ###.###%";H
96Ø PRINT:PRINT">>PERCENT OF PRO
FIT EARNED,       BASED ON NET S
ALES.":GOSUB198Ø
97Ø CLS:PRINT:PRINTUSING"EQUITY
TO DEBT IS ###.##:1";AA
98Ø PRINT:PRINT">>SHOWS THE EQUI
TY COMPARED TO    THE TOTAL LIAB
ILITIES.":GOSUB198Ø
99Ø CLS:PRINT:PRINT"   CAPITAL C
ONTRIBUTIONS:":PRINT:PRINTUSING"
CREDITORS EQUITY IS ###.##%";AC:
PRINTUSING"OWNERS EQUITY IS ###.
##%";AD
1ØØØ PRINT:PRINT">>PERCENT OF TO
TAL EQUITIES TO   EACH.":GOSUB1
98Ø
1Ø1Ø CLS:PRINT:PRINTUSING"DIVIDE
ND YIELD IS ###.##%";AE
1Ø2Ø PRINT:PRINT">>RATE EARNED B
Y STOCKHOLDERS,   BASED ON CURR
ENT MARKET RATE.":GOSUB198Ø
1Ø3Ø CLS:PRINT:PRINTUSING"PRICE-
EARNINGS RATIO IS####.##:1";AF
1Ø4Ø PRINT:PRINT">>SHOWS THE PRI
CE PER SHARE      COMPARED TO E
ARNINGS.":GOSUB198Ø
1Ø5Ø CLS:PRINT:PRINTUSING"ACID-T
EST RATIO IS ###.##:1";AG
1Ø6Ø PRINT:PRINT">>PERCENT OF AS
SETS THAT CAN BE  QUICKLY CONVE
RTED TO CASH,     OVER CURRENT
LIABILITIES.":GOSUB198Ø
1Ø7Ø CLS:PRINT:PRINTUSING"ACCOUN
TS RECEIVABLE TURNOVER IS  #####
#.##";AH
1Ø8Ø PRINT:PRINT">>INDICATES HOW
 LONG IT TAKES    TO COLLECT DE
BTS.":GOSUB198Ø
1Ø9Ø CLS:PRINT:PRINTUSING"BOOK V
ALUE PER SHARE IS $####.##";AI
11ØØ PRINT:PRINT">>PRICE PER SHA
RE OF COMMON      STOCK IN THE
COMPANIES BOOKS.":GOSUB198Ø
111Ø CLS:PRINT:PRINTUSING"OPERAT
ING EXPENCE RATIO IS       ###.
##:1";AJ
112Ø PRINT:PRINT">>PERCENT OF OP
ERATING EXPENCES,  BASED ON NET
SALES.":GOSUB198Ø
113Ø CLS:PRINT:PRINTUSING"DEBT R
ATIO IS ######.##:1";AK
114Ø PRINT:PRINT">>PERCENTAGE OF
 ASSETS FINANCED  THROUGH BORRO
WING.":PRINT@484,"PRESS <ENTER>
TO RETURN";:GOSUB199Ø
115Ø GOTO6ØØ
116Ø CLS:PRINT"1ST SET:":PRINT:P
RINT USING"RETURN ON EQUITY   #
###.###%";A
117Ø PRINTUSING"RETENTION RATE
    ####.###%";B
118Ø PRINTUSING"REINVESTMENT RAT
E   ####.###%";C
119Ø PRINTUSING"RETURN ON ASSETS
    ####.###%";D
12ØØ PRINTUSING"OPER PROFIT MARG
IN  ####.###%";E
121Ø PRINTUSING"PRETAX PROF MARG
IN  ####.###%";F
122Ø PRINTUSING"TAX RATE
    ####.###%";G
123Ø PRINTUSING"CURRENT RATIO
    ####.##:1";I
124Ø PRINTUSING"CAPITAL STRUCTUR
E   $##########";J
125Ø PRINTUSING"EARNINGS PER SHA
RE  ®######.##";L
126Ø PRINTUSING"CASH FLOW
    $##########";K
127Ø PRINTUSING"EQUITY TURNOVER
    ####.###%";N
128Ø GOSUB198Ø
129Ø CLS:PRINT"2ND SET:":PRINT:P
RINTUSING"NET PROFIT MARGIN   ##
##.###%";H
13ØØ PRINTUSING"EQUITY TO DEBT
    ####.##:1";AA
131Ø PRINT"CAPITAL CONTRIBUTIONS
:"
132Ø PRINTUSING"   CREDITORS EQU
ITY ####.###%";AC
133Ø PRINTUSING"   OWNERS EQUITY
    ####.###%";AD
134Ø PRINTUSING"DIVIDEND YIELD
    ####.###%";AE
135Ø PRINTUSING"PRICE TO EARNING
S   ####.##:1";AF
136Ø PRINTUSING"ACID-TEST RATIO
    ####.##:1";AG
137Ø PRINTUSING"ACC RECEV TURNOV
ER  #######.##";AH
138Ø PRINTUSING"BOOK VALUE / SHA
RE  $######.##";AI
139Ø PRINTUSING"OPER EXP RATIO
    ####.##:1";AJ
14ØØ PRINTUSING"DEBT RATIO
    ####.##:1";AK
141Ø PRINT@484,"PRESS <ENTER> TO
 RETURN";
142Ø GOSUB199Ø
143Ø GOTO6ØØ
144Ø CLS:PRINT"ENTER HEADING INF
ORMATION.":PRINT
145Ø PRINT"CO. OR CORP. NAME":LI
NE INPUT">";A$
```

Listing continued

```
146Ø PRINT"DATE ON THE FINANCIAL
 REPORT":LINE INPUT">";B$
147Ø CLS:PRINT@41,"** WARNING **
"
148Ø PRINT"BE SURE THAT THE PRIN
TER IS ON, THE PAPER IS INSERTED
 CORRECTLY AND THE CABLES ARE PL
UGGED IN!!"
149Ø P1$="$##########":P2$="#####
#.###%":P3$="#####.##:1":P4$="$##
####.##"
15ØØ PRINT@486,"PRESS <ENTER> TO
 GO";:GOSUB199Ø
151Ø PRINT@457, "ARE YOU SURE ?"
:PRINT@486,"   (N)O OR (G)O    "
;
152Ø EXEC44539:I$=INKEY$
153Ø IFI$="N"THEN6ØØ
154Ø IFI$<>"G"THEN152Ø
155Ø CLS:PRINT"PRINTING..."
156Ø C$=STRING$(3Ø,"-")
157Ø PRINT#-2:PRINT#-2,TAB(25)C$
:PRINT#-2
158Ø PRINT#-2,TAB(26)"FINANCIAL
STATEMENT ANALYSIS"
159Ø ZZ=INT((8Ø-LEN(A$))/2):PRIN
T#-2,TAB(ZZ)A$
16ØØ PRINT#-2,TAB(29)"For the Pe
riod Ending"
161Ø ZZ=INT((8Ø-LEN(B$))/2):PRIN
T#-2,TAB(ZZ)B$
162Ø PRINT#-2:PRINT#-2,TAB(25)C$
:PRINT#-2:PRINT#-2:PRINT#-2
163Ø PRINT#-2,TAB(3Ø)"BALANCE SH
EET DATA:":PRINT#-2
164Ø PRINT#-2,TAB(5)"Quick asset
s";:PRINT#-2,TAB(24);:PRINT#-2,U
SINGP1$;BB;:PRINT#-2,TAB(45)"Tot
al liabilities";:PRINT#-2,TAB(64
);:PRINT#-2,USINGP1$;X
165Ø PRINT#-2,TAB(5)"Current ass
ets";:PRINT#-2,TAB(24);:PRINT#-2
,USINGP1$;R;:PRINT#-2,TAB(45)"Ow
ner's equity";:PRINT#-2,TAB(64);
:PRINT#-2,USINGP1$;P
166Ø PRINT#-2,TAB(5)"Total asset
s";:PRINT#-2,TAB(24);:PRINT#-2,U
SINGP1$;BE;:PRINT#-2,TAB(45)"Lon
g term debts";:PRINT#-2,TAB(64);
:PRINT#-2,USINGP1$;W
167Ø PRINT#-2,TAB(5)"Accounts re
ceivable";:PRINT#-2,TAB(24);:PRI
NT#-2,USINGP1$;BC;:PRINT#-2,TAB(
45)"Shares outstanding";:PRINT#-
2,TAB(64);:PRINT#-2,USINGP1$;Z
168Ø PRINT#-2,TAB(5)"Current lia
bilities";:PRINT#-2,TAB(24);:PRI
NT#-2,USINGP1$;V
169Ø PRINT#-2:PRINT#-2:PRINT#-2,
TAB(29)"INCOME STATEMENT DATA:":
PRINT#-2
17ØØ PRINT#-2,TAB(5)"Total incom
e";:PRINT#-2,TAB(24);:PRINT#-2,U
SINGP1$;M;:PRINT#-2,TAB(45)"Oper
ating profit";:PRINT#-2,TAB(64);
:PRINT#-2,USINGP1$;S
171Ø PRINT#-2,TAB(5)"Net sales";
:PRINT#-2,TAB(24);:PRINT#-2,USIN
GP1$;T;:PRINT#-2,TAB(45)"Total t
axes";:PRINT#-2,TAB(64);:PRINT#-
2,USINGP1$;U
172Ø PRINT#-2,TAB(5)"Operating e
xpences";:PRINT#-2,TAB(24);:PRIN
T#-2,USINGP1$;BD;:PRINT#-2,TAB(4
5)"Net income";:PRINT#-2,TAB(64)
;:PRINT#-2,USINGP1$;O
173Ø PRINT#-2,TAB(5)"Depreciatio
n";:PRINT#-2,TAB(24);:PRINT#-2,U
SINGP1$;Y
174Ø PRINT#-2:PRINT#-2:PRINT#-2,
TAB(34)"OTHER DATA:":PRINT#-2
175Ø PRINT#-2,TAB(5)"Dividends p
aid";:PRINT#-2,TAB(24);:PRINT#-2
,USINGP1$;Q;:PRINT#-2,TAB(45)"Ma
rket price/share";:PRINT#-2,TAB(
64);:PRINT#-2,USINGP4$;BA
176Ø PRINT#-2: PRINT#-2:PRINT#-2
,TAB(33)"ANALYSIS DATA:":PRINT#-
2
177Ø PRINT#-2,TAB(5)"Return on e
quity";:PRINT#-2,TAB(24);:PRINT#
-2,USINGP2$;A;:PRINT#-2,TAB(45)"
Net profit margin";:PRINT#-2,TAB
(64);:PRINT#-2,USINGP2$;H
178Ø PRINT#-2,TAB(5)"Retention r
ate";:PRINT#-2,TAB(24);:PRINT#-2
,USINGP2$;B;:PRINT#-2,TAB(45)"Eq
uity-to-debt";:PRINT#-2,TAB(64);
:PRINT#-2,USINGP3$;AA
179Ø PRINT#-2,TAB(5)"Reinvestmen
t rate";:PRINT#-2,TAB(24);:PRINT
#-2,USINGP2$;C;:PRINT#-2,TAB(45)
"Capital contribution:"
18ØØ PRINT#-2,TAB(5)"Return on a
ssets";:PRINT#-2,TAB(24);:PRINT#
-2,USINGP2$;D;:PRINT#-2,TAB(47)"
Creditor's equity";:PRINT#-2,TAB
(64);:PRINT#-2,USINGP2$;AC
181Ø PRINT#-2,TAB(5)"Oper. profi
t margin";:PRINT#-2,TAB(24);:PRI
NT#-2,USINGP2$;E;:PRINT#-2,TAB(4
7)"Owner's equity";:PRINT#-2,TAB
(64);:PRINT#-2,USINGP2$;AD
182Ø PRINT#-2,TAB(5)"Pretax prof
. margin";:PRINT#-2,TAB(24);:PRI
NT#-2,USINGP2$;F;:PRINT#-2,TAB(4
5)"Dividend yield";:PRINT#-2,TAB
(64);:PRINT#-2,USINGP2$;AE
183Ø PRINT#-2,TAB(5)"Tax rate";:
PRINT#-2,TAB(24);:PRINT#-2,USING
P2$;G;:PRINT#-2,TAB(45)"Price-ea
rning ratio";:PRINT#-2,TAB(64);:
PRINT#-2,USINGP3$;AF
184Ø PRINT#-2,TAB(5)"Current rat
io";:PRINT#-2,TAB(24);:PRINT#-2,
USINGP3$;I;:PRINT#-2,TAB(45)"Aci
d-test ratio";:PRINT#-2,TAB(64);
:PRINT#-2,USINGP3$;AG
185Ø PRINT#-2,TAB(5)"Capital str
ucture";:PRINT#-2,TAB(24);:PRINT
#-2,USINGP1$;J;:PRINT#-2,TAB(45)
"Acc. rec. turnover";:PRINT#-2,T
AB(64);:PRINT#-2,USING"#### TIME
S";AH
186Ø PRINT#-2,TAB(5)"Cash flow";
:PRINT#-2,TAB(24);:PRINT#-2,USIN
GP1$;K;:PRINT#-2,TAB(45)"Book va
lue/share";:PRINT#-2,TAB(64);:PR
INT#-2,USINGP4$;AI
187Ø PRINT#-2,TAB(5)"Earnings pe
r share";:PRINT#-2,TAB(24);:PRIN
T#-2,USINGP4$;L;:PRINT#-2,TAB(45
)"Oper. expence ratio";:PRINT#-2
,TAB(64);:PRINT#-2,USINGP3$;AJ
188Ø PRINT#-2,TAB(5)"Equity turn
over";:PRINT#-2,TAB(24);:PRINT#-
2,USINGP2$;N;:PRINT#-2,TAB(45)"D
ebt ratio";:PRINT#-2,TAB(64);:PR
INT#-2,USINGP3$;AK
189Ø PRINT#-2:PRINT#-2
19ØØ PRINT:PRINT"DO YOU WANT ANO
THER COPY ? (Y/N)";
191Ø EXEC44539:I$=INKEY$
192Ø IFI$<>"Y"THEN6ØØ
193Ø FORXX=1TO16:PRINT#-2:NEXT:G
OTO155Ø
194Ø PRINT@485,"ARE YOU SURE? (Y
/N)";
195Ø EXEC44539:I$=INKEY$
196Ø IFI$="Y"THENCLS:END
197Ø GOTO6ØØ
198Ø PRINT@483,"PRESS <ENTER> TO
 CONTINUE";
199Ø I$=INKEY$:IFI$<>CHR$(13)THE
N199ØELSE RETURN
```

The AUTO Difference

(Article on page 40)

Program Listing 1. Autonum Basic Driver

```
5 CLEAR2ØØ,32199
1Ø FOR I= 322ØØ  TO  32667
2Ø READ X
3Ø POKE I,X
4Ø NEXT I
5Ø EXEC322ØØ
6Ø DATA  79, 95, 2Ø6, 1, 32, 166
, 196, 39
7Ø DATA  6, 235, 196, 51, 74, 32
, 246, 2Ø2
8Ø DATA  128, 247, 125, 25Ø, 134
, 1, 167, 196
9Ø DATA  142, 125, 243, 175, 65,
 142, 125, 249
1ØØ DATA  175, 67, 111, 74, 142,
 Ø, 1Ø, 191
11Ø DATA  127, 154, 57, 65, 85,
84, 2Ø7, 126
12Ø DATA  1, 128, 226, 142, 125,
 247, 126, 173
13Ø DATA  212, 38, 1Ø, 141, 94,
243, 127, 154
14Ø DATA  19Ø, 127, 154, 32, 46,
 129, 44, 38
15Ø DATA  18, 141, 8Ø, 52, 6, 18
9, 178, 1Ø9
16Ø DATA  189, 183, 61, 53, 6, 5
2, 16, 227
17Ø DATA  225, 32, 24, 189, 183,
 61, 52, 16
18Ø DATA  157, 165, 38, 7, 53, 6
, 19Ø, 127
19Ø DATA  154, 32, 8, 189, 178,
1Ø9, 189, 183
2ØØ DATA  61, 53, 6, 16, 131, 24
9, 255, 35
21Ø DATA  2, 32, 68, 253, 127, 1
52, 48, 31
22Ø DATA  14Ø, 249, 255, 37, 5,
142, 126, 183
23Ø DATA  32, 56, 48, 1, 191, 12
7, 154, 134
24Ø DATA  126, 183, 1, 13Ø, 142,
 126, 2Ø5, 191
25Ø DATA  1, 131, 57, 174, 159,
Ø, 25, 39
```

```
26Ø DATA  22, 158, 27, 48, 3Ø, 5
2, 16, 236
27Ø DATA  13Ø, 16, 163, 228, 39,
 4, 156, 25
28Ø DATA  34, 245, 5Ø, 98, 236,
2, 57, 79
29Ø DATA  95, 57, 14Ø, 249, 255,
 35, 69, 142
3ØØ DATA  126, 166, 134, 57, 183
, 1, 13Ø, 214
31Ø DATA  137, 197, 31, 39, 5, 1
34, 13, 189
32Ø DATA  162, 13Ø, 166, 128, 39
, 5, 189, 162
33Ø DATA  13Ø, 32, 247, 126, 172
, 118, 66, 65
34Ø DATA  68, 32, 76, 73, 78, 69
, 32, 78
35Ø DATA  85, 77, 66, 69, 82, 13
, Ø, 66
36Ø DATA  65, 68, 32, 73, 78, 67
, 82, 69
37Ø DATA  77, 69, 78, 84, 32, 86
, 65, 76
38Ø DATA  85, 69, 13, Ø, 57, 15Ø
, 1Ø4, 76
39Ø DATA  39, 1, 57, 19Ø, 127, 1
52, 141, 17Ø
4ØØ DATA  31, 16, 141, 115, 243,
 127, 154, 37
41Ø DATA  166, 253, 127, 152, 14
2, 2, 221, 166
42Ø DATA  16Ø, 39, 7, 167, 128,
189, 162, 13Ø
43Ø DATA  32, 245, 134, 32, 167,
 128, 189, 162
44Ø DATA  13Ø, 95, 189, 161, 118
, 132, 127, 129
45Ø DATA  13, 39, 64, 129, 8, 39
, 24, 129
46Ø DATA  21, 39, 31, 129, 3, 39
, 42, 129
47Ø DATA  31, 35, 231, 193, 245,
 34, 227, 189
48Ø DATA  162, 13Ø, 167, 128, 92
, 32, 219, 93
49Ø DATA  39, 216, 189, 162, 13Ø
, 9Ø, 48, 31
5ØØ DATA  32, 2Ø8, 93, 39, 2Ø5,
134, 8, 189
51Ø DATA  162, 13Ø, 48, 31, 9Ø,
38, 248, 32
52Ø DATA  193, 134, 57, 183, 1,
13Ø, 134, 13
53Ø DATA  126, 162, 13Ø, 5Ø, 98,
 189, 162, 13Ø
54Ø DATA  79, 167, 132, 142, 2,
22Ø, 57, 52
55Ø DATA  86, 2Ø6, 1, 218, 16, 1
42, 1, 217
56Ø DATA  111, 164, 237, 196, 16
6, 65, 167, 66
57Ø DATA  134, 1Ø, 141, 18, 61,
8Ø, 235, 66
58Ø DATA  2Ø3, 48, 231, 162, 1Ø9
, 65, 38, 236
59Ø DATA  1Ø9, 196, 38, 232, 53,
 214, 52, 2
6ØØ DATA  79, 23Ø, 196, 141, 1Ø,
 231, 196, 23Ø
61Ø DATA  65, 141, 4, 231, 65, 5
3, 13Ø, 142
62Ø DATA  Ø, 8, 88, 73, 161, 98,
 37, 3
63Ø DATA  16Ø, 98, 92, 48, 31, 3
8, 243, 57
64Ø DATA  Ø, 14Ø, Ø, 1Ø, 255, Ø,
 255, Ø
```

Program Listing 2. Autonum Source-Code Listing

```
                    00100 *PROGRAM AUTONUM
                    00110 *WRITTEN BY JEFF MIKEL
                    00120 *FOLLOWING IS INITIALIZATION ROUTINE
                    00130 *WHICH SETS UP POINTERS SO BASIC WILL RECOGNIZE 'AUTO'
7DC8                00140          ORG     32200
7DC8 4F             00150 START    CLRA
7DC9 5F             00160          CLRB
7DCA CE   0120      00170          LDU     #288     ADDRESS OF FIRST WORD LIST BLOCK
7DCD A6   C4        00180 LOOP0    LDA     ,U       IS IT LAST BLOCK?
7DCF 27   06        00190          BEQ     PNTR     GO IF IT IS LAST BLOCK
7DD1 EB   C4        00200          ADDB    ,U       LST TKN VALU+NMBR OF TKNS IN BLCK
7DD3 33   4A        00210          LEAU    10,U     U=ADDRESS OF NEXT BLOCK
7DD5 20   F6        00220          BRA     LOOP0    REPEAT UNTIL LAST BLOCK FOUND
7DD7 CA   80        00230 PNTR     ORB     #128     B=TOKEN VALUE+128
7DD9 F7   7DFA      00240          STB     SUBVAL   SAVE FOR "CHECK" ROUTINE
7DDC 86   01        00250          LDA     #1       NUMBER OF WORDS=1
7DDE A7   C4        00260          STA     ,U       SAVE IN NUMBER-OF-WORDS POINTER
7DE0 8E   7DF3      00270          LDX     #LIST    LOCATION OF WORD LIST
7DE3 AF   41        00280          STX     1,U      SAVE IN WORD LIST POINTER
7DE5 8E   7DF9      00290          LDX     #CHECK   ADDRESS OF TOKEN CHECK ROUTINE
7DE8 AF   43        00300          STX     3,U      SAVE IN JUMP ADDRESS
7DEA 6F   4A        00310          CLR     10,U     SIGNAL LAST BLOCK OF DATA
7DEC 8E   000A      00320          LDX     #10      DEFAULT LINE INCREMENT
7DEF BF   7F9A      00330          STX     LININC   SAVE FOR 'AUTO'
7DF2 39             00340          RTS
                    00350 *DATA FOR BASIC,JMP TBLE,TOKEN CHECKING ROUTINE
7DF3      41        00360 LIST     FCC     /AUT/
7DF6      CF        00370          FCB     'O+128
7DF7      7E01      00380 TABLE    FDB     AUTO
7DF9      80        00390 CHECK    FCB     128
7DFA                00400 SUBVAL   RMB     1
7DFB 8E   7DF7      00410          LDX     #TABLE   X=ADDRESS OF JUMP TABLE
7DFE 7E   ADD4      00420          JMP     44500    RETRN CNTRL TO BASIC INTERPRETER
7E01 26   0A        00430 AUTO     BNE     GETNUM   BRNCH IF AUTO IS NOT TYPED
7E03 8D   5E        00440          BSR     FNDEND   FIND VALUE OF LAST LINE NUMBER
7E05 F3   7F9A      00450          ADDD    LININC   ADD INCRMT TO LAST LINE NUMBR
7E08 BE   7F9A      00460          LDX     LININC   X=VALUE OF INCREMENT
7E0B 20   2E        00470          BRA     SETUP    STORE AND RETURN TO BASIC
7E0D 81   2C        00480 GETNUM   CMPA    #',      NEXT CHARACTER A COMMA?
7E0F 26   12        00490          BNE     LNDEF    GO IF NOT A COMMA
7E11 8D   50        00500          BSR     FNDEND   FIND VALUE OF LAST LINE NUMBER
7E13 34   06        00510          PSHS    D        SAVE LINE NUMBER VALUE
7E15 BD   B26D      00520          JSR     45677    SYNTAX CHECK FOR ','
7E18 BD   B73D      00530          JSR     46909    GET VALUE OF LINE INCREMENT
7E1B 35   06        00540          PULS    D        RESTORE VALUE OF LAST LINE NUMBER
7E1D 34   10        00550 ADDLIN   PSHS    X        SAVE INCREMENT VALUE FOR ADDITION
7E1F E3   E1        00560          ADDD    ,S++     ADD IT TO LINE NUMBER VALUE
7E21 20   18        00570          BRA     SETUP    STORE LINE NUMBER, INCREMENT
7E23 BD   B73D      00580 LNDEF    JSR     46909    GET LINE NUMBER VALUE
7E26 34   10        00590          PSHS    X        SAVE LINE NUMBER VALUE
7E28 9D   A5        00600          JSR     165      END OF LINE/COMMAND?
7E2A 26   07        00610          BNE     GTINC    GO IF NOT END OF LINE/COMMAND
7E2C 35   06        00620          PULS    D        D=LINE NUMBER VALUE
7E2E BE   7F9A      00630          LDX     LININC   X=INCREMENT VALUE
7E31 20   08        00640          BRA     SETUP    STORE LINE NUMBER AND INCREMENT
7E33 BD   B26D      00650 GTINC    JSR     45677    SYNTAX CHECK FOR A COMMA
7E36 BD   B73D      00660          JSR     46909    GET VALUE OF INCREMENT
7E39 35   06        00670          PULS    D        D=LINE NUMBER VALUE
7E3B 1083 F9FF      00680 SETUP    CMPD    #63999   ILLEGAL LINE NUMBER VALUE?
7E3F 23   02        00690          BLS     GDNMBR   GO IF NOT ILLEGAL VALUE
7E41 20   44        00700          BRA     BLERR    PRINT 'BAD LINE NUMBER'
7E43 FD   7F98      00710 GDNMBR   STD     FRSTLN   SAVE LINE NMBR VALU FOR PRNTOUT
7E46 30   1F        00720          LEAX    -1,X     SUBTRACT ONE FROM INCREMENT VALUE
7E48 8C   F9FF      00730          CMPX    #63999   INCREMENT VALUE TOO LARGE?
7E4B 25   05        00740          BLO     GDINC    GO IF NOT TOO LARGE
7E4D 8E   7EB7      00750          LDX     #BDINC   X=ADDRESS OF 'BAD INCREMENT' MESSA
7E50 20   38        00760          BRA     PNTERR   GO PRINT IT
7E52 30   01        00770 GDINC    LEAX    1,X      INCREMENT=ORIGINAL VALUE
7E54 BF   7F9A      00780          STX     LININC   SAVE FOR OUTPUT
7E57 86   7E        00790          LDA     #126     SET UP RAM HOOK
7E59 B7   0182      00800          STA     386         TO JUMP TO NUMOUT ROUTINE
7E5C 8E   7ECD      00810          LDX     #NUMOUT
7E5F BF   0183      00820          STX     387
7E62 39             00830          RTS
7E63 AE   9F 0019   00840 FNDEND   LDX     [25]     X<>0 IF A PROGRAM IS PRESENT
7E67 27   16        00850          BEQ     NOPRG    GO IF NONE IN MEMORY
7E69 9E   1B        00860          LDX     27       X=END OF BASIC PROGRAM+2
7E6B 30   1E        00870          LEAX    -2,X     X=END OF BASIC PROGRAM
7E6D 34   10        00880          PSHS    X        SAVE FOR COMPARISON
7E6F EC   82        00890 LOOP1    LDD     ,-X      CHECK FOR BEGINNING OF LAST LINE
7E71 10A3 E4        00900          CMPD    ,S       FOUND BEGINNING?
7E74 27   04        00910          BEQ     GOTLIN   GO IF SO
7E76 9C   19        00920          CMPX    25       CHECKED ENTIRE PROGRAM?
7E78 22   F5        00930          BHI     LOOP1    REPEAT IF NOT
7E7A 32   62        00940 GOTLIN   LEAS    2,S      RESTORE STACK
7E7C EC   02        00950          LDD     2,X      D=VALUE OF LAST LINE NUMBER
7E7E 39             00960          RTS
```

Listing continued

```
7E7F 4F          00970 NOPRG   CLRA            D=NO LINE NUMBER
7E80 5F          00980         CLRB
7E81 39          00990         RTS
7E82 8C F9FF     01000 SNCHK   CMPX  #63999    DOES X CONTAIN AN ILLEGAL VALUE?
7E85 23 45       01010         BLS   OKNUM     RETRN IF NOT,PRNT'BAD LINE NMBR'
7E87 8E 7EA6     01020 BLERR   LDX   #BDNUM    X=ADDRESS OF "BAD LINE" MESSAGE
7E8A 86 39       01030 PNTERR  LDA   #57       CLOSE RAM
7E8C B7 0182     01040         STA   386           HOOK
7E8F D6 89       01050         LDB   137       CHECK TO SEE OF A CARRIAGE RETURN
7E91 C5 1F       01060         BITB  #31           NEEDS TO BE PRINTED
7E93 27 05       01070         BEQ   SKIP2     GO IF NOT
7E95 86 0D       01080         LDA   #13       PRINT A
7E97 BD A282     01090         JSR   41602     CARRIAGE RETURN
7E9A A6 80       01100 SKIP2   LDA   ,X+       A=NEXT CHARACTER IN MESSAGE
7E9C 27 05       01110         BEQ   ENDMES    GO IF LAST ONE
7E9E BD A282     01120         JSR   41602     PRINT CHARACTER
7EA1 20 F7       01130         BRA   SKIP2     REPEAT
7EA3 7E AC76     01140 ENDMES  JMP   44150     TRANSFER CONTROL TO BASIC
7EA6    42       01150 BDNUM   FCC   /BAD LINE NUMBER/
7EB5    0D       01160         FCB   13
7EB6    00       01170         FCB   0
7EB7    42       01180 BDINC   FCC   /BAD INCREMENT VALUE/
7ECA    0D       01190         FCB   13
7ECB    00       01200         FCB   0
7ECC 39          01210 OKNUM   RTS
7ECD 96 68       01220 NUMOUT  LDA   104       CHECK TO SEE IF
7ECF 4C          01230         INCA                IN THE DIRECT MODE
7ED0 27 01       01240         BEQ   DIRCT     GO IF SO
7ED2 39          01250         RTS             RETURN IF NOT
7ED3 BE 7F98     01260 DIRCT   LDX   FRSTLN    X=VALUE OF PRESENT LINE NUMBER
7ED6 8D AA       01270         BSR   SNCHK     CHECK TO SEE IF IT IS LEGAL
7ED8 1F 10       01280         TFR   X,D       D=LINE NUMBER VALUE
7EDA 8D 73       01290         BSR   BIN2DC    CONVERT TO DECIMAL AND PRINT
7EDC F3 7F9A     01300         ADDD  LININC    D=D+LINE INCREMENT
7EDF 25 A6       01310         BLO   BLERR     GO IF D>63999
7EE1 FD 7F98     01320         STD   FRSTLN    SAVE FOR NEXT TIME
7EE4 8E 02DD     01330         LDX   #733      X=START OF BUFFER
7EE7 A6 A0       01340 LOOP2   LDA   ,Y+       A=NEXT CHARACTER IN DECIMAL NMBR
7EE9 27 07       01350         BEQ   ENDNUM    GO IF LAST ONE
7EEB A7 80       01360         STA   ,X+       SAVE IN BUFFER
7EED BD A282     01370         JSR   41602     PRINT IT
7EF0 20 F5       01380         BRA   LOOP2
7EF2 86 20       01390 ENDNUM  LDA   #32       A=<SPACE>
7EF4 A7 80       01400         STA   ,X+       STORE IN BUFFER
7EF6 BD A282     01410         JSR   41602     PRINT ON SCREEN
7EF9 5F          01420         CLRB            NUMBER OF CHARACTERS IN BUFFER=0
7EFA BD A176     01430 LOOP3   JSR   41334     GET KEYBRD CHARACTER,FLASH CURSR
7EFD 84 7F       01440         ANDA  #127      A=POSITIVE VALUE
7EFF 81 0D       01450         CMPA  #13       ENTER PRESSED?
7F01 27 40       01460         BEQ   ENDINP    GO IF ENTER PRESSED
7F03 81 08       01470         CMPA  #8        BACKSPACE PRESSED?
7F05 27 18       01480         BEQ   BACK      GO IF BACKSPACE PRESSED
7F07 81 15       01490         CMPA  #21       SHIFT BACKSPACE PRESSED?
7F09 27 1F       01500         BEQ   ERASE     GO IF SHIFT BACKSPACE PRESSED
7F0B 81 03       01510         CMPA  #3        BREAK KEY PRESSED?
7F0D 27 2A       01520         BEQ   BRKKEY    GO IF BREAK KEY PRESSED
7F0F 81 1F       01530         CMPA  #31       WAS KEY PRESSED A CONTROL KEY?
7F11 23 E7       01540         BLS   LOOP3     GO IF SO
7F13 C1 F5       01550         CMPB  #245      BUFFER FULL?
7F15 22 E3       01560         BHI   LOOP3     CHK FOR NXT KEY IF BUFER FULL
7F17 BD A282     01570         JSR   41602     PRINT KEY CHARACTER
7F1A A7 80       01580         STA   ,X+       STORE CHARACTER IN BUFFER
7F1C 5C          01590         INCB            ADD 1 TO AMNT OF CHARS IN BUFER
7F1D 20 DB       01600         BRA   LOOP3     REPEAT
7F1F 5D          01610 BACK    TSTB            BUFFER EMPTY?
7F20 27 D8       01620         BEQ   LOOP3     RETURN IF BUFFER EMPTY
7F22 BD A282     01630         JSR   41602     PRINT BACKSPACE
7F25 5A          01640         DECB            SUBTRCT 1 TO CHARS IN BUFER
7F26 30 1F       01650         LEAX  -1,X      DEL PRESENT CHARS FROM BUFER
7F28 20 D0       01660         BRA   LOOP3
7F2A 5D          01670 ERASE   TSTB            BUFFER EMPTY?
7F2B 27 CD       01680         BEQ   LOOP3     RETURN IF BUFFER EMPTY
7F2D 86 08       01690         LDA   #8        A=BACKSPACE VALUE
7F2F BD A282     01700 LOOP4   JSR   41602     PRINT BACKSPACE
7F32 30 1F       01710         LEAX  -1,X      DELETE PRESENT CHARACTER
7F34 5A          01720         DECB            SUBTRCT 1 FROM CHARS IN BUFER
7F35 26 F8       01730         BNE   LOOP4     REPEAT UNTIL BUFFER EMPTY
7F37 20 C1       01740         BRA   LOOP3
7F39 86 39       01750 BRKKEY  LDA   #57       CLOSE RAM HOOK
7F3B B7 0182     01760         STA   386
7F3E 86 0D       01770         LDA   #13       PRINT CARRIAGE RETURN
7F40 7E A282     01780         JMP   41602     AND RETURN TO BASIC
7F43 32 62       01790 ENDINP  LEAS  2,S       RESTORE STACK
7F45 BD A282     01800         JSR   41602     PRINT CARRIAGE RETURN
7F48 4F          01810         CLRA            A=0 SGNALS END OF INPT
7F49 A7 84       01820         STA   ,X        FLAG END OF BUFFER
7F4B 8E 02DC     01830         LDX   #732      X=START OF BUFFER-1
7F4E 39          01840         RTS             RETURN TO BASIC
7F4F 34 56       01850 BIN2DC  PSHS  U,X,D
7F51 CE 01DA     01860         LDU   #474      U=SCRATCH USE POINTER
7F54 108E 01D9   01870         LDY   #473      Y=END OF BUFFER
7F58 6F A4       01880         CLR   ,Y        FLAG END OF BUFFER
7F5A ED C4       01890         STD   ,U        SAVE D IN SCRATCH AREA
7F5C A6 41       01900 LOOP5   LDA   1,U       A=LSB OF PRESENT VALUE
7F5E A7 42       01910         STA   2,U       SAVE FOR DIGIT DETERMINATION
7F60 86 0A       01920         LDA   #10       A=DIVISOR=10
7F62 8D 12       01930         BSR   DIVIDE    DIVIDE NUMBER BY 10
7F64 3D          01940         MUL             MULTIPLY RESULT BY 10
7F65 50          01950         NEGB            GET REMAINDER
7F66 EB 42       01960         ADDB  2,U       MAKE VALUE BETWEEN 0 AND 9
7F68 CB 30       01970         ADDB  #48       MAKE VALUE INTO AN ASCII DIGIT
7F6A E7 A2       01980         STB   ,-Y       SAVE DIGIT IN BUFFER
7F6C 6D 41       01990         TST   1,U       REPEAT PROCESS
7F6E 26 EC       02000         BNE   LOOP5
7F70 6D C4       02010         TST   ,U        UNTIL NUMBER IS FINISHED
7F72 26 E8       02020         BNE   LOOP5
7F74 35 D6       02030         PULS  U,X,D,PC
7F76 34 02       02040 DIVIDE  PSHS  A         SAVE DIVISOR
7F78 4F          02050         CLRA            INITIAL RESULT=0
7F79 E6 C4       02060         LDB   ,U        B=VALUE TO DIVIDE BY 10
7F7B 8D 0A       02070         BSR   DODIV     DO DIVISION
7F7D E7 C4       02080         STB   ,U        STORE NEW VALUE
7F7F E6 41       02090         LDB   1,U       REPEAT
7F81 8D 04       02100         BSR   DODIV       PROCESS FOR
7F83 E7 41       02110         STB   1,U       LSB OF NUMBER
7F85 35 82       02120         PULS  A,PC
7F87 8E 0008     02130 DODIV   LDX   #8        X=NUMBER OF REPITITIONS
7F8A 58          02140 LOOP6   ASLB            SHIFT D LEFT ONE PLACE
7F8B 49          02150         ROLA
7F8C A1 62       02160         CMPA  2,S       IS NUMBER > DIVISOR
7F8E 25 03       02170         BLO   CNTDIV    GO IF NOT
7F90 A0 62       02180         SUBA  2,S       SUBTRACT DIVISOR FROM NUMBER
7F92 5C          02190         INCB            SET CORRESPONDING BIT TO 1
7F93 30 1F       02200 CNTDIV  LEAX  -1,X      CONTINUE UNTIL ALL
7F95 26 F3       02210         BNE   LOOP6       8 REPITIONS DONE
7F97 39          02220         RTS
7F98             02230 FRSTLN  RMB   2
7F9A             02240 LININC  RMB   2
            0000 02250         END
00000 TOTAL ERRORS
```

The John-B System, Part Two

(Article on page 56)

```
1 REM**  JOHN-B SYSTEM PROJECT
2 REM**  POWER CONTROLLER
3 REM**  GENERAL USE SOFTWARE
4 REM**  (C) 1984, J.F.S./J.J.B.

5 REM**  NAME: JBPOWER
6 REM**  V 1.Ø, 11 AUG 84
```

```
1Ø CLSØ:PMODE Ø:PCLEAR 1:CLEAR 5
ØØ,16ØØØ:DIM A(22)
2Ø MA=16ØØØ:DEFUSR=MA+1:GOSUB 2Ø
ØØ:BL$=STRING$(32,32):BR$=STRING
$(32,128)
3Ø CLS:PRINT"      JOHN-B SYSTEM
PROJECT":PRINT"    POWER CONTROLL
```

```
ER SOFTWARE":PRINT BR$:PRINT@448
,BR$;:PRINT@484,"(C) 1984, J.F.S
., J.J.B.";:PRINT@16Ø,;
4Ø PRINT"TYPE HOUSE CODE (A - P)
...";
5Ø A$=INKEY$:IF A$=""THEN5Ø ELSE
 T=ASC(A$)-64:IF T<1 OR T>16 THE
N 5Ø
6Ø PRINTA$:PRINT:POKE MA+114,A(T
)
7Ø INPUT"ENTER DEVICE NUMBER (1-
16)";D
8Ø IF D<1 OR D>16 THEN PRINT@224
,BL$:PRINT@224,;:GOTO 7Ø
9Ø E=1:S$="ONOFFALL OFF"
1ØØ PRINT@288,;:INPUT"ENTER ACTI
ON (ON, OFF, ALL OFF) ";A$
11Ø E=INSTR(S$,A$):IF E=Ø THEN P
RINT@288,"  ** ILLEGAL OPTION **
":FOR I=1 TO 2ØØØ:NEXT:PRINT@288
,BL$;BL$;:PRINT@288,;:GOTO 1ØØ
12Ø IF E=3 THEN E=2 ELSE IF E=6
THEN E=3
13Ø E=E+16:C=3
14Ø POKE MA+115,A(D):POKE MA+113
,3:X=USR(Ø)
15Ø FOR H=1 TO 1Ø:NEXT H 'SHORT
DELAY REQURED.
16Ø POKE MA+115,A(E):POKE MA+113
,C:X=USR(Ø)
17Ø GOTO 3Ø
199Ø REM* STARTUP SUBROUTINE *
2ØØØ PRINT@234,"INITIALIZING";
2Ø1Ø H1$="6ØE Ø2ØA Ø1Ø9Ø5ØD Ø7ØF Ø3Ø
BØØØ8Ø4ØC Ø2838Ø8185848"
2Ø2Ø FOR I=1 TO 22:A(I)=VAL("&H"
+MID$(H1$,(I*2)-1,2)):S=S+A(I):N
EXT:IF S<>22Ø8 THEN PRINT"CHECKS
UM ERROR # 1":END ELSE S=Ø
2Ø3Ø H2$="3Ø8DØØ6CE68434Ø48D2F8D
2D8D2B8D21A6Ø1C6Ø48DØCC6Ø5A6Ø28D
Ø635Ø45A26E5394824Ø28D128DØ825Ø2
8DØC5A26F23934Ø634Ø1C6ØØ2ØØ634Ø6
34Ø1C6FDB6FF2Ø4424FA86344A26FD86
Ø3F7FF2Ø34Ø286B24A26FDB7FF2Ø35Ø2
4A26Ø535Ø135Ø63934Ø286F88AØØ4A26
FB35Ø22ØDC"
2Ø4Ø FOR I=1 TO 112:S=VAL("&H"+M
ID$(H2$,(I*2)-1,2)):CK=CK+S:POKE
 I+MA,S:NEXT:IF CK<>9736 THEN PR
INT"CHECKSUM ERROR # 2":END
2Ø5Ø PK=6528Ø:RETURN
```

Screen Symmetry

(Article on page 66)

Program Listing 1. Assembly-Language Symmetry

```
3E00                    00100          ORG     $3E00
                        00110 *************************
                        00120 *  S Y M M E T R Y 1.0  *
                        00130 *  A GRAPHICS DISPLAY   *
                        00140 *      FOR PMODE 4      *
                        00150 *      JOE FINAMORE     *
                        00160 *************************
3E00 BD   B3ED          00170 START    JSR     $B3ED    ,GET ARGUMENT
3E03 30   8D 016D       00180          LEAX    MIDSCR,PCR       ,POINT TO VRBLE. TABLE
3E07 FE   00BA          00190          LDU     >$00BA   ,GET START OF SCREEN
3E0A 31   C9 0C00       00200          LEAY    $0C00,U  ,POINT TO MID-SCREEN
3E0E 10AF 81            00210          STY     ,X++     ,SAVE POINTER
3E11 C1   06            00220          CMPB    #6       ,SIX-WAY?
3E13 27   1C            00230          BEQ     SIXPT    ,YES; GO THERE
3E15 CC   2080          00240 FOURPT   LDD     #$2080   ,INITIALIZE VARIABLES
3E18 ED   81            00250          STD     ,X++     ,FOR 4-WAY SYMMETRY
3E1A CC   1000          00260          LDD     #$1000   ,& SAVE
3E1D ED   81            00270          STD     ,X++
3E1F 86   01            00280          LDA     #1
3E21 ED   81            00290          STD     ,X++
3E23 4F                 00300          CLRA
3E24 ED   81            00310          STD     ,X++
3E26 C6   7F            00320          LDB     #$7F
3E28 ED   81            00330          STD     ,X++
3E2A CC   6001          00340          LDD     #$6001
3E2D ED   81            00350          STD     ,X++
3E2F 20   1E            00360          BRA     SYMMET
3E31 CC   48D9          00370 SIXPT    LDD     #$48D9   ,INITIALIZE VARIABLES
3E34 ED   81            00380          STD     ,X++     ,FOR 6-WAY SYMMETRY
3E36 CC   0901          00390          LDD     #$0901   ,AND SAVE
3E39 ED   81            00400          STD     ,X++
3E3B CC   0096          00410          LDD     #$0096
3E3E ED   81            00420          STD     ,X++
3E40 CC   5A15          00430          LDD     #$5A15
3E43 ED   81            00440          STD     ,X++
3E45 CC   DC5B          00450          LDD     #$DC5B
3E48 ED   81            00460          STD     ,X++
3E4A CC   7002          00470          LDD     #$7002
3E4D ED   81            00480          STD     ,X++
3E4F 1F   10            00490 SYMMET   TFR     X,D      ,A=MSB; B=LSB
3E51 1F   8B            00500          TFR     A,DP     ,VRBLES NOW IN DPR
          3F            00510          SETDP   $3F
3E53 5F                 00520          CLRB
3E54 E7   80            00530          STB     ,X+      ,CLEAR TOPSLP, BITNUM
3E56 E7   80            00540          STB     ,X+      , & BITSTR
3E58 E7   84            00550          STB     ,X
3E5A 30   8D 010E       00560          LEAX    BITTBL,PCR       ,POINT TO CLRTBL (+1)
3E5E 96   76            00570          LDA     <STRTBT  ,GET # OF BITS 1ST ROW
3E60 34   46            00580 SYMM05   PSHS    D,U      ,SAVE REGISTERS
3E62 80   08            00590 SYMM10   SUBA    #8       ,A FULL BYTE (8 BITS)?
3E64 25   04            00600          BLO     SYMM15   ,NO; EXIT...
3E66 6F   C0            00610          CLR     ,U+      ,CLEAR SCREEN BYTE
3E68 20   F8            00620          BRA     SYMM10   ,DO NEXT
3E6A E6   86            00630 SYMM15   LDB     A,X      ,GET VALUE FROM CLRTBL
3E6C E4   C4            00640          ANDB    ,U       ,MASK OUT UNWANTED BITS
3E6E E7   C4            00650          STB     ,U       ,STORE ON SCREEN
3E70 35   46            00660          PULS    D,U      ,RESTORE REGISTERS
3E72 D3   7A            00670          ADDD    <SLOPE1  ,ADJUST # OF BITS/ROW
3E74 33   C8 20         00680          LEAU    $20,U    ,POINT TO NEXT ROW
3E77 1193 74            00690          CMPU    <MIDSCR  ,REACHED MIDSCREEN?
3E7A 25   E4            00700          BLO     SYMM05   ,NOT YET; GO BACK
3E7C 1F   12            00710          TFR     X,Y      ,Y NOW POINTS TO BITTBL
3E7E 17   00BB          00720          LBSR    MIRROR   ,REFLECT INTO QUAD. 2
3E81 FE   00BA          00730          LDU     >$00BA   ,GET START OF SCREEN
3E84 96   78            00740          LDA     <VALUE1  ,GET BIT-OFFSET
3E86 33   C6            00750          LEAU    A,U      ,ADJUST
3E88 9E   74            00760          LDX     <MIDSCR  ,POINT TO MIDSCREEN
3E8A 30   88 E4         00770          LEAX    -28,X    ,ADJUST
3E8D 0F   76            00780          CLR     <STRTBT
3E8F 34   50            00790 SYMM20   PSHS    U,X      ,SAVE REGISTERS
3E91 0F   85            00800          CLR     <RATIO   ,CLEAR CARRY VALUE
3E93 96   80            00810          LDA     <BITCT   ,# OF BITS TO COPY
3E95 97   87            00820          STA     <COUNT   ,SAVE
3E97 0F   86            00830          CLR     <SLPCT   ,CLEAR CARRY VALUE
3E99 5F                 00840          CLRB
3E9A A6   C0            00850          LDA     ,U+      ,GET SCREEN VALUE
3E9C D1   76            00860 SYMM25   CMPB    <STRTBT  ,PROPER STARTING BIT
3E9E 27   04            00870          BEQ     SYMM30   ,YES; GO ON
3EA0 48                 00880          LSLA             ,SHIFT OUT UNNECESSARY
3EA1 5C                 00890          INCB             , BIT & ADJUST BIT #
3EA2 20   F8            00900          BRA     SYMM25   ,DO NEXT
3EA4 48                 00910 SYMM30   LSLA             ,GET BIT
3EA5 34   06            00920          PSHS    D        ,SAVE ACCUMULATORS
3EA7 24   08            00930          BCC     SYMM35   ,BIT WAS NOT SET
3EA9 96   83            00940          LDA     <BITNUM  ,WHICH BIT DO WE NEED?
3EAB A6   A6            00950          LDA     A,Y      ,GET VALUE FROM TABLE
3EAD AA   84            00960          ORA     ,X       ,SET BIT ON SCREEN
3EAF A7   84            00970          STA     ,X
3EB1 D6   86            00980 SYMM35   LDB     <SLPCT   ,GET CARRY VALUE
3EB3 DB   7C            00990          ADDB    <SLOPE2  ,ADJUST
3EB5 D1   77            01000          CMPB    <SLPCMP  ,"ROUND OFF" NUMBER
3EB7 2E   0C            01010          BGT     SYMM40   ,NO ADJUSTMENT YET
3EB9 0C   83            01020          INC     <BITNUM  ,ADJUST BIT-POINTER
3EBB 96   83            01030          LDA     <BITNUM
3EBD 81   08            01040          CMPA    #8       ,BIT-POINTER>7?
3EBF 25   04            01050          BLO     SYMM40   ,NO; JUMP AHEAD
3EC1 0F   83            01060          CLR     <BITNUM  ,CLEAR VARIABLE
3EC3 30   01            01070          LEAX    1,X      ,ADJUST SCREEN-POINTER
3EC5 D7   86            01080 SYMM40   STB     <SLPCT   ,SAVE CARRY VALUE
3EC7 96   85            01090          LDA     <RATIO   ,GET THS CARRY VALUE
3EC9 9B   7E            01100          ADDA    <ADJUST  ,ADJUST
3ECB 97   85            01110          STA     <RATIO   ,SAVE NEW CARRY VALUE
```

Listing continued

```
3ECD 91   7F       01120          CMPA   <ADJCMP ,"ROUND OFF" VALUE
3ECF 2E   03       01130          BGT    SYMM45  ,NO CHANGE NEEDED YET
3ED1 30   88 E0    01140          LEAX   -$20,X  ,ADJUST SCREEN POINTER
3ED4 35   06       01150 SYMM45   PULS   D       ,RESTORE ACCUMULATORS
3ED6 0A   87       01160          DEC    <COUNT  ,DECREMENT PIXEL COUNT
3ED8 27   0A       01170          BEQ    SYMM50  ,END OF LINE; JUMP AHEAD
3EDA 5C            01180          INCB           ,BIT# OF SCREEN VALUE
3EDB C1   08       01190          CMPB   #8      ,ALL 8 BITS DONE?
3EDD 26   C5       01200          BNE    SYMM30  ,NO; READY TO DO NEXT
3EDF 5F            01210          CLRB           ,GET NEW BYTE & GO BACK
3EE0 A6   C0       01220          LDA    ,U+
3EE2 20   C0       01230          BRA    SYMM30
3EE4 35   50       01240 SYMM50   PULS   U,X      ,RESTORE REGISTERS
3EE6 96   82       01250          LDA    <TOPSLP ,GET CARRY VALUE
3EE8 9B   7B       01260          ADDA   <SLOPE1+1       ,ADJUST AND SAVE
3EEA 97   82       01270          STA    <TOPSLP
3EEC 91   7D       01280          CMPA   <SLPCP2 ,ROUND OFF
3EEE 2E   16       01290          BGT    SYMM55  ,NO ADJUSTMENT NEEDED YET
3EF0 96   80       01300          LDA    <BITCT  ,ADJUST # OF BITS/ROW
3EF2 90   81       01310          SUBA   <INCRM
3EF4 27   25       01320          BEQ    COPY    ,IF COUNT=0 THEN DONE
3EF6 97   80       01330          STA    <BITCT  ,SAVE NEW COUNT
3EF8 96   76       01340          LDA    <STRTBT ,GET STARTING-BIT POINTER
3EFA 9B   79       01350          ADDA   <VALUE2 ,ADJUST
3EFC 97   76       01360          STA    <STRTBT ,& SAVE
3EFE 81   08       01370          CMPA   #8      ,IS BIT# VALID
3F00 25   04       01380          BLO    SYMM55  ,YES; JUMP AHEAD
3F02 0F   76       01390          CLR    <STRTBT ,NO; REINITIALIZE
3F04 33   41       01400          LEAU   1,U     ,ADJUST SCREEN-POINTER
3F06 33   C8 20    01410 SYMM55   LEAU   $20,U   ,POINT TO NEXT LINE
3F09 0C   84       01420          INC    <BITSTR ,"X LINE" STARTING BIT
3F0B 96   84       01430          LDA    <BITSTR ,GET NEW VALUE &
3F0D 81   08       01440          CMPA   #8      ,ADJUST IF NEEDED
3F0F 25   05       01450          BLO    SYMM60
3F11 4F            01460          CLRA
3F12 0F   84       01470          CLR    <BITSTR
3F14 30   01       01480          LEAX   1,X
3F16 97   83       01490 SYMM60   STA    <BITNUM ,STORE VALUE @ BITNUM
3F18 16   FF74     01500          LBRA   SYMM20  ,START NEW LINE
3F1B 8D   1F       01510 COPY     BSR    MIRROR  ,REFLECT INTO QUAD. 2
3F1D FE   00BA     01520          LDU    >$00BA  ,GET SCREEN START
3F20 30   C9 17E0  01530          LEAX   $17E0,U ,POINT TO LAST ROW
3F24 C6   10       01540 COPY10   LDB    #$10    ,BITS/LINE (/2)
3F26 D7   87       01550          STB    <COUNT
3F28 EC   C1       01560 COPY20   LDD    ,U++    ,GET VALUE FROM TOP HALF
3F2A ED   81       01570          STD    ,X++    ,STORE IT IN BOTTOM HALF
3F2C 0A   87       01580          DEC    <COUNT  ,DONE WITH LINE?
3F2E 26   F8       01590          BNE    COPY20  ,NO; DO NEXT VALUE
3F30 30   88 C0    01600          LEAX   -$40,X  ,ADJUST BOTTOM POINTER
3F33 1193 74       01610          CMPU   <MIDSCR ,DONE?
3F36 26   EC       01620          BNE    COPY10  ,NO; DO ANOTHER LINE
3F38 4F            01630          CLRA           ,RESTORE DIRECT PAGE
3F39 1F   8B       01640          TFR    A,DP    ,REGISTER & RETURN
3F3B 39            01650          RTS            ,TO CALLING PROGRAM
3F3C FE   00BA     01660 MIRROR   LDU    >$00BA  ,GET SCREEN START
3F3F 30   C8 20    01670 MIRR10   LEAX   $20,U   ,END OF CURRENT ROW
3F42 C6   08       01680          LDB    #8      ,INITIALIZE COUNT
3F44 D7   87       01690          STB    <COUNT
3F46 C6   08       01700 MIRR20   LDB    #8      ,8 BITS/ACCUMULATOR
3F48 34   04       01710          PSHS   B       ,SAVE COUNT
3F4A EC   C1       01720          LDD    ,U++    ,GET SCREEN VALUE
3F4C 48            01730          LSLA           ,1ST SHIFT INTO CCR
3F4D 56            01740 MIRR30   RORB           ,ROTATE INTO B
3F4E 49            01750          ROLA           ,ROTATE INTO A
3F4F 6A   E4       01760          DEC    ,S      ,DECREMENT COUNT
3F51 26   FA       01770          BNE    MIRR30  ,ALL BITS NOT DONE YET
3F53 32   61       01780          LEAS   1,S     ,ALIGN STACK
3F55 ED   83       01790          STD    ,--X    ,SAVE INVERTED VALUES
3F57 0A   87       01800          DEC    <COUNT  ,CURRENT ROW DONE?
3F59 26   EB       01810          BNE    MIRR20  ,NO; GO BACK
3F5B 33   C8 10    01820          LEAU   $10,U   ,POINT TO NEXT ROW
3F5E 1193 74       01830          CMPU   <MIDSCR ,DONE?
3F61 26   DC       01840          BNE    MIRR10  ,NO; DO NEXT ROW
3F63 39            01850          RTS            ,RETURN
3F64      FF7F     01860 CLRTBL   FDB    $FF7F
3F66      3F1F     01870          FDB    $3F1F
3F68      0F07     01880          FDB    $0F07
3F6A      0301     01890          FDB    $0301
3F6C      8040     01900 BITTBL   FDB    $8040
3F6E      2010     01910          FDB    $2010
3F70      0804     01920          FDB    $0804
3F72      0201     01930          FDB    $0201
3F74               01940 MIDSCR   RMB    2
3F76               01950 STRTBT   RMB    1
3F77               01960 SLPCMP   RMB    1
3F78               01970 VALUE1   RMB    1
3F79               01980 VALUE2   RMB    1
3F7A               01990 SLOPE1   RMB    2
3F7C               02000 SLOPE2   RMB    1
3F7D               02010 SLPCP2   RMB    1
3F7E               02020 ADJUST   RMB    1
3F7F               02030 ADJCMP   RMB    1
3F80               02040 BITCT    RMB    1
3F81               02050 INCRM    RMB    1
3F82               02060 TOPSLP   RMB    1
3F83               02070 BITNUM   RMB    1
3F84               02080 BITSTR   RMB    1
3F85               02090 RATIO    RMB    1
3F86               02100 SLPCT    RMB    1
3F87               02110 COUNT    RMB    1
          3E00     02120          END    START
00000 TOTAL ERRORS
```

Program Listing 2. Basic Driver For Symmetry

```
1Ø DATA189,179,237,48,141,1,1Ø9,
254,Ø,186,49,2Ø1,12,Ø,16,175,129
,193,6,39,28,2Ø4,32,128,237,129,
2Ø4,16,Ø,237,129,134,3642
2Ø DATA1,237,129,79,237,129,198,
127,237,129,2Ø4,96,1,237,129,32,
3Ø,2Ø4,72,217,237,129,2Ø4,9,1,23
7,129,2Ø4,Ø,15Ø,237,129,4391
3Ø DATA2Ø4,9Ø,21,237,129,2Ø4,22Ø
,91,237,129,2Ø4,112,2,237,129,31
,16,31,139,95,231,128,231,128,23
1,132,48,141,1,14,15Ø,118,4111
4Ø DATA52,7Ø,128,8,37,4,111,192,
32,248,23Ø,134,228,196,231,196,5
3,7Ø,211,122,51,2ØØ,32,17,147,11
6,37,228,31,18,23,Ø,3453
5Ø DATA187,254,Ø,186,15Ø,12Ø,51,
198,158,116,48,136,228,15,118,52
,8Ø,15,133,15Ø,128,151,135,15,13
4,95,166,192,2Ø9,118,39,4,3781
6Ø DATA72,92,32,248,72,52,6,36,8
,15Ø,131,166,166,17Ø,132,167,132
,214,134,219,124,2Ø9,119,46,12,1
2,131,15Ø,131,129,8,37,35Ø7
7Ø DATA4,15,131,48,1,215,134,15Ø
,133,155,126,151,133,145,127,46,
3,48,136,224,53,6,1Ø,135,39,1Ø,9
2,193,8,38,197,95,3ØØ1
8Ø DATA166,192,32,192,53,8Ø,15Ø,
13Ø,155,123,151,13Ø,145,125,46,2
2,15Ø,128,144,129,39,37,151,128,
15Ø,118,155,121,151,118,129,8,37
48
9Ø DATA37,4,15,118,51,65,51,2ØØ,
32,12,132,15Ø,132,129,8,37,5,79,
15,132,48,1,151,131,22,255,116,1
41,31,254,Ø,186,274Ø
1ØØ DATA48,2Ø1,23,224,198,16,215
,135,236,193,237,129,1Ø,135,38,2
48,48,136,192,17,147,116,38,236,
79,31,139,57,254,Ø,186,48,4Ø1Ø
11Ø DATA2ØØ,32,198,8,215,135,198
,8,52,4,236,193,72,86,73,1Ø6,228
,38,25Ø,5Ø,97,237,131,1Ø,135,38,
235,51,2ØØ,16,17,147,3696
12Ø DATA116,38,22Ø,57,255,127,63
,31,15,7,3,1,128,64,32,16,8,4,2,
1,1188
13Ø CLEAR2ØØ,15871: L=1Ø:CS=Ø:CL
S
14Ø FORX=15872 TO16243:READA:IFA
>255THEN16Ø
15Ø CS=CS+A:POKEX,A:NEXT:GOTO 17
Ø
16Ø IFCS<>A THEN18ØELSEL=L+1Ø:CS
=Ø:X=X-1:NEXT
17Ø PRINT"SUCCESSFUL RUN":PRINT"
MACHINE CODE IN MEMORY":END
18Ø PRINT"DATA ERROR IN LINE";L:
END
```

Program Listing 3. Sample Program

```
1Ø PMODE4,1:SCREEN1,1:DEFUSRØ=&H
3EØØ
2Ø PCLS:FORX=1TO2Ø
3Ø LINE-(RND(96)+31,RND(96)-1),P
SET:NEXT
4Ø A$=INKEY$:IFA$="6"ORA$="4"THE
NA=USRØ(VAL(A$))ELSE4Ø
5Ø IFINKEY$=""THEN5Ø ELSE2Ø
```

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- Programmable Prompt Character or Delay to Send Next Line
- Programmable Control Character Trapping
- Programmable Open/Close Buffer Characters
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Sound Commands:	PLAY, SOUND
String Functions:	CHR$, LEFT$, MID$, RIGHT$, LEN, INSTR, LSET, RSET, TRM$, STR$, STRING$, INKEY$, MKN$
Numeric Functions:	ABS, POS, TIMER, RND, ASC, TAB, CAL, JOYSTK, PEEK, POKE, LOC, LOF, EOF, FREE, CVN, ERR, VARPTR, SWAP
I/O Commands:	OPEN, CLOSE, INPUT, LINEINPUT, PRINT WRITE, PRINT @, GET, PUT, KILL, CHAINM, FIELD, DATA, READ, RESTORE
Program Control:	FOR/NEXT/STEP, GOTO/GOSUB, IF/THEN/ELSE, RETURN, STOP, RETI, ON n GOTO/GOSUB, ON ERROR, ON RESET, ON IRQ/FIRQ/NMI, ON OVR/NOVR, EXEC, LET
Directives:	ORG, REM OR ', END, DIM, END, BASE, RAM, ON/OFF, RAM64K, HIRES, GENERATE, DPSET, STACK
Editor Commands:	LINE EDIT, AUTO EDIT, COPY, MOVE, RENUMBER, AUTO LINE#, PRINTER, LIST, DELETE, SEARCH, REPLACE, BAUD RATE, PRINTER, CBASIC, TAPPEND, SKIP, SIZE, LOAD, SAVE, APPEND, KILL, DIR, and much, much more.

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PROGRAM FEATURES	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Black	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16,32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24.95	$19.95	$29.95

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by James J. Barbarello

Complete the hardware part of this project and prepare for the final setup.

The John-B System, Part Two

Ed. Note: This is the second of a three-part article, which shows you how to build a person-assistance/home-control system around your CoCo. Last month, author Jim Barbarello gave instructions for building the Phone I/O and Puff Switch assemblies. This month he describes how to construct the Sequencer and Power Controller.

The sequence controller (or Sequencer) allows the selection of one of eight different devices, or the "off" state where none of the devices is selected. Typical uses include connecting a number of transistor radios (each tuned to a different station) to allow the user to select different programs. Even ac-powered devices such as a tape recorder or TV can be controlled by having the Sequencer power a relay to provide current to the device. You can expand the sequencer's use by remotely switching the S puff switch input through the Power Controller. You'll be able to turn on the TV, change channels, and turn it off again with just the S and C puff switches!

Referring to Fig. 1, notice that the S switch input is debounced using the same circuit as found in the Phone I/O (IC1A). The pulse output from IC1A sequences (or clocks) IC2, a 4017 decade counter. In its initial condition, pin 3 (Q0) is high and all other outputs are low. At the first pulse, Q0 goes low and Q1 (pin 2) goes high. This high level turns on transistor Q1, shorting it to ground. Current can now flow through R9 and LD1 (a light-emitting diode, or LED), causing it to light and signaling that the device connected to J1 is now energized. The tip of J1 is connected to the 9-volt source and the ring is connected through Q1 to ground.

At the next closure of the S switch, Q1 goes low and Q2 (pin 4) goes high. This sequence continues until it reaches Q9. Here, the high level resets IC2 (via reset pin 15). This starts the cycle again at Q0. Thus you have one "off" position (Q0, with nothing connected to it) and eight "on" positions (Q1 through Q8). DIP switch 1 (DS1) lets you shorten the cycle if you want to control fewer than eight devices. As an example, if you close switch 5 in DS1, the cycle will be shortened to four steps (since a high level at Q5 passes through DS1 to pin 15 and reset IC2).

System Requirements

16K RAM
Extended Color Basic

Construction

Begin by fabricating a PC board from the pattern shown in Fig. 2. Mount all components on the board (see Table 1 for a parts list), being sure to observe the orientation shown for C1, IC1, IC2, and all diodes and LEDs. You need to install diodes D1 through D8 only if the particular output is to control a relay. Since IC1 and IC2 are static sensitive, handle them as little as possible (and preferrably by their ends). Before touching IC1 or IC2, remove any static charge you might have by touching a ground point (such as the screw holding an electric outlet cover).

Perform final wiring per Fig. 3. Mount the completed unit in any suitable case, making sure J1 through J9 are readily available and LD1 through LD9 are suitably marked and visible to the user. If you are constructing

both the Phone I/O and the Sequencer, you can power them both from a single 9-volt dc, 500-milliamp power cube.

To use the Sequencer, connect the S switch to J1 (S) and apply power to the unit. Momentarily press the S switch. LD1 will glow. Press the S switch again. LD1 will extinguish and LD2 will now glow. Continue pressing the S switch until LD8 glows. At the next press of the S switch LD8 will extinguish, leaving all LEDs dark.

To shorten the cycle, place the switch with the number one higher than the cycle length to "on." For instance, for a cycle length of 5, place the number 6 switch to "on". For a full cycle, all switches should be off.

Power for the devices is obtained from J1 through J8. Say you want to power two 9-volt transistor batteries. You will need two plugs to match jacks J1 and J2, and two 9-volt battery snaps. Connect the black wire from one battery snap to the tip of one of the plugs. Connect the snap's red wire to the plug's ring. Repeat this for the other battery snap and plug. Now, place one plug in J1 and the other in J2. Open one radio and connect its snap to the snap from J1. Repeat for the other radio and the snap from J2. Now, as you use the S switch, the first radio will begin playing when LD1 glows and the second radio will be energized when LD2 glows. For all other conditions, both radios will be off.

To control a device that requires other than 9-volt dc or more than 400 milliamps, you will need a relay similar to the ones used in the Phone I/O. Attach one relay coil lead to the tip of a plug. Attach the other relay coil lead to the ring of a plug. Attach the common and normally open relay contacts in line with the power source to the device you want to control (such as an on/off switch). Make sure the relay you choose has contacts rated to handle the power the device requires. For instance, the 275-004 relay used in the Phone I/O has contacts rated at 1 amp and 125 volts. Do not try to control a 3-amp device with this relay! Remember, when controlling a relay, a diode must be connected across the driving transistor. The diode prevents damage to the transistor, which can result when the magnetic field in the relay coil collapses (i.e., when the relay is deenergized).

Other Comments

Before connecting to the phone lines, call the local phone company, or the retired phone company employees club (Pioneers of America) to determine if any special arrangements (such as an isolating coupler) are required. In many instances, the phone company will pro-

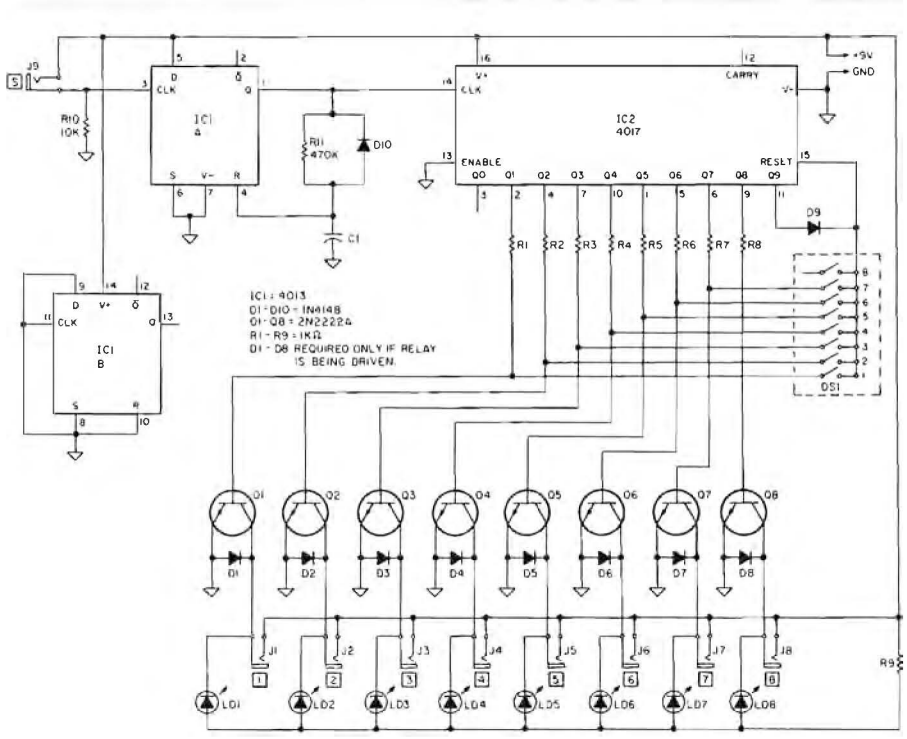


Fig. 1. The John-B Sequencer

D1–D11 . . . . . 1N4148 silicon signal diode (such as RS P/N 276-1620)
IC1 . . . . . 4013 CMOS dual "D" flip-flop IC (such as RS P/N 276-2413)
IC2 . . . . . 4017 CMOS decade counter (such as RS P/N 276-2417)
J1–J8 . . . . . ⅛" phone jack (RS P/N 274-251 or similar)
J9 . . . . . ¼" phone jack (RS P/N 274-252 or similar)
LD1–LD8 . . . . . T-1 ¾ jumbo red LED (such as RS P/N 276-041)
C1 . . . . . 0.1uf, 10v (or greater) disk capacitor (such as RS P/N 272-1434)
Q1–Q8 . . . . . 2222A silicon NPN transistor (such as RS P/N 276-2009)
R1–R9 . . . . . 1-Kohm, ¼-watt resistor (such as RS P/N 271-1321)
R10 . . . . . 10-Kohm, ¼-watt resistor (such as RS P/N 271-1335)
R11 . . . . . 470-Kohm, ¼-watt resistor (such as RS P/N 271-1354)

Miscellaneous: 9-volt, 500-ma power cube (such as RS P/N 273-1651 or Jameco P/N DC-900), PC board, suitable case, hookup wire, solder, etc.

Notes:

1. RS = Radio Shack.
2. Herbach and Rademan, 401 E. Erie Ave., Philadelphia, PA 19134. 215-426-1708. $10 minimum order. Visa and M/C accepted.
3. Jameco Electronics, 1355 Shoreway Road, Belmont, CA 94002. 415-592-8097. $10 minimum order. Visa and M/C accepted.
4. All Sequencer parts (except jacks and relays) are also available from Jameco Electronics.
5. The Sequencer can be housed in a single case and powered from the same 9-volt power cube. Additional power (+9 and Gnd) takeoff points are provided on the Phone I/O board, which can be connected to the power input points on the Sequencer PC board to provide the required 9 volts. Then only one power cube is required.

Table 1. Sequencer Parts List

vide an isolation coupler (if required) free of charge to the handicapped user.

Power Controller

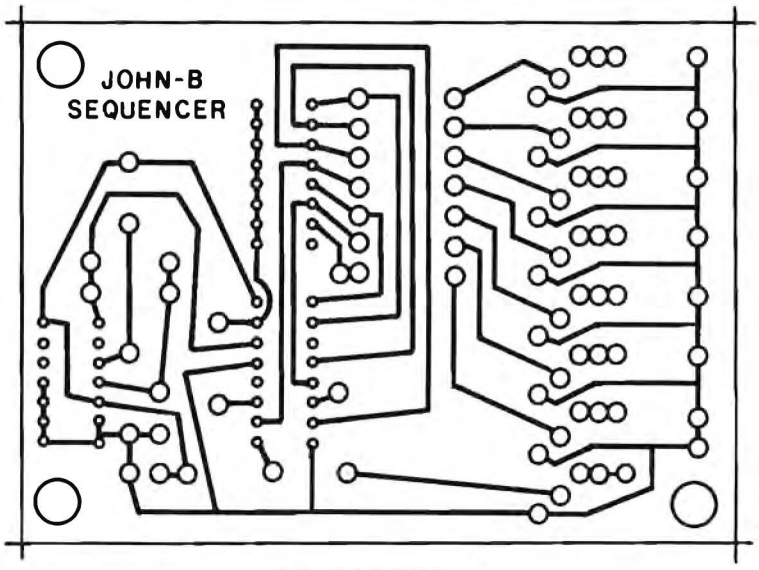
Before Radio Shack dropped it from its product line, the Plug 'n Power Controller was both a marvel and a bargain. It was used in concert with your CoCo (or Model I/III) and BSR X-10 control modules. Under software control, it would inject coded signals onto the house's ac power lines. These coded signals could then be received by control modules plugged into the the ac wiring anywhere in the house. So, without any direct wiring, the control modules could be made to control any normal ac-powered device (lamps, motors, TVs, and so on).

The John-B Power Controller is an adaptation of the original Plug 'n Power Controller, optimized for use with the CoCo. For those of you who are not familiar with theory of operation, I'll briefly discuss how the signals are coded and what they mean to the control modules.

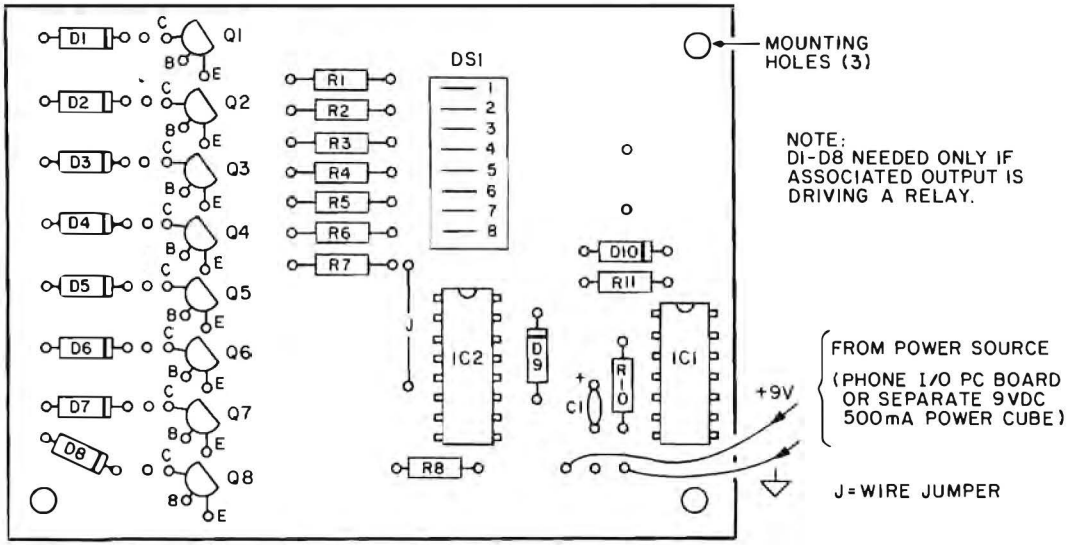
The system uses a form of pulse-code modulation. One half of a 60-Hz ac cycle occurs in $\frac{1}{120}$ of a second. The originators of the system decided on a pulse-code rate of 120 KHz, which always starts at or around the zero crossing point of the ac (the point where the ac goes from negative to positive, or positive to negative).

The system protocol consists of an address packet, followed by a command packet. Each packet starts with a header (three high pulses in a row), followed by a pause (low level for one pulse period). The next packet portion is the house code. It consists of a 4-bit binary number (starting with the most-significant bit). Each bit is followed by a pause. The final portion of the packet is either the unit code (for the address packet) or the command (on, off, and so on for the command packet). This final portion also consists of a 4-bit binary number, starting with the most-significant bit, with each bit followed by a pause. The last bit in the packet defines its type: address (0) or command (1). The system is analogous to serial data communications, where the information (preceded by a start bit) is transmitted serially bit by bit and terminated with a stop bit.

In normal operation, the address packet is sent three times to ensure the proper command module receives it. (Ac power lines can be noisy and interfere with communications!) Then, the command packet is sent.



PC PATTERN



PARTS PLACEMENT

Fig. 2. Sequencer PC Board Pattern And Parts Placement

Both packets contain the house code. This redundancy ensures that none of the control modules mistakenly intercept information not meant for them.

To communicate with commercial control modules, a standard protocol for house, unit, and command codes must be followed. Each code is a 4-bit sequence. With 16 possibilities for both the house and unit code, the system has a potential to accommodate 256 different control modules. The standard protocol is shown in Table 2.

Power Controller Theory

Knowing the protocol, your hardware must perform two distinct functions. It must first sense when a zero crossing occurs on the ac line. Then it must create the proper pulse sequence and inject it onto the line. The system is an "open loop" type; there is no confirmation that the intended control module received the instructions.

Figure 4 is the Power Controller's schematic diagram. A standard power cord delivers to the unit 120 volts ac, which is routed through the protective fuse to transformer T1. Diodes D3 through D6 form a full-wave rectifier that transforms the alternating voltage at the output of T1 to positive-going half sine waves. R10 provides a constant load to the transformer. Diode D2 isolates this voltage from the dc conversion circuit, consisting of C2, R11, and VR1. C2 filters the converted voltage, transforming it into a dc level of about 18 volts. This voltage is used in other parts of the circuit (V + +). VR1 regulates V + + to 5 volts dc. (Excess voltage is dropped across R11.)

R9 provides the positive-going half sine waves at a 120-Hz repetition rate to IC1B's pin 6. Diode D1 limits the maximum level to approximately 0.7 volts. R1 and R8 provide a reference voltage to IC1B's pin 7 of approximately 25 millivolts. As the ac signal comes down to the zero level, the IC1B's output goes negative. The ac signal quicky reaches zero and begins up again. This causes IC1B's output to return to a high level. Thus, short-duration, negative-going pulses are produced at the zero crossing points of the ac signal. These pulses are inverted in transistor Q1. The pulses are ac coupled and level shifted by C1, R4, and R7, and provided to J1 (EAR). The resultant signal provided to the CoCo's EAR plug is a short-duration pulse with a negative and positive component (similar to that produced by a cassette recorder). This signal allows the CoCo to sense the zero crossing of the ac line.

IC1D and C form a gated oscillator (an oscillator that can be turned off and on by an external control signal). The oscillation frequency, set by C6 and R19, is approximately 120 KHz. R20 and R21 provide a reference of approximately 0.65 volts to IC1C's pin 10. Resistors R15, R17, and R22 provide a lower reference voltage to pin 11. A positive-going signal from the CoCo's AUX plug (to J2) enables the oscillator. R23 provides the oscillator output to the base of transistor Q2. The signal is passed through the tuned pulse transformer, T2. Capacitors C3 and C4 allow this signal to be injected onto the ac line but block the ac from entering T2.

House Code	Unit Code	Command	4-Bit Code
A	1	—	0110
B	2	—	1110
C	3	ON	0010
D	4	—	1010
E	5	ALL ON*	0001
F	6	—	1001
G	7	BRIGHT +	0101
H	8	—	1101
I	9	—	0111
J	10	—	1111
K	11	OFF	0011
L	12	—	1011
M	13	ALL OFF (Clear)	0000
N	14	—	1000
O	15	DIM +	0100
P	16	—	1010

* ALL ON or ALL OFF disregard unit code and operate any control module with the identified house code.

+ DIM/BRIGHT refers only to lamp modules.

Table 2. BSR X-10 Protocol

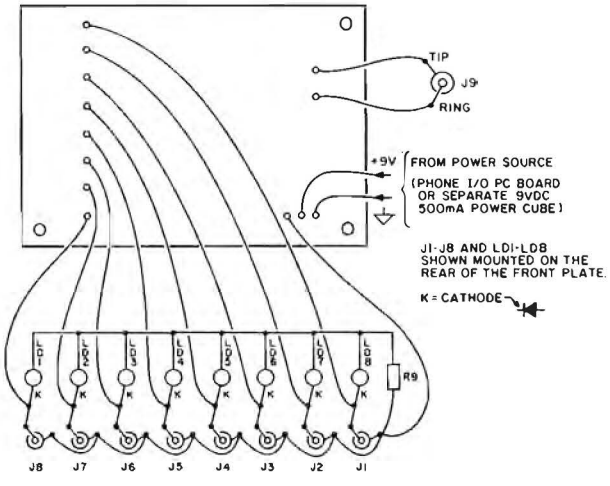


Fig. 3. Sequencer Final Wiring

Building The Power Controller

The Power Controller is constructed on a single PC board, which holds all parts except the jacks and LED. Begin by fabricating a PC board as shown in Fig. 5. Table 3 lists the required parts. Mount all parts onto the PC board as shown in Fig. 6 with the exception of IC1. (Mount a 14-pin DIP socket at this

time, but do not insert IC1 into it yet.) Note that the power transformer (T1) and fuse connections are made with short lengths of discarded resistor or capacitor leads. Pay special attention to the orientation of VR1, D1 through D6, IC1, T1, T2, C1, C2, LD1, Q1, and Q2. Match the small black polarization marker on T2 to the polarization mark shown in Fig. 6. After the power cord has been soldered in place, pass a wire tie strap through the two holes below the ac power-cord pads, and around the cord, securing it to the PC board.

Using the PC board as a template, mark the location of the four corner mounting holes on the outside bottom of a case. Drill these four holes with a ⅛-inch bit. Pass a #4-40 by ½-inch screw through each hole (head on the outside) and secure on the inside with #4-40 screws. Place the PC board inside the case and on the mounting screws. Using four additional #4-40 nuts, secure the PC board to the case.

Using a small round file, form a U-shaped opening in the top of the longer side wall closest to the power cord. Make the opening large enough to allow the cord to exit the case when the top cover is attached. Make a knot in the cord such that it will restrict the cord from exiting the case when the cover is attached. Drill appropriate holes in the cover for the AUX and EAR connectors. Mount J1 and J2 on the cover, marking J1 as EAR and J2 as AUX. Holding the power cord in the U-shaped opening with the knot on the inside of the case, attach the top cover using the hardware provided with the case. Construction is now complete.

Power Controller Checkout

Type in and save the Program Listing using the name JBPower. Obtain an X-10 control module. Set the house code to D and the unit code to 10. Plug it into the ac line and attach a lamp or some other appliance to it. Plug in your Power Controller to an ac line near your CoCo.

Attach the large grey (AUX) connector to J2 and the black (EAR) connector to J1. Run the JBPower program. When asked for house code, press the S key. Note that nothing happens. Press the D key and note that the letter D is displayed after the question. In response to the device number (unit code) question, type 23 and press enter. Note again that nothing happens. Type 10 and press enter. In response to the action (command) question, type OT and press enter. Note that the message "* Illegal Option *" appears for a few seconds, and is then replaced by the action question. Type ON and press enter. After a few seconds, the device plugged into the control module is activated.

Repeat the procedure, this time identifying the action as OFF. Note that the device is deactivated. Once more activate the device. Then repeat the procedure, but this time specify device number 1 instead of 10. Also specify action ALL OFF (you can type ALL OFF, being sure the words are separated by a single space, or just the word ALL). Note that the device is deactivated even though the device number was not the one specified. (ALL OFF deactivates all control modules of a particular house code, regardless of device number (unit code).)

continued

Designation	Description	RS Part #
R1, R12, R14, R18, R21, R22	100-Kohm, ¼-watt resistor	271-1347
R2, R23	3.3-Kohm, ¼-watt resistor	271-1328
R3, R13, R17	1-Kohm, ¼-watt resistor	271-1321
R4	3.9-Kohm, ¼-watt resistor (can use ½-watt)	271-029
R5	470-Kohm, ¼-watt resistor	271-1354
R6	4.7-Kohm, ¼-watt resistor	271-1330
R7	2.2-Kohm, ¼-watt resistor	271-1325
R8	470-Kohm, ¼-watt resistor	271-1317
R9	10-Kohm, ¼-watt resistor	271-1335
R10	1-Kohm, ½-watt resistor	271-023
R11	560-ohm, ½-watt resistor	271-020
R15	1-Megohm, ¼-watt resistor	271-1356
R16, R20	15-Kohm, ¼-watt resistor	271-1337
R19	39-Kohm, ¼-watt resistor (can use ½-watt)	271-041
R24	33-ohm, ¼-watt resistor (can use ½-watt)	271-007
C1	4.7-uf, 35-volt or greater electrolytic cap	272-1024
C2	470-uf, 35-volt or greater electrolytic cap	272-1018
C3, C4	0.1-uf, 200-volt metal film cap	272-1053
C5	1,800-pf, 10-volt disk (can use two 0.001-uf caps in parallel RS PN 272-126)	
C6	100-pf, 10-volt disk cap	272-123
D1	1N4148 small signal diode	276-1122
D2–D6	1N4001 or 1N4002 or 1N4003 diode	276-1102
VR1	5.1-volt Zener diode (1N4733)	276-565
Q1, Q2	2222A NPN transistor	276-2009
IC1	LM339 comparator IC	276-1712
T1	12.6-volt, 300-ma power transformer	276-1385
T2	Isolation pulse transformer (replacement part number 8418001 for catalog no. 26-1182. Order from Radio Shack National Parts, 1-817-870-5662).	
J1, J2	⅛" phono jack	274-251
F1	¾-amp fuse	270-1272
	PC mount fuse holder	270-739

Miscellaneous: 14-pin DIP socket, line cord (278-1255), wire tie (278-1632), PC board, mounting hardware, case (such as 270-224), wire, solder, etc.

Table 3. Power Controller Parts List

MUL-T-SCREEN

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P-C PAK (R) **$ 59.95**
Battery backed real time clock cartridge.

P-C PAK (C) **$ 99.95**
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2SP-PAK **$ 79.95**
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Cbreeze		**$ 29.95**
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(OS-9)	*Stylo III wordprocessor	**$ 99.95**
(OS-9)	*Stylo Pak (includes stylo, mailmerge and spell checker)	**$199.95**
(OS-9)	*X-Word wordprocessor	**$ 79.95**
(OS-9)	*X-Merge mail merge for X-Word	**$ 29.95**
(OS-9)	*X-Term terminal package	**$ 59.95**
(BAS)	*EliteWord wordprocessor	**$ 79.95**
(BAS)	*EliteCalc spreadsheet	**$ 79.95**
(BAS)	*Deft Pascal software development system	**$ 89.95**
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If your device does not operate as described above, double check the house and unit code settings on the control module. Next, check that the device plugged into the control module is turned on. If these checks do not resolve the problem, recheck all construction details.

If your device does not operate as described above, double check the house and unit code settings on the control module. Next, check that the device plugged into the control module is turned on. If these checks do not resolve the problem, recheck all construction details.

If the Power Controller still doesn't operate, the oscillator frequency or the signal amplitude throughout the RF transformer needs adjustment. To adjust the frequency, replace R19 with a 50K ohm trimmer potentiometer (Radio Shack cat. no. 271-219, or equal). Solder a short length of bare wire to the pot's left and center leads, and another piece to the right lead. Insert the two wires into the holes R19 formerly occupied (either wire in either hole). Place the pot to mid position. Operate the controller while you slowly change the wiper's position until the controller will no longer operate a module. Mark this position on the pot. Repeat the process while you rotate the wiper in the other direction, and mark this position also. Permanently place the wiper midway between the two marks. If you have an oscilloscope, connect the scope leads to ground and the Q2 collector. Adjust the tuning slug of RF transformer T2 for maximum amplitude. Repeat the frequency adjustment if necessary.

If you're using the Power Controller with a CoCo 2, you'll need to change the 104th character (a 4) in line 2030 to a 5. You must also modify the checksum calculated in line 2040 from 9736 to 9737.

If you have questions on the John-B System, contact Joe Sobieski at 2277 Menoher Blvd., Johnstown, PA 15905. But be warned: Joe's enthusiasm for handicapped assistance projects is infectious. (I can attest to that!) If you have any technical questions about the project, please write to me at the address below. In either instance, please include a stamped, self-addressed envelope with your correspondence if you want to receive a reply.

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Next month, I'll give details on the Power Controller program and provide the main John-B controlling program. I'll also discuss a typical John-B setup. ■

See program listing on page 52

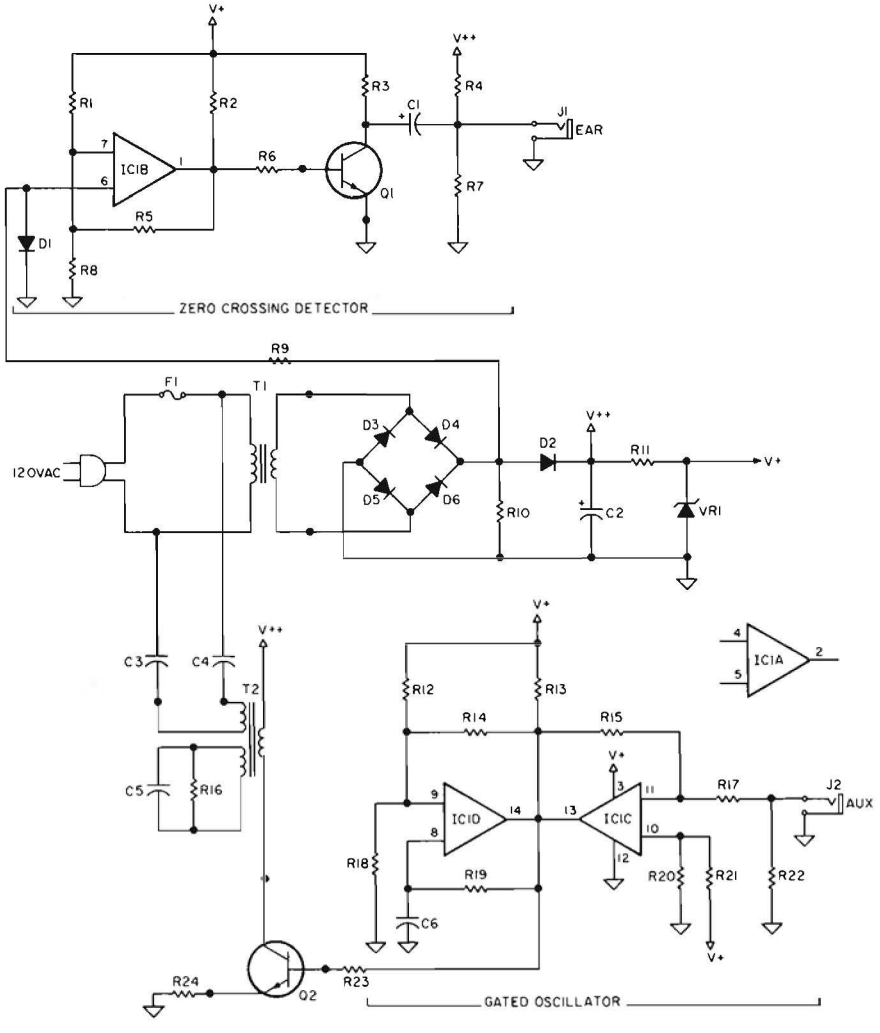

Fig. 4. Power Controller Schematic Diagram

Address correspondence to James J. Barbarello, R.D. #1, Box 241H, Tennent Road, Englishtown, NJ 07726.

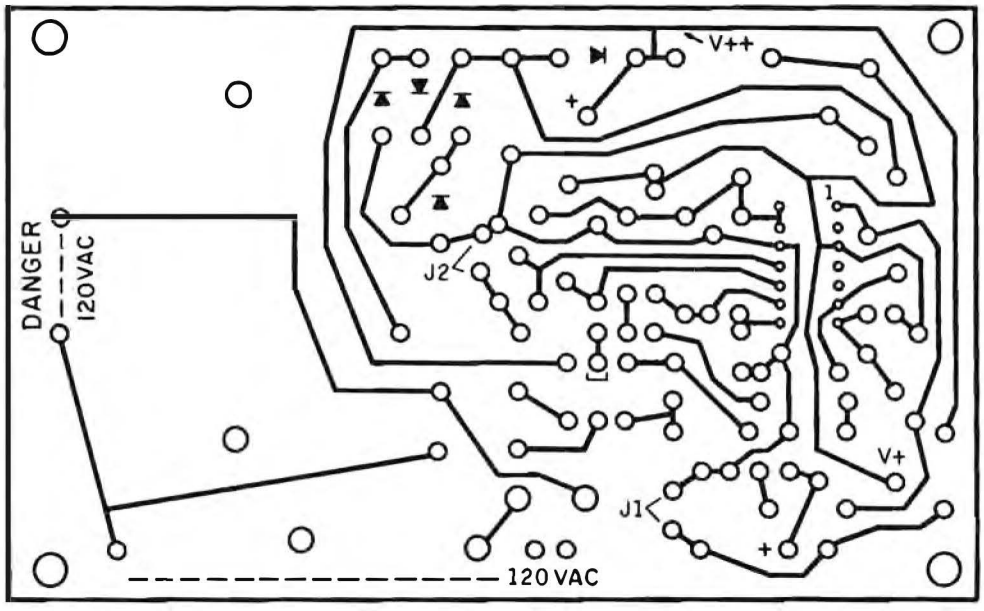

Fig. 5. Power Controller PC Board Pattern

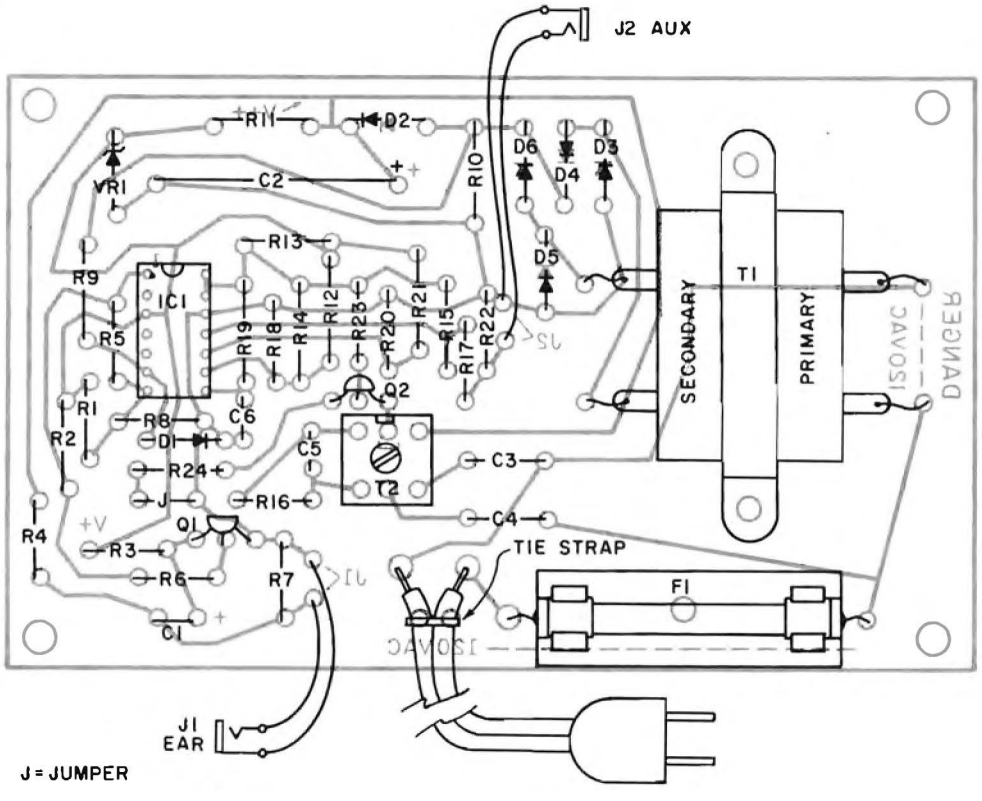

Fig. 6. Power Controller Component Placement And Wiring

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Symmetry is the correspondence of points (or lines, shapes and so on) on opposite sides of a dividing line or about a central axis. In other words, symmetrical points are mirror images of each other. (See Fig. 1.)

A figure can have more than one axis of symmetry. I will discuss four-way and six-way symmetry since they translate most easily into a matrix of points like those produced on a TV screen. Each point in four-way symmetry, except those on the central axis, has seven other equivalent points—reflections if you will. However, any figure created has four equivalent corners. (See Fig. 2.)

Saving Symmetry

You can assemble Symmetry from the source code (Listing 1) with an editor/assembler. If you do not have an assembler, type in the Basic driver program instead (Listing 2). Be sure to save the program to tape or disk before you try to execute it because one typographical error might make running the program impossible. For tape systems type CSAVEM"SYMMETRY",15872,16243,15872 to save the source code. If you do not have Extended Color Basic, CSAVE the Basic driver instead. Whenever you load Symmetry from tape, run the program before executing it.

As written and assembled, Symmetry is not strictly position independent. However, you can add any offset that is a multiple of 256

System Requirements

16K RAM
Extended Or Color Basic
Editor/Assembler Optional
Printer Optional
Screen-Dump Utility Optional

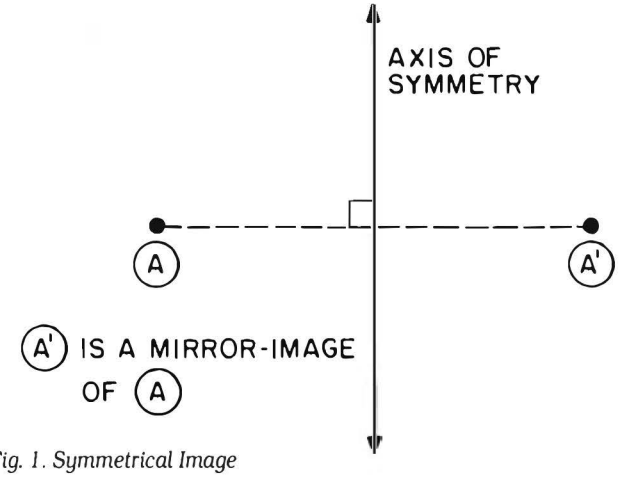

Fig. 1. Symmetrical Image

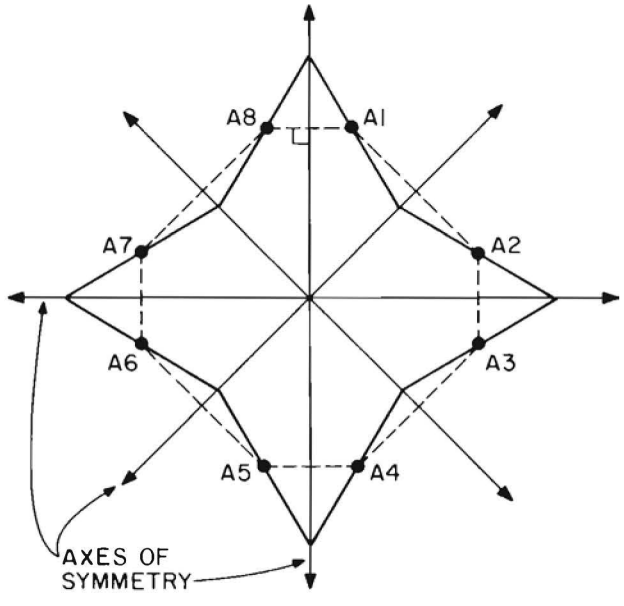

Fig. 2. Four-Way Symmetry

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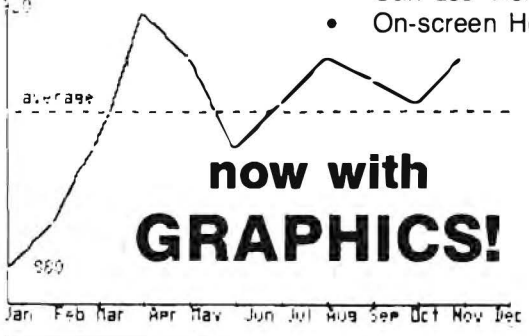

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($H0100) when CLOADMing it, and the program works without modification. For example, to load the program at the top of memory in a 32K machine, type CLOADM"SYMMETRY",16384 ($H4000). Before loading, be sure to type CLEAR S,M, where S is the desired string space for the Basic program and M is 15871 ($H3DFF) plus any offset you wish to add.

Using Symmetry

After the program is loaded into protected memory, you must define the execution address, set up the graphics screen with PMODE and SCREEN commands, draw your design, and execute a USR0(Q) command, where Q is four or six depending on which type of symmetry you use. I have included a short sample program, Listing 3, to illustrate the process. When loaded, this listing calls Symmetry and generates random graphics in quadrant 1 (see Fig. 3). Press the four key to get four-way symmetry; press the six key to get six-way graphics. (See Figs. 4 and 5.) To create another design, press any key.

Symmetry does not include a print routine, but there is a simple way to produce a printout. When you create a pattern you would like to send to the printer, press the break key and then type:

```
SAVEM"FILENAME/BIN",3584,9727,3584
```

If you are working with a cassette system, type:

```
CSAVEM"FILENAME",1536,7679,1536
```

Then clear memory and reload the file. Set up the graphics screen by typing:

```
10 PMODE4:SCREEN1,1:GOTO10
```

After pressing the break key, load and execute your screen dump utility.

If you write your own graphics program for Symmetry, do not worry which graphics page you use since Symmetry adjusts automatically. If you call Symmetry from a machine-language program, $BA and $BB must contain the starting address of the graphics screen. Omit the JSR $B3ED call, and enter the program with the A accumulator set at four or six.

It is possible, but difficult, to use this program from Color Basic. First, set up and clear the graphics screen as outlined in part A of *Getting Started with Color Basic*. Use the G6R mode. Then, draw your design using PEEKs and POKEs. Next, load Symmetry into an area of protected memory where it will not interfere with the graphics screen. Tell Basic where the subroutine is by POKEing the 2-byte address into RAM locations 275 and 276 (the most-significant byte goes first). Finally, type POKE 186,MS and POKE 187,LS, where MS = INT(GP/256) and LS = GP – MS*256. GP is the starting address of the graphics screen. You can then call Symmetry with a USR0(Q) command.

Program Explanation

The program starts drawing in the upper left quadrant of the screen. For consistency, I have defined the quadrants as shown in Fig. 6. The steps are:

- masking unnecessary bits in quadrant 1,
- creation of a mirror image of quadrant 1 in quadrant 2,
- completion of quadrant 1,
- reflection of quadrant 1 into quadrant 2 again, and
- reflection of the top half of the screen into the bottom half.

By now the need for an Assembly-language program should be obvious. Unless you are fanatically patient, Basic would be too slow to do the job. In PMODE 4 there are 49,152 bits (pixels) to process. I will use the words pixels and bits interchangeably because, in PMODE 4, there is a one-to-one correspondence between them.

Masking Quadrant 1

This step isolates the portion of quadrant 1 containing the drawing to be used. It is a wedge-shaped piece of screen (see Fig. 7). Angle Θ is 45 degrees for four-way symmetry and 30 degrees for six-way symmetry. You must clear the rest of the quadrant so that it does not appear later during mirroring.

Lines 00560–00700 mask the unnecessary bits. Accumulator A contains the number of bits to be masked out in the current row. Lines 00590–00620 divide A by eight (eight is subtracted from A until the result becomes negative). Each time that eight "goes into" A, another byte (8 bits) is masked, the byte is cleared, and subtraction is tried again. A negative answer means that the program must mask fewer than 8 bits. The program looks for the proper value in CLRTBL, ANDing it to the byte currently stored on the screen.

D and U are restored to their values at the start of the last row. Remember A contained the number of bits to mask in each row; B contained a "carry" value, which is —in essence—a fraction. The value of SLOPE1 is added to D, which is A and B concantenated; A is adjusted; and B contains the new carry value. This process continues until the entire quadrant is masked.

Mirror Image Of Quadrant 1 In Quadrant 2

The MIRROR subroutine duplicates the contents of quadrant 1 in quadrant 2. Register U is loaded at $BA, which contains the starting address of the current high-resolution screen. Register X is then pointed to the byte following the screen line to which U points. The program loads D with the value at U.

Lines 01730–01770 rotate this 2-byte value to create a mirror image of the original value. The new value is then stored on the screen. The program repeats this sequence until it reaches the center of the line (the end of quadrant 1). The pointer advances to subsequent lines and continues the process for the remainder of quadrant 1. At this point the program has created a reflected image, which is copied in the next step.

Finishing Quadrant 1

This step is the core of Symmetry. It is difficult to reflect the image because the axis of symmetry is at an odd angle—30 or 45 degrees.

The program traces line U along the previously drawn figure, stripping bits off the line one at a time. The bits are then deposited along line X, which is at the required angle. (See Fig. 8.) The line labels refer to the register used to track the line.

One complicating factor for six-way symmetry is that the lines do not contain an equal number of bits. For example, the first line traced has 112 bits in line U and 96 bits in line X. The vertical resolution of the screen (i.e., 192/2 = 96) dictates the number of bits in line X. If you used 96 in line U, the resulting figure would be taller than it is wide because of the rules of trigonometry. The variable ADJUST represents the ratio of U to X.

A discussion of the tabulation of the slopes and ratios is in order. Look at lines 01090–01130. The first step in tabulation is to load the previous carry value into accumulator A. Next, a specific value ($DC in six-way symmetry) is added to this. The program compares the result with another value—here it is $5B. If the result is greater than the value to which it is compared, no adjustments are necessary.

It is no mistake that $5B (91 decimal) is equal to $7F (127) plus $DC (220) minus the 8-bit overflow value of 256. BGT in line 01130 is a signed comparison. Remember that in signed numbers the most-significant byte is a sign bit (+ or −). Any number from $80 to $FF is considered negative in a signed comparison because the most-significant bit is set. In our example, only the numbers from $5C to $7F are greater than $5B. If the number resulting from the aforementioned addition is greater than $5B, the original carry value was already higher than $7F (in unsigned terms). However, it was not high enough to make the newly calculated carry greater than $7F.

Think of these carry values as fractions. When the fraction is greater than or equal to ½, you round up to the next integer. In binary math, when the fraction is greater than or equal to $80, you must round up because it is halfway between $00 00 and $01 00. Rounding produces a more accurate reflection than using the integral value does.

Program lines 00790–00850 initialize new screen lines. U is pointed to line U, X is pointed to line X, the carry values of RATIO and SLPCT are cleared, the number of bits in line U (nondestructively stored at BITCT) is stored in the temporary counter, and the value of the first byte in line U is loaded into the accumulator. Pro-

Fig. 3. Screen Shot Of Randomly Generated Lines

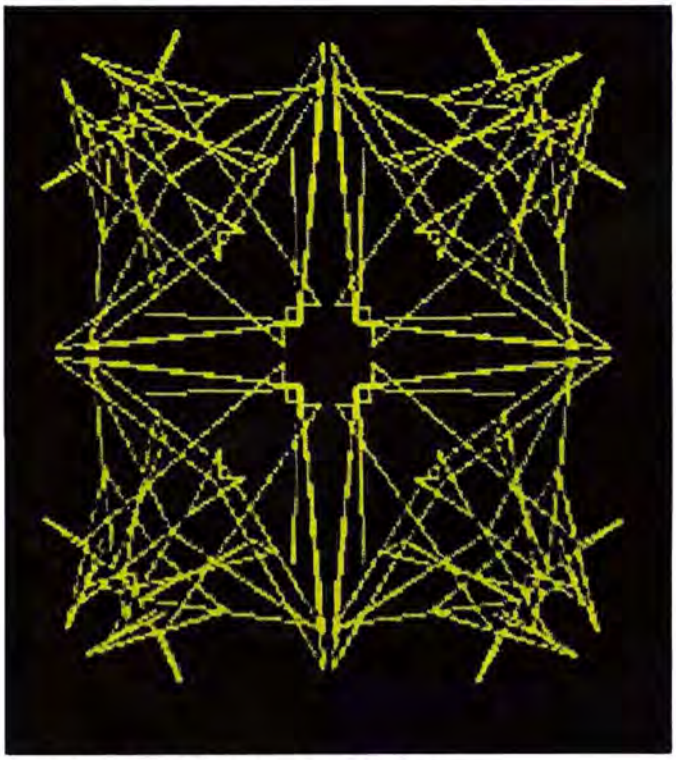


Fig. 4. Screen Shot Of Random Four-Way Design

Fig. 5. Screen Shot Of Random Six-Way Design

Photos by Suzanne Torsheya

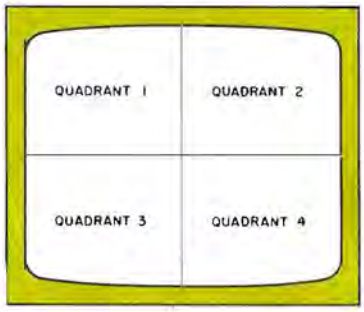


Fig. 6. Quadrants

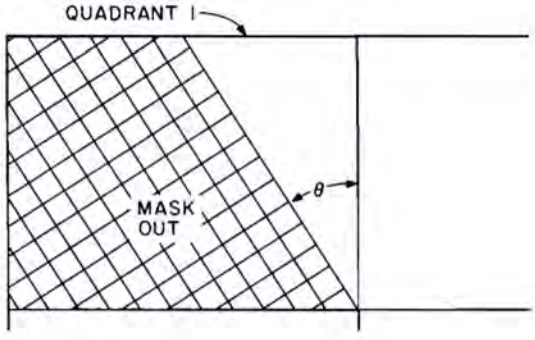


Fig. 7. Masking Quadrant 1

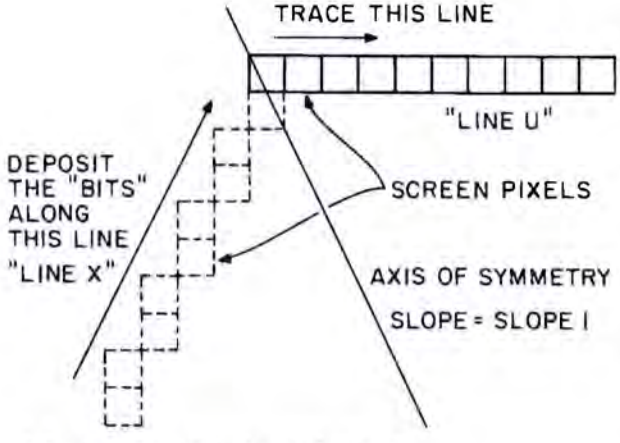


Fig. 8. Depositing Bits From Line U On Line X

gram lines 00860–00900 strip unnecessary bits from the value. For simplicity, I have numbered the bits in line U as zero through seven, from left to right.

Lines 00910–00970 draw on the screen. A bit is shifted into the condition-code register. If the bit was cleared (logical 0), no new bit is set in line X. Otherwise, the proper value is looked up in BITTBL, logically ORed with the present screen value, and then stored on the screen.

The remainder of this section of the program tracks screen positions and bit numbers. Lines 00980–01000 trace line X. If the calculated carry value rounds up to the next integer, the value at BITNUM is incremented. BITNUM keeps track of the current bit number in line X. When this number reaches eight, the program increments register X and starts at bit 0 again.

Lines 01090–01140 control the ratio of the pixel counts of lines X and U. In four-way symmetry, the variables maintain one-to-one correspondence. As we have already seen, however, the ratio in six-way symmetry is not one to one. If the newly calculated carry rounds up, line X moves up one row on the screen; otherwise it does not.

Lines 01150–01230 decrement the bit count in the lines and jump to the next line if this bit count reaches zero. If it does not, the current bit number of line U is incremented and adjusted if the bits in the current byte of line U have been rotated out. The program starts over with the next bit.

Lines 01290–01410 find the starting point of the next line U. They adjust the bit count/line (if necessary) and the number of the starting bit of line U. Lines 01420–01500 increment and adjust the number of the starting bit of line X. They then go to SYMM20, where the next lines are initialized.

Reflect Quadrant 1 Into Quadrant 2 Again

Line 1510 invokes the MIRROR subroutine again; the newly completed quadrant is reflected into quadrant 2. The top half of the screen is now complete and is symmetrical with respect to the vertical line bisecting it.

Reflect Top Half Into Bottom Half

Lines 01520–01650 are straightforward. U is pointed to the first row of the screen and X is pointed to the last row. The program copies the top row to the bottom row. Duplication continues until the screen is filled.

Summary

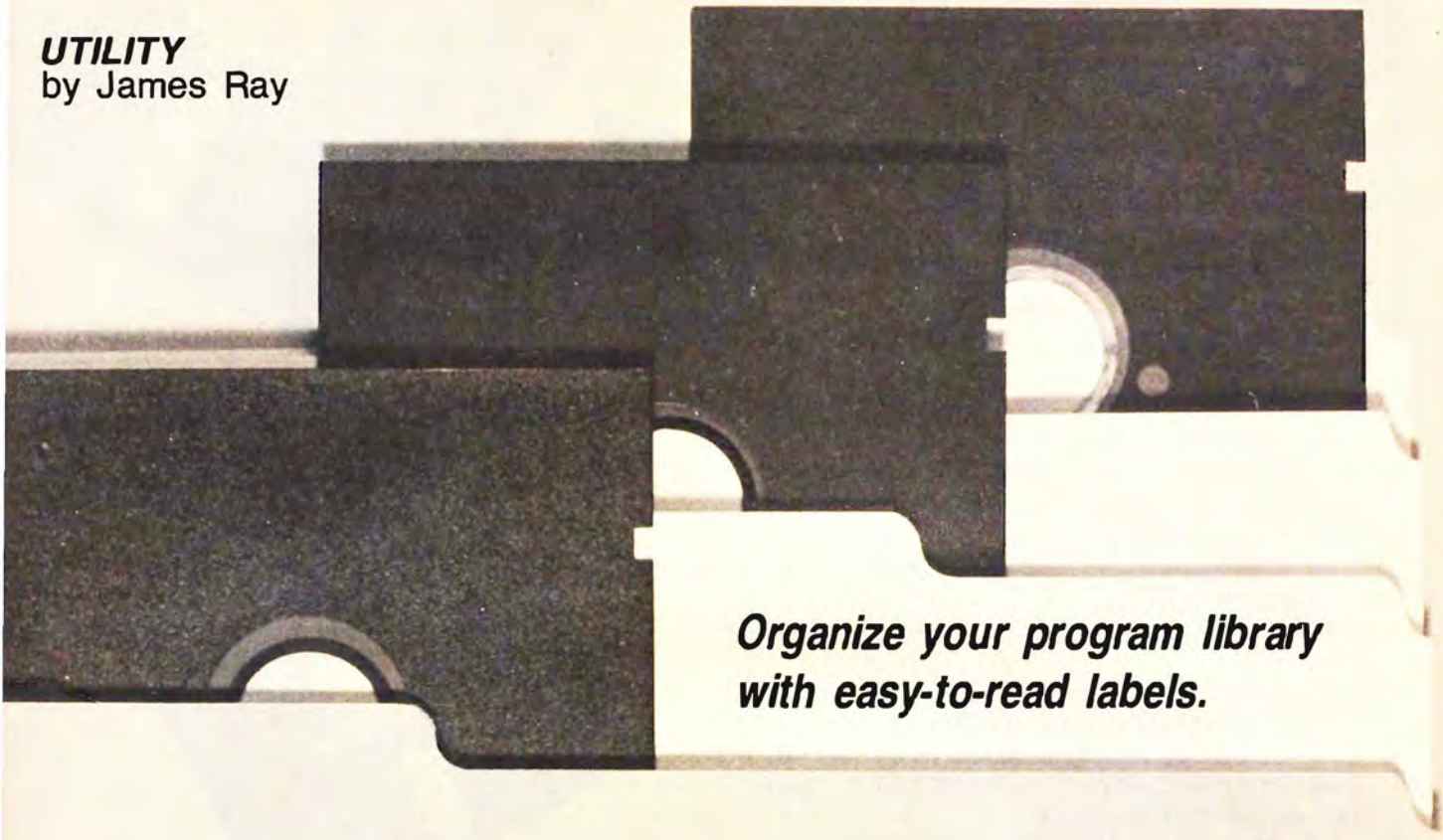
I hope you enjoy Symmetry. It is a quick and easy way to produce high-resolution displays for title pages and other applications. The pictures produced by four-way symmetry are perfect. Those produced by six-way symmetry are not quite perfect because of hardware limitations and the difficulties of translating 30- and 45-degree angles onto a matrix of square pixels. The distortion should not, however, limit the program's uses.

I encourage students of Assembly language to use the routines and explanations in this article to develop their own graphics routines. While Assembly-language graphics are complex, they are not unreasonably so. The rewards of successful routines are speed and greater flexibility. I welcome questions and comments regarding the program■

See program listings on page 53

Address correspondence to Joseph Finamore, 1100 S. Cedar, Marshfield, WI 54449.

UTILITY
by James Ray



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Lines 160–170 establish the printer codes. If you want to operate at a different baud rate than the usual 600 baud, insert the POKE value in line 50. The only other printer code used is for bold, or double-strike, print. If you do not use the DMP-200, you need to adjust BOLD$ in line 160 and EBOLD$ in line 170.

You can use the standard mailing labels from Radio Shack, either on-up or two-up. Using standard printer type, you can print five or six lines per label. Line 160 lets you input the disk title, which can be of any length provided it will fit on the label. This title wil be printed in bold type. I like to add the disk number to the title so I'll be sure to return the proper disk to the jacket.

The program then prints the title and the amount of free granules left and the number of granules used. This is helpful to determine how much more a disk will handle. Next the program reads and sorts the disk directory. If your disk contains a lot of programs or files, this could take a few seconds.

Soon, the labels will be printed. The programs on the disk are printed in two columns on each label in alphabetical order. The program automatically spaces every five lines if your labels are five-line labels.

I hope Directory Label will be as useful to you as it is to me! ■

System Requirements

16K RAM
Disk Extended Color Basic
Disk Drive
Printer

Address correspondence to James Ray, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.

Program listing on following page

Program Listing. Directory Label

```
1Ø 'DISKETTE LABEL PROGRAM
2Ø 'BY J. D. RAY
3Ø CLS
4Ø 'PRINTER CODES
5Ø  'SET COMPUTER @ 12ØØ BAUD
6Ø 'INITIALIZE PRINTER
7Ø PRINT:PRINT"    disk label pr
int program"
8Ø PRINT:PRINT" BE SURE PRINTER
IS TURNED ON!"
9Ø PRINT:PRINT" LINE UP LABELS W
ITH PRINT HEAD"
1ØØ 'PREPARE DISK LABEL
11Ø PRINT:PRINT" TURN DISK DRIVE
 ON AND INSERT     DISK"
12Ø PRINT:PRINT" HIT enter WHEN
READY"
13Ø EXEC44539
14Ø CLS:SP=Ø::PRINT:PRINT
15Ø CLEAR5ØØØ:DIMPROG$(5Ø):SP=Ø
16Ø BOLD$=CHR$(27)+CHR$(31) 'BEG
IN BOLD CHARACTER
17Ø EBOLD$=CHR$(27)+CHR$(32) 'EN
D BOLD CHARACTER
18Ø LINE INPUT "DISK TITLE: ";DT
$
19Ø PRINT#-2,BOLD$;DT$;EBOLD$
2ØØ PRINT#-2,FREE(Ø);"FREE GRANU
LES,";68-FREE(Ø);"USED"
21Ø PRINT#-2
22Ø 'READ DISK DIRECTORY
23Ø FOR ST=3 TO 11
24Ø DSKI$ Ø,17,ST,A$,B$
25Ø C$=A$+LEFT$(B$,127)
26Ø FOR T=1 TO 225 STEP 32
27Ø IF MID$(C$,T,1)=CHR$(Ø) THEN
3ØØ
28Ø IF MID$(C$,T,1)=CHR$(255) TH
EN 33Ø
29Ø PROG$(I+ST-3)=MID$(C$,T,11):
I=I+1
3ØØ NEXT T
31Ø NEXT ST
32Ø 'SORT DIR IN ALPHABETICAL OR
DER
33Ø PRINT:PRINT" DISK DIRECTORY
IS BEING SORTED"
34Ø FOR M=Ø TO I+3
35Ø FOR N=M TO I+3
36Ø IF PROG$(M) < PROG$(N) THEN
4ØØ
37Ø SORT$=PROG$(M)
38Ø PROG$(M)=PROG$(N)
39Ø PROG$(N)=SORT$
4ØØ NEXT N
41Ø NEXT M
42Ø SP=5
43Ø 'PRINT DIR ON LABELS
44Ø PRINT:PRINT:PRINT" DIRECTORY
 LABELS ARE PRINTING.."
45Ø PRINT:INPUT" SPACE BETWEEN L
ABELS (Y/N) ";SP$
46Ø FOR M=Ø TO I+3
47Ø IF LEN(PROG$(M))<>Ø THEN PRI
NT#-2,PROG$(M);"        ";ELSEGOT
O52Ø
48Ø IF POS(-2)>22 THEN PRINT#-2
49Ø SP=SP+1
5ØØ IF SP$="Y" AND SP=11 THEN PR
INT#-2:SP=1
51Ø IF SP=12 THEN SP=1
52Ø NEXTM
53Ø CLS:PRINT:PRINT" ANOTHER LAB
EL? (Y/N)":INPUT SEL$
54Ø IF SEL$="Y"THENGOSUB56ØELSEE
ND
55Ø END
56Ø IF SP<15 THEN PRINT#-2,"":SP
=SP+2
57Ø IF POS(-2)>12 THEN PRINT#-2,
""
58Ø IF SP=11 OR SP>11 THEN 14Ø E
LSE 56Ø
59Ø GOTO56Ø
6ØØ RETURN
```

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M. *Assembly 101*, Perotti and Perotti, p. 89
N. *6809 On Line*, Ballard, p. 91
O. *The Learning Page*, Kipperman, p. 92
P. *Product News*, Finnie, p. 94

Coming Next Month

Want to own the biggest CoCo on the block? In September, our memory experts, Richard Esposito and Jesse Jackson, show you how to stuff 256K of RAM memory into your Color Computer. They'll also provide software that will allow you to put that memory to immediate use.

Everyone knows that spreadsheet programs are great for computing dollars and cents, but they can also help collectors keep track of their collections. A.J. Sabel's "Spectaculator Collector" demonstrates how to set up Tandy's spreadsheet program to catalog a stamp collection and total its net value.

Crashed disks are the bane of computing. But you can minimize the damage they cause with David Meredith's disk-repair utility in next month's *HOT CoCo*. It will make crashed disks bootable and reconstruct most of the damaged data.

And don't miss Fred Blechman's "The Truth About Monitors." Fred's article covers virtually every question you might have about purchasing a video monitor for your CoCo. ■

Continued from page 24

ples of plotter operation should be covered by another book. Tandy should be more circumspect in what it claims on its book covers.

Is It For You?

Whether or not this book is for you depends on what you need from your equipment. If you own only one Radio Shack printer, you might want to spend some time evaluating how much of the information presented by the book is really pertinent to your machine and your needs. Although the book covers all Radio Shack computers, the Color Computer is given plenty of attention. The manual offers several listings in Color Basic along with other forms of Basic for other Radio Shack computers.

If you are a programmer or own more than one Radio Shack printer, this book will be a welcome reference. The information contained in the book's charts and graphs alone make it a worthwhile investment. One example of this is a table that lists every printer, feature, and control code for that feature. I cannot begin to praise this aspect of the book enough—it is very impressive.

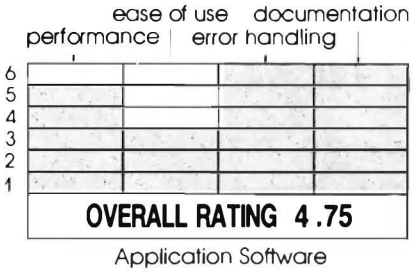
Summary

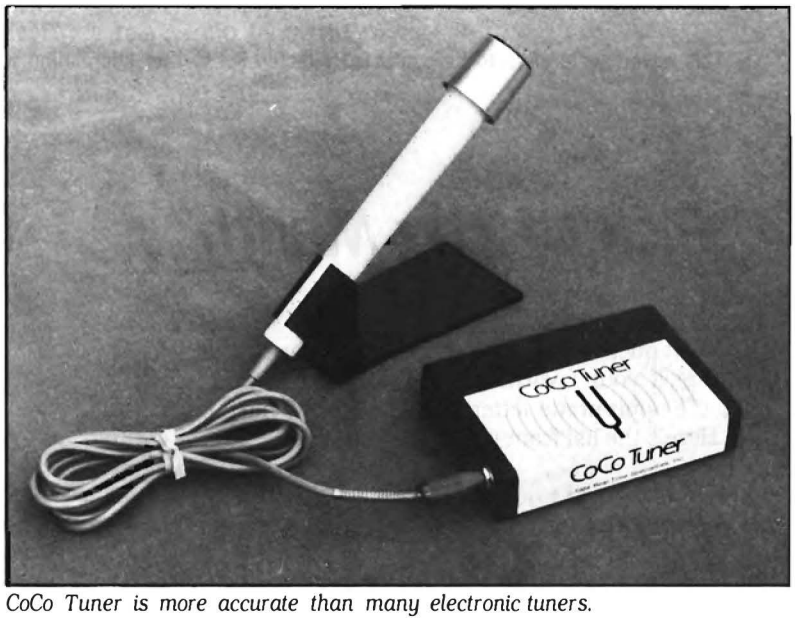
How to Use Your Radio Shack Printer is a well-written and well-produced manual that offers information about virtually every Radio Shack printer. I recommend the book to programmers; its information might be invaluable. Many other Radio Shack printer owners will find what they have been looking for in this book. I hope that some day Tandy will provide manuals like this one with all its computer products as an original-equipment item, not an accessory. ■

How to Use Your Radio Shack Printer, *by William Barden, Jr., is available from Tandy Corp. (catalog no. 26-1242), 1400 One Tandy Center, Fort Worth, TX 76102, 1985, 204 pp., softcover, $14.95.*

Tuning In CoCo Tuner

by John Ogsapian





CoCo Tuner is more accurate than many electronic tuners.

CoCo Tuner from Real-Time Specialities turns your computer into an auditory and stroboscopic tuner for a piano or other instrument. After a brief title screen, it begins with a main-menu display that shows indicators for the pitch letter, octave, frequency in Hz, sound control, alternative pitch-level parameter setting, and percentage of offset in the event that tuning is set at a pitch level in which a specific note A equals something other than what is considered by many to be the standard: 440 Hz. Most symphony orchestras play at a pitch above A = 440 Hz. Many older pianos and reed and pipe organs were designed to tune at A = 436 Hz or lower. The A = 440 Hz setting was not standardized until the 1930s and is not accepted universally, even today.

CoCo Tuner's menu offers the options of pitch selection by letter, octave (one through seven, corresponding to the piano keyboard) number, and chromatic alteration up and down from the note alphabetically via arrows. At the same time, it emits an audio signal in which A equals 220 Hz—octave 4 on the piano, or the A above middle C.

Across the middle of the CoCo Tuner screen there is a broken black band, which functions as a visual fine-tuning device. It is a CRT display equivalent to the stroboscopic wheel. The CoCo Tuner ROM pack has a minijack for a microphone. The microphone plugs into the ROM pack and must be placed near the piano or other instrument according to the product's instructions.

CoCo Tuner emits the precise tone of each note you are tuning. When tuning a keyboard instrument, such as a piano, CoCo Tuner's documentation recommends "pulling" the string to the proper octave by ear and matching it as closely as possible to the tone generated by CoCo Tuner. Then, you can cut off the sound via a main-menu option and finish the job by eye. To do this, watch the motion of the broken band on the screen; its speed decreases as you adjust the string nearer to tune. When the band ceases to move, an exact match in the pitch between instrument and tuner is indicated. In the case of most pianos and mouthpiece positions in wind instruments, the fine-tuning step will probably be all that is necessary.

Tuning is a time-consuming process that can be nerve wracking under any circumstances. Nevertheless, CoCo Tuner is easy to use and requires very little documentation. It comes with an excellent booklet, *How to Tune Pianos Electronically*, which discusses pitch, tuning, temperament, and technique in understandable English. The book might well serve as an introductory text for laymen and music students alike.

There is no likely manner in which a program error or crash can occur with CoCo

Tuner. However, I did have a problem initially with seating the CoCo Tuner ROM pack in my older-model CoCo. Real-Time Specialties was very responsive to my call for advice. It turned out that the head of a grounding-clip screw was getting in the way. A simple cut out of the ROM pack's case solved the problem. No modifications were necessary to fit the ROM pack in a CoCo 2. My encounter with Real-Time Specialities over this small matter left me with a good impression of the company's support of CoCo Tuner.

Compared With Other Tuners

The principle of the electronic tuner is not a new one. Strobotuners and audio pitch-making devices—or electronic tuning forks, as it were—have been in use for 20 years. This is especially true of school environments, where the instruments of several inexperienced students need tuning quickly for rehearsals and concerts. CoCo Tuner permits a degree of accuracy not possible before. Some other tuners derive their pitch from the 60-cycle ac current to which they connect. CoCo Tuner obtains its frequencies from the computer's internal quartz clock. The deviation of its frequencies is negligible by comparison. It is not necessary to perform a calibration procedure with CoCo Tuner unless you require a pitch level other than A = 440 Hz.

Despite this advantage, CoCo Tuner does have a sizable drawback—the size of the Color Computer. The original Strobotuner from C.G. Conn Ltd. measures about 12 inches in each direction and is portable. CoCo Tuner requires that the instrument for tuning and the Color Computer be within arm's length of each other. In the case of a piano, for instance, moving either the instruments or the computer, CRT, and related equipment is a cumbersome endeavor. I spent most of my testing time for this review working with a small harpsichord instead of my piano.

Tuning Concerns

CoCo Tuner produces a perfect, "diamond-hard" tuning. Professional tuners of pianos and organs set a "bearing" or temperament by ear, making small adjustments in the tuning. The tunings of the octaves at the extremes of the keyboard are widened (as CoCo Tuner's documentation notes) to give more depth to the bass and more brilliance to the treble. Professional tuners seek a "give" in the tuning that offers a warm sound.

Most of the notes you hear played on the piano are made up of the sounds of three separate strings. The purpose of this is to provide solidity, volume, and a "division" of the string tension exerted on the piano's cast frame. In addition, the effect of hammering three strings to create one tone is a very slight broadening of tune—or a state of being faintly out of tune—which lends warmth to the tone.

The coldness that results from electronic tuning will probably not disturb you on the piano in your den, but is likely to be regarded by professional tuners and performers as undesirable. This is part of the reason that electronic tuners have never caught on among serious piano and organ technicians.

Something else to consider involves temperament. Pitch is the frequency of a given note. Temperament is the relationship of notes within an octave. Equal temperament (used commonly since the end of the 18th century) places each note equally within the scale: $\sqrt[12]{2}$ times the Hz of the next lower

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chromatic. The result is to create 24 major and minor keys, or pitch-level scales. This choice of pitch levels is not arrived at, however, without some compensatory drawbacks. Most notes in an equal-tempered scale are out of tune relative to their place within the physical set of partials over the keynote of that scale.

In early music, the choice of keys was restricted drastically. The tones within each key had a cleaner, more natural relationship to one another. Modern recreations of early music are often tuned in this manner, called "mean tone". CoCo Tuner, like other electronic tuners, is specifically calibrated to equal temperament; it cannot be used to create mean-tone tuning.

One area of contemporary music for which CoCo Tuner will prove ineffective is orchestral string instruments. They are usually tuned in a series of Pythagorean fifths (3:2). While playing, musicians adjust the pitch level slightly up or down by the placement of their fingers on the fingerboard. An equal-temperament tuning of the strings with CoCo Tuner or another electronic device is impractical for these instruments.

"CoCo Tuner is a well-made product that tunes musical instruments reliably and precisely. It is more accurate than many other electronic tuners."

Summary

Admittedly, some of the limitations mentioned here border on the arcane. CoCo Tuner is a well-made product that does what it sets out to do reliably and precisely. It also comes with an excellent booklet, which I look upon as a premium rather than merely as documentation. Moreover, it is more accurate than many other electronic tuners. Although its purchase price of $89 is higher than some other software on the market, professional piano tuning runs about $50 a visit in my neck of the woods. Even if you buy the tuning kit offered by Read-Time Specialties consisting of wedge mutes, felt, booklet, and tuning wrench (not reviewed here), you will recoup your investment by your third tuning. ■

CoCo Tuner is manufactured by Real-Time Specialties, 6384 Crane Road, Ypsilanti, MI 48197, 313-434-2412. It requires 16K and a microphone with a mini-plug. It sells for $89. Real-Time Specialties offers a microphone for $14 and a piano-tuning kit for $27.

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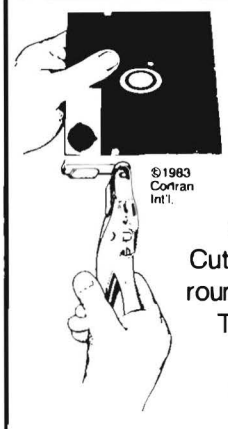

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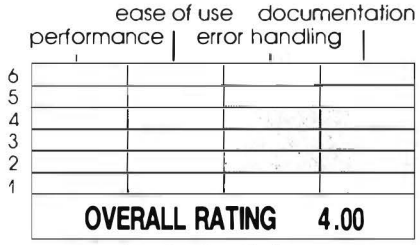
COMPUTERWORLD

Rembrandt Reflections

by Scott L. Norman



Application Software

Rembrandt is a recent addition to the ranks of Color Computer "drawing board" programs. It offers many of the major features you have come to expect from such utilities and is noteworthy for making computer-assisted drawing available to cassette users at a low cost. It lacks some convenience features, however, and is unable to provide printouts of the on-screen images it creates.

Rembrandt artists draw on a PMODE 4 screen using a joystick as a sketching tool. There are menu selections for creating straight lines, circles, and ellipses. The program takes advantage of the CoCo's high-resolution artifact colors to spice up images through its paint command. You can select a small portion of a figure and use it as a "stamp" to make duplicates anywhere on the screen. An enlarge/edit feature makes it possible to touch up images pixel by pixel.

Rembrandt lets you address every point on the CoCo's 256- by 192-pixel, high-resolution screen, even though the computer's joystick circuitry can only resolve 64 points in either direction. The program's cursor is a one-pixel dot that is surrounded by a square box 32 pixels on a side. As soon as the cursor touches any side of the box, the window begins to move in that direction.

Achieving the right drawing speed is a tough job for designers of graphics programs. Rembrandt's outer box moves too slowly and with too much flicker. It takes too long to cover the screen, yet lacks the precise control that I expect to accompany slow motion.

Almost all of Rembrandt's functions are controllable from a joystick plugged into the right joystick port. You select the main menu by pressing the M key or the button of a joystick plugged into the left joystick port. Then you can use the right joystick to make selections from a series of menus. The keyboard comes into play occasionally, such as when you want to erase painting operations that have spilled over into unwanted areas of the screen.

Even the simplest drawing in Rembrandt is done with straight-line segments that you manipulate like rubber bands. You fix one end by pressing the joystick button, move the cursor until you get the line the way you want it, and pin down the second end. Audio cues inform you when the program detects a button press.

There is no freehand drawing mode in this program. The closest equivalent is the enlarge/edit option. Similar to features offered by other Color Computer graphics editors, enlarge/edit divides the screen into a magnified working area with a convential-scale sec-

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tion on which you can monitor the effects of your pixel-by-pixel changes. The prototype for this kind of editing is the "Fat Bits" feature of the Apple Macintosh's MacPaint program.

Rembrandt's circle option lets you draw both circles and ellipses. Once you have identified a center, fore-and-aft movement of the joystick controls the growth of a circle and left-and-right movement makes a vertical or horizontal ellipse. Rembrandt does not, however, have a command for producing prefabricated rectangles.

There are numerous options for inserting color into Rembrandt's images. The default drawing screen is white (buff), on which you can draw with black, red, and blue lines. You can also select white as a drawing color to erase small portions of a drawing. If you are willing to fiddle with your TV set's color controls, you can use other four-color settings, such as green/blue/magenta/black and orange/buff/cyan/red. There is also a two-color, black-on-green mode, useful for getting fine detail into drawings made on a conventional TV receiver.

The paint command gives you several additional choices for filling in areas of a drawing. A 16-color palette offers a variety of solid and striped patterns, including, for example, gold or gray stripes. Because not all receivers are able to display every artifact color, you might have to experiment. Many of the selections make attractive patterns on a monochrome monitor, too.

Rembrandt's stamp command includes options found on other graphics packages. It allows you to duplicate any 32- by 32-pixel region of the screen and create "opaque" or "transparent" effects. The stamp image can be logically ANDed or ORed with other portions of the picture, and a NOT function lets you reverse the tones for additional effects. There are no provisions for rotating or reflecting stamp images, however.

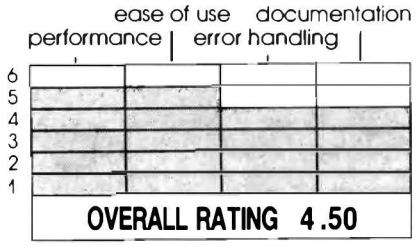
Finished screens can incorporate text as well as imagery. A black character set is included with the main program file. You can load red, blue, and green-on-black sets from separate files on the cassette or disk.

Rembrandt's major shortcoming is its lack of a screen-print routine. Although you can store pictures on cassette or disk and incorporate them into other programs, you have to purchase a separate utility to print your images. However, Rembrandt does a good job of helping you create images, and its availability on cassette is a real advantage. ■

Rembrandt is available from Family Computers, 4047 Bee Ridge Road, Sarasota, FL 33582, 813-921-7510. It requires 32K, Extended Color Basic, and one joystick. It sells for $24.95 on cassette and $27.95 on disk.

Getting Disk Sort And Order

by Jeffrey S. Parker



Application Software

Disk Sort and Order from Derby City Software is a quick and efficient program for alphabetically sorting and reformatting a disk, track by track, in sequential order. The program makes labeling, file reading, and directory reading easier to perform. It also saves wear and tear on your disk drive.

Disk Sort is a machine-language program that sorts through disk files quickly, beginning by alphabetizing them. It sorted a disk with four files in under three seconds. Writing to a new disk took only about a minute. A full disk might take up to seven minutes for multiple reads and rewrites—still a short amount of time. Disk Sort also has an option for a fast or slow run. The slow run does a software verification. The fast run does a copy without verification. Disk Sort runs flawlessly at high speed.

Disk Sort can read and write to any Radio Shack DOS or JDOS disk. It has seven format options, which permit any combination of reads and writes. If you want to transfer a file from a 35-track Radio Shack disk to a 40-track JDOS disk, you simply select a transfer option and wait a few minutes. As an internal verification, Disk Sort displays a directory of the new disk at the end of its run.

Derby City Software strongly recommends a multi-drive system for use with Disk Sort and Order. The recommendation derives from precaution. If you have ever used one disk drive to make disk copies or backups, you know that it is possible to lose your original disk because you accidentally inserted it at the wrong moment during disk swapping. If you have only one disk drive, a prompt screen in red with green cutouts and black text informs you which disk to insert: source or destination. If you are careful to insert the proper disk, you'll avoid problems.

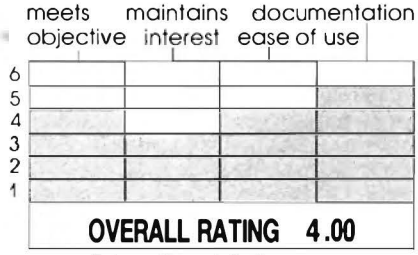
Disk Sort comes with two pages of instructions that clearly describe how to use the utility. They also include a short troubleshooting section. One point not properly emphasized in the manual is the need for freshly formatted disks for copying new files. Because the entire destination disk is rewritten when you run Disk Sort, any files already on the destination disk will be erased. This should be spelled out in bold-face type in Disk Sort's instructions.

If you have been looking for a way to organize your disk files, reduce the workload carried by your disk system by sequentially reading the sectors on a disk, or make conversions between JDOS and Radio Shack DOS disks—Disk Sort and Order will do the trick. And the latest version of the program works with double-sided drives. Despite a minor documentation flaw, it is a reasonably priced and effective program. ■

Disk Sort and Order is manufactured by Derby City Software—Spectrum Projects South, 3825 Bardstown Road, Suite 232, Louisville, KY 40218, 502-454-6809. It requires 32K, a disk drive, and runs on Radio Shack DOS or JDOS. It sells for $11.95.

A Check On Super-Speller

by Richard Ramella



Educational Software

A student comes home with a list of the week's spelling words. The parent loads the list onto a cassette. Later in the evening, the student plays text games to learn how to spell the words. That capability is the intent of Super-Speller from Creative Technical Consultants.

The program uses anagrams, missing letters, and clues in three separate game activities to help kids learn to spell. Super-Speller is straightforward, not flashy. It is similar to the curriculum that most students encounter every day in school. My testers (ages 9 to 12) found the exercises to be "too schooly." This is not a knock on Super-Speller. Special effects are not required for children to learn numbers and words.

Using Super-Speller

Super-Speller's title screen is its only attempt at graphics. Parents or teachers enter spelling lists of up to 50 words from the main menu. The otherwise well-planned and well-written manual that comes with Super-Speller puts the limit of words at 25. Entering words calls for some thought; both the word and a clue, such as a definition, antonym, or synonym, must be typed. Super-Speller's games can begin as soon as the list is completed. Lists that have been created earlier and stored on cassette can also be recalled from the main menu.

Super Speller's games are not limited to use as spelling exercises. Trivia questions, states and capitols, foreign vocabularies, and other two-element sets can be saved for study and games. When my play panel got over the "schooliness" of the intended activities, some members of the group used the program to create their own game of riddles.

One of the Super-Speller games involves presentations of the spelling words with missing letters; another presents them as anagrams. Players must type the entire word to get it right. All three games have levels of difficulty from which players can choose. This is a good feature. If third graders, for example, do not feel equal to the challenge of the game at a higher level, they can select a

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simpler level in which the word *animal* is presented as *anim-l*. This might seem to be self defeating, but when they type the answer, they are still learning to spell.

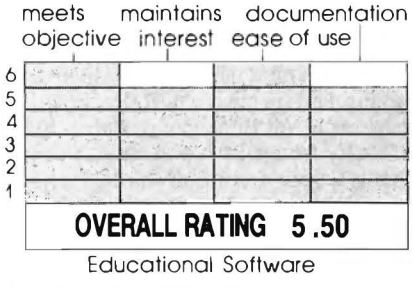
Summary

Super-Speller is well programmed. I could not crash it, try as I might. I CLOADed the program from cassette while my disk system was on and ran into the disk-controller problem, however. The program refused to display the text mode. Super-Speller's documentation should warn you that the disk controller must be disconnected when you run the program. This is not an unusual problem, and I don't count it as a program bug. I liked Super-Speller. So did the kids, once they realized there was more to it than "schooly" drill and practice. ■

Super-Speller is manufactured by Creative Technical Consultants, P.O. Box 652, Cedar Crest, NM 87008. It requires 16K and Extended Color Basic, and comes on cassette. It sells for $17.95.

Brainy Teasers By Tobbs

by Dennis W. Peterson



Teasers by Tobbs from Sunburst Communications is not just another drill-and-practice math program. Instead of rote learning, it uses addition and multiplication to help make students logical thinkers. Program author Thomas C. O'Brien views his software as a remedy to a problem encountered commonly by contemporary educators in which children do not want to think, but instead want to receive an answer, store it, repeat it at test time, and forget it.

Teasers by Tobbs does not permit numbers greater than 99 or less than 0. Only whole numbers are acceptable. Nevertheless, Sunburst considers this software valuable to students up to the twelfth-grade level. Students as young as the third-grade level will be comfortable with the addition portion. Fourth-graders are apt to feel at home with the multiplication section.

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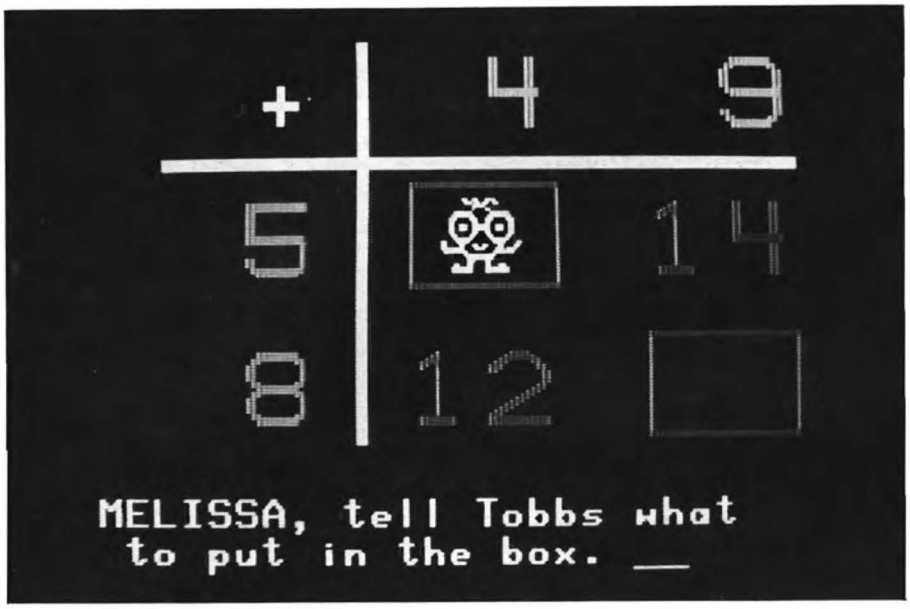
Tell them "I saw it in HOT CoCo."



A View Of Teasers By Tobbs

Students add or multiply the numbers on the vertical and horizontal, left and top edges of a grid containing nine squares. The answer is printed by the student in the space where Tobbs, the program's energetic graphics character, appears—in the upper left corner at the junction of the row and column numbers.

This might sound simple, but it is difficult. The addition and multiplication programs have six levels, which increase in difficulty. Students must learn to think backward because an answer might appear without an addend or multiplier. Perched in the corner, Tobbs waits for the answer while students ponder what, for example, must be added to 6 to get 9. Some problems direct students to use that kind of logic as a preliminary exercise, requiring the resulting information for the stated problem.

Still not impressed? We haven't looked at the most difficult part of Teasers by Tobbs, for which I wanted to send the kids to bed and summon all I remember from Miss Abigail Fricket's seventh-grade math class—back when they still had bullet noses on Studebakers. At the top level, more than one answer might satisfy a problem. You'll find that although an answer works, it affects other answers, perhaps causing one to exceed 99, which is not allowed. Then you must go back to the drawing board.

Teasers by Tobbs, like its cousin, Better View a Zoo (see the review on p. 78 of the April 1985 issue of *HOT CoCo*), performs flawlessly. Especially nice are the menu options students can select to explain how the grid works. Options within the program allow players to pass, get help, select a puzzle at a different level, and return to the main menu.

There aren't likely to be any squabbles over who gets to play Teasers by Tobbs because four players can play at once. Each player is given three to five problems to make player rotation rapid.

The directions that come with the program are easy to follow. Simple and logical keyboard commands keep things moving smoothly and quickly. The program doesn't allow any input that could cause glitches; everything that should work does so. Teasers by Tobbs is well error trapped.

The explanation in the documentation of the math puzzles at all levels is tops, as are the introductory and educator commentaries. But because the program is designed for six different computers, the manual offers several unnecessary pages about the operation of other computers. Also included in the package is a sheet on a sound option for two of the computers, leaving me with the distinct impression that others are getting a little more for their software dollars.

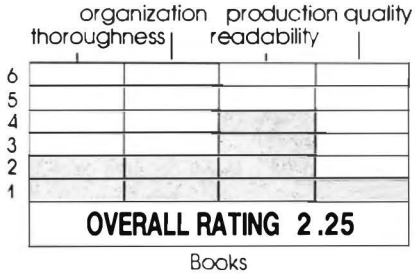
Teasers by Tobbs comes in two versions, one for the home market and the other for the school market. Both versions come with an unusual guarantee that covers the software in all situations for as long as you own it. The school version comes with a backup disk and extra documentation to aid educators in planning exercises. The home version has fewer pages of documentation, but there is some information for parents. The school version of Teasers by Tobbs sells for $55. The home version sells for $44.95.

With more educators turning to the cost-effective networked Color Computer as the best option for the school computer center, a network version of Teasers by Tobbs and Sunburst's other programs should be made available by the company. Sunburst has already done this for other Radio Shack computers. A network version of Teasers by Tobbs would allow more students to benefit from this high-quality program. ■

Teasers by Tobbs is manufactured by Sunburst Communications, Room BC 999, 39 Washington Ave., Pleasantville, NY 10570, 800-431-6616 (home market), 800-431-1934 (school market). It requires 32K and a disk drive, and sells for $44.95 (home) and $55 (school).

The TRS-80 Color Computer 2 User's Guide

by Brian Sherman



Books

The TRS-80 Color Computer 2 User's Guide offers the novice insight into the many practical applications of the CoCo. The strength of this short book lies in its explanation of Radio Shack's accessory product line for the Color Computer. It provides short descriptions on what Radio Shack products do and how much they cost. It gives CoCo owners new to the computer a good handle on hardware items they might want in the future, including some third-party products. Another nice feature of the book is its introduction, which provides a brief but interesting history of Radio Shack and Tandy.

Despite these advantages, *The User's Guide* contains several bungles and inaccuracies. The book resembles an unedited rough draft in some chapters, with textual notations and comments such as: "insert photo of grey ma-

Continued on p. 84

CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!

We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.

UNMATCHED CAPABILITY...

Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.

All the sophisticated power of the bigger systems is there: *Icons, Pull-Down Menus,* full *Graphic Editing, Font Styles,* and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush, Spray* or *Fill* with any *Color, Shading* or *Pattern.* Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, elipse, etc.) to create perfect illustriations with speed and ease. There's a *Pencil,* an *Eraser* and even a selection of *Caligraphy Brushes.* And, as you can see, CoCo Max can do a lot with text. All of the newest special effects are there: *Trace Edges, Flip, Invert, Brush Mirrors,* etc. And all of the very latest super-capabilities like: *Undo,* which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

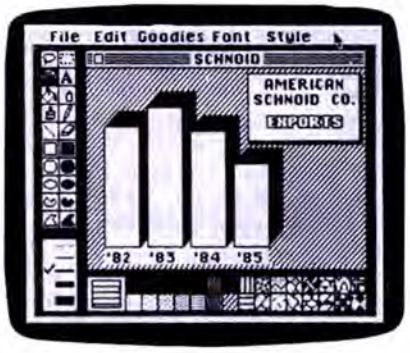
FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



graphs, and computer art – for serious use or just for creative fun.

tion by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.

You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.

COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

THE COMPLETE COCO MAX SYSTEM,
with software on ***DISK***..... ***$69.95***

with software on ***CASSETTE*** (Available Mar '85)..... ***$69.95***

Y-BRANCHING CABLE-If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo..... ***$27.95***

(Sorry, not compatible with JDOS)

COLORWARE

AN ABSOLUTE GUARANTEE

CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen

has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen.

Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limita-

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Continued from p. 81

chine" where there is none and a 16K machine is "roughly a thousand characters worth." The book also asserts that "literally millions of events must happen, for example, when you type a simple CSAVE or CLOAD command."

Chapter 6 of *The User's Guide* touches on CoCo SIGs (special interest groups) and clubs—it is less than two pages long. Chapter 7 delves into other sources of information on the Color Computer, including magazines. Two other chapters—each labeled chapter 8—offer hints on repairs and a glossary.

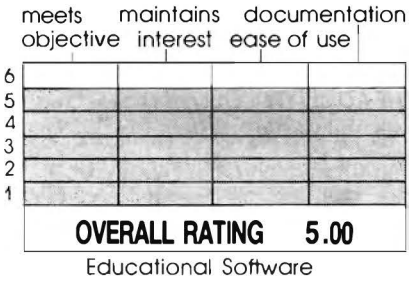
Radio Shack's manuals for programming with the Color Computer are probably the best choice for the beginning programmer. *The User's Guide* introduces programming in seven pages. It starts off by explaining the PRINT command and then moves into graphics programs (which contain errors) using complicated sine and cosine functions.

If you read *HOT CoCo* on a regular basis, you don't need *The TRS-80 Color Computer User's Guide*. If you are a computer novice and want an upbeat introduction to the Color Computer and what it can do, this short book is an inexpensive option. The "Peripheral Visions" chapter offers a good summary of your hardware choices. But most of the book is not a reliable source for helping to make "setting up and computing with the CoCo—both the basic and the upgraded versions—easy, rewarding, and trouble-free," as the promotional material on its back cover suggests. ■

The TRS-80 Color Computer User's Guide *is written by Bill Brewer, Mark Brownstein, and Roger C. Sharp and published by Macmillan Publishing Company, New York, NY, 1984, 128 pp., softcover, $5.95*

Charting Solar Explorer

by Richard Ramella



Name the nine planets of the solar system. What is the fourth planet from the sun? What is the mean distance of Pluto from the sun? What is Saturn's mass? How long does it take Neptune to make one solar revolution?

Answers to these and other questions about our solar system are presented by Solar Explorer, a newly released educational-game program from Tandy that works with the *TRS-80 Electronic Book*. Solar Explorer comes with colorful pages for preschool and grammar-school kids to overlay on the *Electronic Book*'s 12 touch-sensitive areas. The *Electronic Book* plugs into the Color Computer's joystick interface. (For more information about the *Electronic Book*, see the review on p. 24 of the May issue of *HOT CoCo*.) Solar Explorer was originally created by Spectrarts of England.

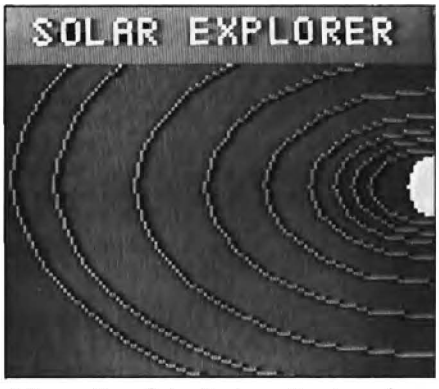
Solar Explorer offers more than 100 facts about the solar system. Players accept the role of "mission controller," sitting at a console (the Color Computer), pushing buttons that send space ships millions of miles around the solar system on exploratory missions. The program is a natural for schools, where it could be used as a supplement to classroom instruction on the solar system or as a rainy-day recess game.

Most of Solar Explorer's material is displayed on fancy text screens designed to be thought of as control panels. More interesting, however, are the Extended Color Basic graphics and animation of the scenes of the concentric solar system, a probe heading toward planets, and a robot and probe on the surfaces of planets. The aim of the program is to cement facts in the minds of its young players, and kids seem to enjoy the process. Even after several replays, Solar Explorer continues to provide new information and delight young players.

Playing Solar Explorer

The title screen is the jumping-off point for exploration in Solar Explorer. Players can turn to any of four pages to try the activities there. The first page shows the nine planets of the solar system. Pressing the picture of a planet produces a brief report on it. The second overlay page simulates the exploration of a probe on the Earth's moon or any of the nine planets. It features countdown, liftoff, orbit, and other phases of such an operation.

The third page is probe control. It reveals specifics about the planet's density, temperature, moons, diameter, gravity, mass, and atmosphere. It also has a brief animation in which the parabola of an object thrown by the probe robot is compared to an Earth toss of the same force. The fourth page tests players on knowledge they have gained from the program, giving "solar credits" for "data checks" on specific planets. If the score on a particular planet is low, players are advised to reexplore that planet.



A Screen From Solar Explorer Courtesy of Radio Shack

Summary

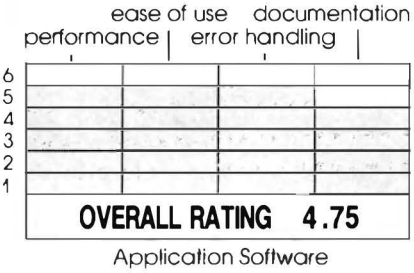
The Electronic Book and Solar Explorer represent a $45 investment. Tandy intends to offer a series of six programs for the *Electronic Book* that should make it well worth its purchase price. Professor Pressnote's Music Machine (see the review on p. 25 of the May 1985 issue of *HOT CoCo*) is the other Electronic Book program that has been released as of this writing.

Solar Explorer's documentation is 27 pages long and reinforces the instructions provided in the program. Children can use Solar Explorer satisfactorily with scant reference to its manual. The sheer number of important solar-system facts Solar Explorer offers through its intriguing format make it a winner. Children must still be interested in pursuing that information, however. After all, Solar Explorer is an educational program. Players expecting speed, tricky animation, and arcade action will be disappointed. ■

Solar Explorer is manufactured by Tandy Corp. (catalog no. 26–2546), 1400 One Tandy Center, Fort Worth, TX 76102. It requires 32K and the TRS-80 Electronic Book *(catalog no. 26-3141, $24.95). It sells for $19.95.*

It's Super Utility

by Peter Paplaskas
HOT CoCo *Staff*



Ever spend what seems to be interminable hours trying to organize your disk files? You'll find that it is no easy task to sort and purge your files without the help of a reliable utility. Super Utillity from B&J Software is designed to do just that.

Super Utility is written in machine language for fast alphabetical sorts and file manipulations. It runs on any 64K disk system with either of the CoCo's two disk-ROM versions (1.0 or 1.1) and is completely menu driven. The program lets you use as many as four single- or double-sided drives with either 35 or 40 tracks. Two programs reside on the Super Utility disk. The 64K/BIN program puts the computer in the 64K mode, allowing you to initialize your disks to 40 tracks. The other program is Super Utility, itself.

After you load Super Utility, you answer prompts that ask for the number of tracks and the baud rate you plan to use. Other prompts ask whether you are using single- or double-sided drives and whether you want to toggle on the verify command.

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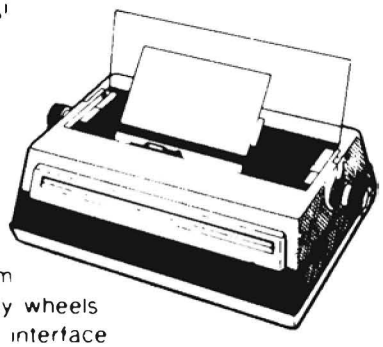

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BASIC COMPILER

WASATCHWARE believes that users of the Color Computer deserve the right to use all 64k of RAM that is available in the computer, and have fast machine language programs that use the full potential of the 6809 microprocessor. That is why the BASIC compiler, called MLBASIC was developed. Here are some of the reasons that make this compiler one of the best bargains in this magazine:

- Programs can use all 64k of RAM for either program storage or for large numbers of variables and arrays like A(200@0)
- Full Floating Point arithmetic expressions with functions
- SUBROUTINE and CALL commands allows for structured programming and more independant program development
- Full sequential and direct access disk files allowed
- BASIC source and M.L. output I/O to disk, tape or memory
- Many new commands that expand your programming capability

Commands Supported

1. I/O -Commands
   CLOSE CLOADM CSAVEM DIR DRIVE DSKI$
   DSKO$ FIELD FILES GET INPUT KILL
   LSET OPEN PRINT PUT RSET
2. Program Control Commands
   CALL END EXEC FOR STEP NEXT
   GOSUB GOTO IF THEN ELSE ERROR
   ON..GO RETURN STOP SUBROUTINE
3. Math Functions
   ABS ASC ATN COS CVN EOF
   EXP FIX INSTR INT LEN LOG
   LOC LOF PEEK POINT PPOINT RND
   SGN SIN SQR TAN TIMER VAL
4. String Functions
   CHR$ INKEY$ LEFT$ MID$ MKN$ RIGHT$
   STR$ STRING$
5. Graphic/Sound Commands
   COLOR CLS CIRCLE DRAW LINE PAINT
   PCLEAR PCLS PLAY PMODE PRESET PSET
   RESET SCREEN SET SOUND
6. Other/Special Commands
   DATA DIM LLIST MOTOR POKE READ
   REM RESTORE RUN TAB VERIFY DLD
   DST IBSHFT LREG PCOPY PMODD PTV
   REAL SREG SWP VECTD VECTI

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The next display is the main menu, which offers several options for organizing your files. The first option alphabetizes your directory and automatically rewrites it to a drive you specify. After sorting, you could use the print-directory option for a printout from an 80-column printer. The directory prints in a format that tells you the name of the file, kind of program, format, and granules. If one of your files is written in machine language, its start, end, and execution addresses are printed in hexadecimal. The program also prints the number of free granules remaining on that disk.

Super Utility has a "safety directory" option that lets you back up your directory or restore a crashed disk if the directory becomes unreadable. You must back up your directory prior to restoring it. You'll find this to be a valuable option if you ever crash a directory.

Choosing the file-transfer option provides a variety of file manipulations. You can view files one at a time by pressing the up or down arrows. Super Utility can display as many as 28 files with the screen directory option. You can rename, copy, kill, and list the directory to the screen. The program displays the drive number, free granules, and the current file name along with your options. The free-granule display helps you to determine how many granules you have left when you are transferring several files to a disk. If fewer than 10 granules are free. the program signals you with an audio-visual warning.

"Data-file transfers with Super Utility are quick and easy."

Another nice feature is the program's ability to change drive destinations while in the file-transfer mode. You'll find that data-file transfers are quick and easy because you need just a few keystrokes to activate them.

Super Utility is one of the better disk managers available at its price. The program is easy to use and its documentation is understandable, though dot-matrix printed. One important feature of Super Utility is that B&J Software allows you to back it up in case you ever accidentally clobber the disk. The company's protection scheme requires you to have the original disk to run the backup copy. Super Utility is just the ticket for cleaning up sloppy disk files with the least amount of effort on your part. ■

Super Utility, version 2.1, is manufactured by B&J Software, P.O. Box 116, Route 46, Vienna, NJ 07880, 201-637-6644. It requires 32K, Extended Color Basic, and one disk drive. It sells for $24.95.

Reader's Forum

Get More From Your DMP-120, Hide Basic Code, Faster Tape Loads

Better Print

Your Radio Shack DMP-120 manual says you have three styles of printing: normal, condensed, and elongated. I sent the control code to elongate—CHR$(27); CHR$(14)—followed by the control code to condense—CHR$(27); CHR$(20)—and got fatter letters in a darker print. I use it more often because it is easier to read.

Don Ward
Groton, CT

Invisible Basic Lines

Have you ever wanted to hide lines in a Basic program, but didn't know how? Well, you now have a few simple POKEs and edits.

The first step is to type in the program below at the end of the program that contains the lines you wish to hide.

```
60000 X = PEEK(25)*256 + PEEK(26)
60010 Y = PEEK(31)*256 + PEEK(32)
60020 FOR M = X TO Y
60030 PRINT HEX$(M),CHR$(PEEK(M))
60040 NEXT M
```

The second step is to choose the line you wish to hide and enter that line in the edit mode. Once in the edit mode, press X to move the cursor to the end of the line. Then type in a colon and an apostrophe. For example: 10 PRINT "IT WORKS":'

While still in the edit mode, count the number of characters in the line; don't forget to include the line number. For my example there are 21 characters in the line.

The third step is to type in space holders. This is done by typing X's after the apostrophe equal to the number of characters in the line. The line will now look like this:

```
10 PRINT "IT WORKS":'XXXXXXXXXXXXXXXXXXXXX
```

Now exit the edit mode by pressing the enter key.

Now run the program by typing RUN 60000 and pressing enter. This will display two columns on the screen. The first column gives a display of the addresses and the second column displays the contents of each memory location in ASCII code. Now, watching the display closely, find your space holders in the second column and make note of the first and last addresses. Once you find these addresses, exit the program by pressing the break key or let the program finish the loop.

Next, POKE backspaces into these memory locations by typing from Basic:

```
FOR X = BA TO EA: POKE X,8: NEXT X (ENTER)
```

where BA is the first address and EA is the last address in hex. The line should now be invisible. To overwrite this line, reedit the line and press X to move the cursor to the end of the line. You may now type in a fake line and exit the edit mode by pressing enter. This fake line will overwrite the original line when the program is listed. You now have a hidden Basic line, which can be used to protect your Basic program.

Tim Wehner
Yale, MI

Sound Off

The TRON and TROFF commands are useful in debugging programs by listing line numbers as they are processed. However, these commands leave your video display in text mode when you run high-resolution graphics.

I imbed SOUND commands, such as SOUND 125,10 in strategic areas of hi-res graphics routines where I think a problem could exist. As the routines execute, they sound off, and you remain in hi-res mode. If you are musically inclined, you can refer to the piano scale in the back of the Color Basic manual for the correct SOUND number. After debugging, just delete the SOUND commands. Extended Basic users can insert the PLAY command for more versatility.

Henry Nielsen
Ocean Springs, MS

High-Speed Tape Loads

How many times have you waited while your tape player loaded a long program? Here's a way to save your programs while your CoCo is in the high-speed mode, and with a simple POKE sequence they will take half the time to load!

To load non-ASCII format programs that were saved while the computer was operating in high-speed mode (POKE 65495,0) from a cold start, first type POKE 143,8:POKE 144,24:POKE 145,4 and then CLOAD. To load programs saved in the high-speed mode while the computer is still in that mode, type POKE 143,14: POKE 144,24:POKE 145,6 and CLOAD. To load a regular-speed program on a regular-speed CoCo after using one of these POKE statements, type POKE 143,18:POKE 144,24:POKE 145,10 and CLOAD.

Dan Layne
Mt. Pleasant, IA

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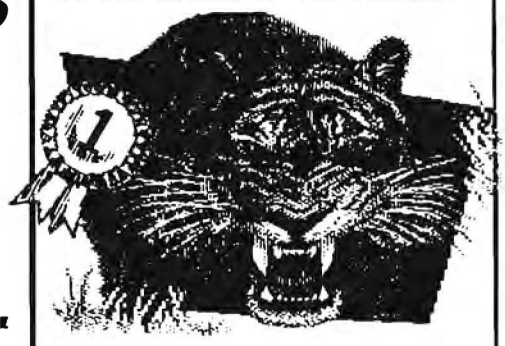

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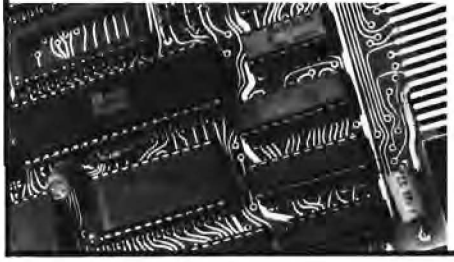

Assembly 101

by Victor and James Perotti

Displaying Text At The Cursor Location

To follow this column, you will need an editor/assembler. The authors use Micro Work's Macro-80C disk assembler, and changes are given for Radio Shack's EDTASM+. Other editor/assemblers will work, but the programs may require some additional modification.

Assembly-language programming is not hard in the sense of being sophisticated; the commands tend to be simple: load, store, and so on. However, Assembly language is mysterious and frustrating. You write programs, compile them, execute them, and they crash! What happened?

Machine-code programs execute with blinding speed. You cannot discover what went wrong, because the step-by-step process zips by too quickly. Hence, it is the invisibility, the inaccessibility of the execution, that drives you crazy. Often you just cannot figure out what went wrong.

The better assembler packages for the Color Computer include debugging programs. Debuggers display the contents of the computer's registers at the critical points and, therefore, help us discern what is going on. A program crashes when the addresses in the registers wander off into LaLa land. Often the X or Y registers store the addresses that control the program; when these registers increment above $FF00, they dump garbage into the CoCo's control locations. When the cassette or disk turns on, and the screen fills with red blobs, you know that it is all over for that program.

Put Mistakes On The Screen

If there were a way to see your Assembly mistakes, you could learn to program faster and better. What follows is a series of programs that work with screen memory in order to teach Assembly-language programming. We will use text instead of graphics, because graphics requires elaborate setup procedures in Assembly.

ASCII And Screen Codes

Computer manufacturers years ago agreed upon a standardized set of codes with which to represent alphanumeric symbols: letters A through Z, numbers, punctuation marks, and special symbols. These ASCII codes are given at the back of each Color Computer manual.

Tandy decided to deviate from the standard with some of the Color Computer's screen codes. Rather than writing an elaborate lookup table, you can use the CoCo's subroutine for printing all these characters to the screen. Try this: FOR X = 65 TO 128:PRINT CHR$(X), :NEXT X. The PRINT subroutine in the Color Computer lives at the hexadecimal address $A30A. Label it "PRINT": PRINT EQU $A30A. This Assembly statement translates into a labeling of the subroutine found at or equal to $A30A, so it substitutes the label for that address. The label, PRINT, is a clear indication of what you will be doing at the address, which is why you use labels. This subroutine displays the ASCII character in register A at the cursor location.

To display text, then, the program must control the following:

- the character to be printed from register A,
- the X register that will store and load the address, and
- the address for the cursor location stored at $088.

Screen Memory: VIDRAM

Think of the screen as a display of part of the CoCo's memory. In the normal text mode, the screen memory, VIDRAM, starts at $0400 and ends at $05FF. (Get used to hexadecimal addresses; it's good practice.) The Color Computer makes these screen addresses accessible to the programmer—many other high-priced micros lack this feature. Your CoCo can move its screen through memory, giving you a look at the contents; but that is another story.

Basic's CLS command clears the screen and places the cursor at the upper left corner, $0400. Clearing the screen consists of a process of placing blanks ($60) in each screen memory location from $0400 to $05FF. A ROM subroutine that clears the screen is located at $A928. Define this subroutine with CLS EQU $A928; the subroutine labeled CLS equals (is found at) memory location $A928. Tandy nicely provided these subroutines in its ROM; with "equates" defining them in your Assembly-language program, you can then use these "ROM calls".

System Requirements

16K
Color Basic
Editor/Assembler

The Cursor

The cursor is a graphics display of solid blocks of changing colors. Another ROM subroutine continuously alters the color of the cursor. You should understand the cursor as a position marker on the screen, which is its real purpose. It displays where you are in screen memory, and shows you where the next letter will appear (i.e., text in register A is placed into screen memory at the address designated by the cursor). In this sense, the cursor is a storage location for a screen address; that storage location exists at $088 and $089 as a 2-byte memory location. When you change the contents of this location, the cursor moves to the location stored in $088. The Program Listing, Display, shows how it works.

EDTASM+ users should replace line 0004 with ORG $0E00 and delete START in line 0011.

POLCAT

The Listing starts with a POLCAT subroutine and labels it for later use. You could write a shorter program that just uses CLS to clear the screen, placing the cursor back in the top left corner and returning to Basic. Can you guess the problem with such a program? Run it once, and it's gone.

POLCAT is like INKEY$ in Basic. It polls the keyboard and waits for you to press a key. The ASCII value of that key is placed in register A; the PRINT subroutine can then take the key in A and print it on the screen. POLCAT is a way to halt the processor and make it wait for you to press a key. The break key, which is 03 in hex, decimal, ASCII, or whatever, is used to signal the 6809 that you have seen enough and want to return to Basic.

The statement CMPA #03 compares the contents of register A to 03. The pound sign

(#) in front of the 03 is critical; it means, "Do not compare A to the contents of the address 03, but rather to the value 03." The next statement, BEQ DONE, says, "If A has a three in it, or if A equals 03, branch to the subroutine labeled DONE." There are lots of branching commands: BEQ, BNE, BRA, BLO, and BHI. Translated, these mean; branch if equal to, branch if not equal, branch always, branch if lower than, and branch if higher than. BRA GO says to always branch back to GO to pick up another key; it is the way Assembly language can loop. So the Display program clears the screen with JSR CLS, jumps to POLCAT, which both waits for a key and turns on the cursor, positioning it at $400. The cursor sits there and blinks until you press the break key. That causes a jump to Basic.

Now, with two more lines you can include the PRINT subroutine and have text printed at the cursor's location on the screen. Add another equate, PRINT EQU $A30A, and add another line, CHROUT JSR PRINT, right before BRA GO. Now assemble this beauty and EXEC (execute) it from Basic (EDTASM + users should type EXEC&H0E00). Voila! The cursor now moves. POLCAT moves the cursor forward one location on the screen each time a letter is printed. This is a simple program with four modules: the label definition, screen clearing (the initialization routine), the main program, and the jump back to Basic.

This program is easy to understand, but not very useful because you cannot fix mistakes on the screen (e.g., if you press the up arrow, it will print one and not move the cursor). Next time you can improve what you have done by adding a backspace delete key, making a rudimentary editor. ■

```
0001 A1B1              POLCAT EQU $A1B1       GET CHARACTER
0002 A928              CLS    EQU $A928       CLEARS SCREEN
0003 A027              BASIC  EQU $A027       START BASIC
0004 0725              START  NAM DISPLAY
0005 0725 BDA928              JSR CLS         CLEAR SCREEN
0006 0728 BDA1B1       GO     JSR POLCAT      CHK KEYBOARD
0007 072B 8103                CMPA #03        BREAK KEY?
0008 072D 2702                BEQ DONE        RETURN TO BASIC
0009 072F 20F7                BRA GO
0010 0731 7EA027       DONE   JMP BASIC       RETURN TO BASIC
0011 0734                     END START

BASIC  A027  CLS    A928  DONE   0731  GO     0728
POLCAT A1B1  START  0725
```

Address correspondence to Victor and James Perotti, 163-D Pine Grove Heights, Athens, OH 45701.

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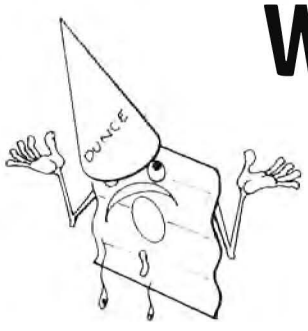

EDTASM +

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Hot CoCo—May 1985
Assembly 101; by James and Victor Perotti

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6809 on Line

by Bobby Ballard

On-Line Art

Sending and receiving graphics over phone lines has excited computer enthusiasts for some time. Now, with the release of Graphicom and CoCo Max, interest has boomed. And thanks to Art Flexser and Mike Ward, computerists can receive graphics over the phone and display them even if they do not own the software on which the graphics were developed. The software needed to prepare graphics for on-line transfer is in the public domain and is free to all aspiring CoCo artists because of these programmers' generosity.

The Software

Art and Mike have been generous twice over: They created two programs for converting artwork into Basic. The programs are similar but have different applications. The first, which has been widely distributed on Graphicom disks and CompuServe, is PIXCMP. Written in Basic, PIXCMP produces an ASCII file that loads as a Basic program, displays the graphics from DATA statements, and saves the file in binary format. The file can then be used in machine-language programs, in Basic programs, or with other graphics software—including CoCo Max and Graphicom. Graphicom users must process the picture an additional time, using the BIN>GC program supplied on the boot disk.

Mike and Art's second program, MAXCMP, performs comparable tasks, but it is written to handle CoCo Max files, which are longer and must be saved in binary using the MAX extension. MAXCMP lets you scroll through the picture on the screen by using the up- and down-arrow keys.

You can download PIXCMP and MAXCM from CompuServe's Games and Graphics Data Library (DL2). You will also find these programs on BBSes around the country. To use either program, your terminal must be capable of receiving lowercase and your host settings must be set to send lowercase, as well. If you have trouble downloading MAXCMP or PIXCMP, check your terminal and host settings.

The Art

DL2 contains several types of graphics for your collection. I uploaded my creation, SUNSET.PIX, while preparing this column; you can download it from the DL2 gallery. By checking the file name of a graphics program, you can determine the file type. The file extension—.CMX,.PIX,.CC, or .PIC—tells you how to manipulate the file when you are off line. I should point out that you cannot see the graphics while you are on line nor as they download. If you view your buffer during downloading, you see a Basic program scroll down the screen.

The CMX extension indicates that the picture has been processed by MAXCMP and will occupy two video pages or eight graphics pages. Download the picture; then load and run the file from Basic. The information you have downloaded contains the code to regenerate the picture and save it under any file name you choose. You do not have to append an extension since MAXCMP handles this function for you. You need MAXCMP to send the Basic file but not to receive it. So, if you do not own CoCo Max, you can still display other peoples' work on your system or use CoCo Max graphics in your programs.

PIX files are similar to CMX files, but they have been compressed using PIXCMP. They are one video page long and might have been created with one of a variety of software packages, using graphics tablets, joysticks, mice, or Basic-generated pictures. PIXCMP also creates a Basic program that the artist can upload and that you can download and run by following the prompts to save the picture as a binary file.

Files with CC appended are also Basic listings in ASCII that you can load into your computer and view off line. Some files are animated pictures. To see an example, download POPEYE.CC, runit, and watch the smoke rings rise from his corncob pipe.

The primary difference between CC and PIX or CMX files is the end product. You save and run CC programs in Basic. With PIX and CMX files, you can save files in Basic or save the picture itself as a binary file.

The final file type, PIC, stores printer art, so you must handle it differently. PIC files are designed to be loaded into a word processor and then printed on a dot-matrix printer. You may also use a program found in the CoCo SIG (special-interest group) on CompuServe to print these files. The program, FILPRT.CC, is available for downloading.

Of course, you do not need CompuServe to send graphics files to other people. Recall that MAXCMP and PIXCMP create Basic programs in ASCII format, so you can store them on most BBSes and other information utilities—as you would other Basic programs.

Graphicom provides another way of sending pictures directly from one CoCo to another and the graphics appear on the screen during the transfer. This feature, unique to Graphicom, requires that both computers run the software. I plan to cover the details of this operation in a future column.

In addition, Graphicom's documentation has instructions for sending picture files without a modem by using the CoCo's cassette port. To execute a cassette-modem transfer, you must have a speaker phone from Radio Shack and be equipped to make some simple hardware modifications. Interestingly, the transfer takes place at 1,500 baud—five times faster than the common 300 baud rate and 25 percent faster than a 1,200-baud modem!

I hope I have inspired you to show your artwork to the rest of the CoCo world. One of the methods discussed should suit you. If you have difficulty obtaining MAXCMP or PIXCMP, send me a formatted disk and a postage-paid mailer. I will send you a copy of both programs.

My thanks to Art Flexser and Mike Ward for their donation of PIXCMP and MAXCMP. If you like their software, I encourage you to leave a note or drop them a letter on CompuServe. ■

Address correspondence to Bobby Ballard, 1207 Eighth Ave., 4R, Brooklyn, NY 11215. You may also reach him on line through CompuServe (#72746,2373 or #73135,255), The Source (#BCT173), and MCI Mail (#172-3476).

The Learning Page

by Nancy Kipperman

Perspective On Software Graphics

What is the role of graphics in educational software? Are graphics a teaching tool or just the sugar coating used to make learning a skill more palatable? Do you need graphics to keep a student's attention, or are graphics just a distraction? Do graphics contribute more to education than a reward for a poorly motivated child?

This month, I spoke with software developers and people who evaluate educational software and explored the importance of graphics in today's computer education.

Good Art Shows

Julie McGee, director of software development for Tandy Home Education Systems in Chicago, reviews new and proposed software constantly. "Good art shows," she says. "It should be intrinsic to the product. A developer makes a mistake trying to fit education into graphics. The educational intent has to come first. However, the graphics ought to be of professional quality."

McGee sometimes sees software that misses the boat where graphics is concerned. "A nifty title screen is nice, but it's not enough," she states. "When a program doesn't use graphics to teach a skill—like telling time, for example—the child might as well be learning from a book. Graphics should be more than decoration. They should help the child visualize the problem, if possible."

Rewards are also important, in McGee's judgement. "Kids need to be motivated by graphics. They want to see a reward for getting an answer right—that means more to a child than reading 'correct' or 'well done' in text."

Rob Madell, vice president for software at the Children's Computer Workshop, a division of the Children's Television Workshop in New York City, agrees. "Our artists and programmers are integrated into the design process," he says. "The child must be motivated by doing, and our graphics are intrinsic to the subject being taught."

Demonstrate And Reinforce

Glen Vargas, president of B5 Software in Columbus, OH, values graphics because they demonstrate concepts and reinforce learning. "Graphics are versatile," he states. "They can be a controlled mix of simulation, animation, and text. The visual element should reinforce a specific concept."

Available computer memory must be considered in designing educational software. "A software package may use too much memory in providing accountability," comments Vargas. "In our math packages, we teach all the steps in a process. We try to do a better job on specific things, mixing text and graphics to teach the number concept itself. There is no room for unnecessary graphics."

However, B5 Software provides a graphic reward for correct answers and sometimes offers a timed game at the end of a lesson as a quick reward for the student who has mastered the concept.

"In our package to teach students to tell time," says Vargas, "we divided the concept into four levels. As students learn what the hour hand is and does, a moving, accurate clock visually reinforces learning."

Graphics are often helpful in demonstrating a concept. "When a student gives an incorrect answer in our addition-facts software, he can then view a graphic representation of that concept," suggests Vargas. "Four of something plus five of something equal nine of something. When a student sees addition presented graphically, the concept might become clearer." Graphics make an abstract concept concrete.

Programming Motivation

Frank Thompson, vice president of marketing for Deft Systems of Damascus, MD, provides another view of motivating students. Speaking of programming students, he says, "Sometimes a student can be motivated to learn a skill in order to achieve something else. The student may wish to create his own graphics on the computer—a Battle Zone screen, for example. However, to do this, the student must learn three-dimensional trigonometry. Because creating the Battle Zone screen involves mapping coordinates on graph paper first, a high-school student can see the relevence of learning trig."

Graphics Library

Dorsett Educational Systems of Norman, OK, uses high-resolution digitized graphics in its tutorial software. Dorsett's offerings have traditionally been on cassette, but Larry Ersland, director of planning, says they are converting their cassettes to disk. He foresees a trend toward more sophisticated graphics in educational software.

"We have an extensive graphics library on tape now," says Ersland. "It contains more than 100,000 digitized pictures. Our company might market this library so that individuals can use these graphics in developing their own software." (I hope to provide further details on Dorsett's graphics library in a future column.)

Chris Malaska, educational sales representative for TCE Programs of Gaithersburg, MD, believes graphics "enhance the challenge of software. They help the student keep trying," she says. "The student should want to earn a reward or see what's coming next. Graphics are a participation motivator. The positive reinforcement provided by the reward display helps a student with low esteem."

Color is important in graphics, Malaska believes. "Very colorful graphics are important at the elementary-school level, but they are less important as a student gets older."

Interactive Simulations

Simulations, which are generally designed for older students, have fewer graphics than other software. Glen Vargas feels that here the motivation for participation is interaction. B5 Software offers two simulations for social studies students in grades 7–12. "We use graphics in the opening screen but mostly text from then on," he says.

Simulations have fewer graphics, but there are usually fewer pictures in adult books. Just as brightly colored pictures hold the interest of younger children, graphics seem most useful in the lower grades.

What is the role of graphics in educational software? It is to command attention, motivate students to achieve, demonstrate and reinforce the concepts being taught, and reward students for their efforts. Graphics must be intrinsic to the software to be successful. And, as with all educational tools, professional quality is important.■

Nancy Kipperman is HOT CoCo's *Education Editor and an English teacher at Conant High School in Jaffrey, NH. Write her c/o* HOT CoCo, *80 Pine St., Peterborough, NH 03458.*

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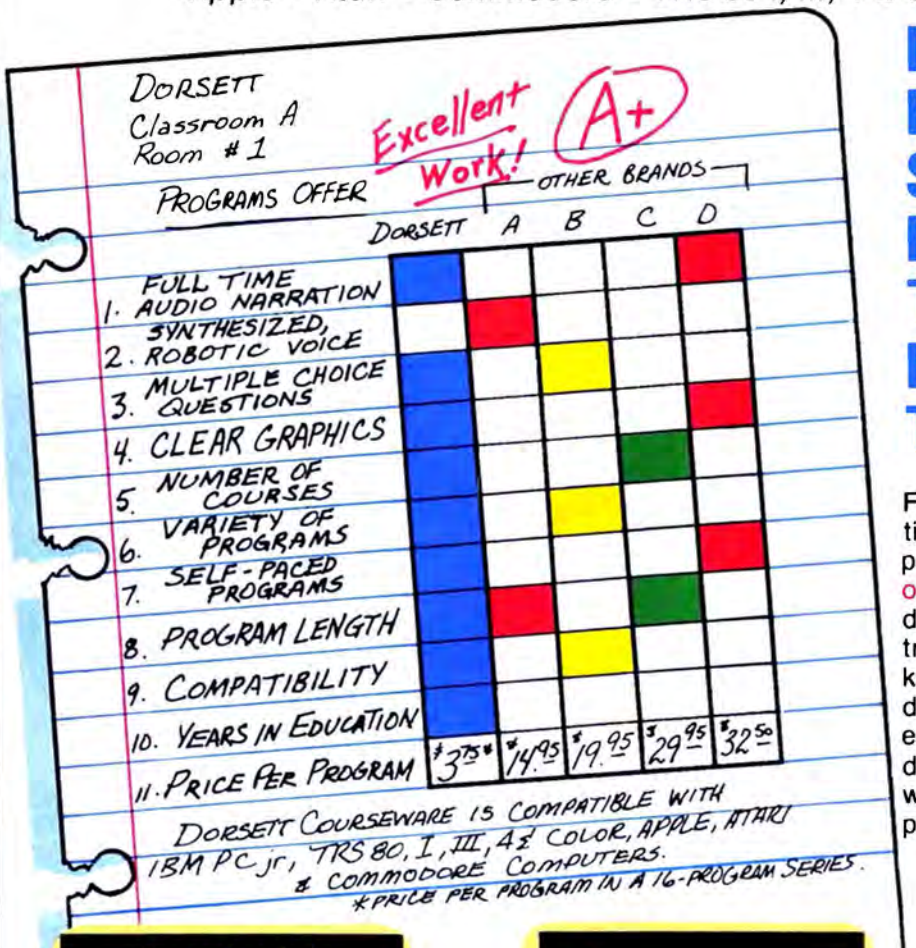

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Product News

by J. Scot Finnie

EARS, J & M's New Disk Controller, Full Character Set, PenGraph EB50, Escape From Denna, Ultra, Periglobe, And More

Information related in the Product News section is supplied by manufacturers. HOT CoCo has not tested or reviewed the products discussed here and cannot guarantee manufacturers' claims.

Most of the noises we're hearing this month concern **EARS**, Speech Systems' Electronic Audio Recognition System, which has the potential to alter dramatically the way you use some application programs. Kenneth Holt, Vice President of Speech Systems, comments that EARS "opens up a new venue for software developments." He estimates that Speech Systems' adventure, education, and appliance-controller (Home-Commander) packages will probably find new appeal when used in conjunction with the new product.

EARS recognizes as many as 64 words, which you preprogram and save to cassette or disk. The package adds several commands to Basic, including LISTEN and MATCH, which facilitate the programming and use of your voice prints. A Speech Systems' advertisement suggests that you might write your own Basic programs without touching the keyboard. The company sells a separate program called Voice Control for $24.95 that works with EARS and Home Commander (or Radio Shack's Appliance/Light Controller). You can use these items in combination to create voice-activated control of lights and appliances in your home.

Speech Systems has programmed some useful features into EARS to make it work for you. For example, it has software settings that control EARS' recognition-rejection tolerance. Because the human voice rarely sounds precisely the same twice, the ability to fine tune the program could be helpful. Despite the irregularities in human speech, EARS matches voice with voice print 95 to 98 percent of the time. Kenneth Holt notes that EARS manages 100-percent recognition of computerized voice and voice prints.

EARS requires a 32K Color Computer and sells for $99.95. It comes with a headset microphone (sound comes from your TV or separate speaker). Disk drive owners need a multiple ROM-pack interface or a Y cable. Speech Systems sells a "triple Y cable" for using EARS with its voice synthesizer, Super Voice. See the list of manufacturers following Product News for information on how to contact the company.

The EARS Package From Speech Systems

Tech Row

J & M Systems, makers of JDOS, has released a new disk controller for the CoCo. The **JFD-CP Disk Controller** features switch-selectable ROMs (a 28-pin JDOS ROM comes with the board), the WD1773 controller chip (which has a built-in data separator and precompensation circuits), fully buffered I/O (input/output) lines for greater dependability, and an 8-bit parallel port (which can support a printer or Winchester hard drive). The JFD-CP is plug compatible with all models of the CoCo. It sells for $149.

CoCo Devices has released **Full Character Set**, which displays upper- and lowercase characters on screen without reverse video and prints characters with true descenders. It also offers extra characters, including a slashed zero, a vertical bar, and braces. Full Character Set is strictly a hardware device; it requires no software and does not affect memory. It sells for $38 plus $2 for shipping. Contact the manufacturer for more information.

Real Computers and Intelligence has announced plans to market its full-featured debug **Machine Monitor** for the Motorola 6809E microprocessor. Machine Monitor will allow you to list or edit registers, memory, or programs; execute program routines; set breakpoints on control sequencing; and access points on data addressing. It is written in self-relocatable position-independent code. The program is available on cassette and disk from The Zellerbach Group. At press time, the price was anticipated to be under $27. A source-code listing for Machine Monitor will be available separately. Contact Zellerbach for more information.

The **Computer Bankbook System** was developed by Sunrise Software to replace the conventional check register. It also prints checks on special tractor-feed check forms. You can assign account numbers to all transactions and list transactions by month or account number. The program maintains a file of account numbers to which you send checks on a regular basis. It also provides a list of outstanding checks. The Computer Bank Book System has a full set of editing commands. It requires 16K and a disk drive. A printer is optional. It sells for $29.95 plus $2 for shipping. Specify Bank.5 when ordering.

Sunrise Software also makes the **Business Bankbook System**, which combines the features of the Computer Bankbook System with the ability to charge as many as four accounts per check or deposit transaction. The program comes in two version: System One for one-disk-drive applications (specify Bank.7) and System Two for two-disk-drive usage (specify Bank.9). Each ver-

sion sells for $59.95 plus $2 for shipping.

Games And Diversions

The World According to Robo the Robot, by C. William Engel, is an introduction to robots that presents sophisticated concepts and programming details in easy-to-understand language. The book is published by Hayden Book Company and sells for $12.95. ***A Robot in Every Home***, by Mike Higgins, is an introduction to the robots that are already available for educational and entertainment use in the home. The book also explores the author's view of the future of robots. Higgins is the editor of *Personal Robotics News*, a monthly newsletter for manufacturers and vendors of personal robots. The book is published by Kensington Publishing Co. and sells for $14.95 in softcover.

Crockett Software has introduced a program for philatelists, the **U.S. Stamp Inventory Management System**. The company claims to have developed the first full-featured, U.S. specialized, stamp-inventory system for the CoCo. The product can be used for many categories of foreign stamps, too. The U.S. Stamp Inventory Management System consists of two major parts: a utility program and a battery of four small merge programs. It uses direct-access techniques for storage and retrieval of all inventory data to and from disk files. The program requires 64K and sells for $44.95. Crockett has also announced the **Mailing List/Data Information** program for $29.95. Contact the manufacturer for details.

Adventurers take note. Baen Enterprises has released a helpful publication titled ***The Guidebook for Winning Adventurers***, by David and Sandy Small. It provides background on adventures and how they are programmed. There are chapters that help novice adventurers get started. It also contains hints, clues, and detailed maps for several popular adventure games. The book has 353 soft-cover pages and sells for $9.95.

Ark Royal, the well-known makers of strategy games, has two new programs in the works. **River Crossing** is a strategy game that pits you against Axis enemies the world over in 12 river battles that actually took place during World War II. It requires 32K and sells for $22 on cassette or disk. In a departure from its popular military and science-fiction motifs, Ark Royal's second new program is a Medieval-style, graphic-adventure game called **Escape from Denna**. It requires 32K, Extended Color Basic, and sells for $25.95 on cassette and $28.95 on disk.

News Bits

R.G.S. Micro Inc. of Canada has gone out of business. The progressive hardware and software manufacturing company was well known for its innovative products. John Kunze, developer of the company's hard disk and several other products, Emil Richards, Tony DiStephano, and a brain trust of other hardware and software experts continue to develop new products for the Color Computer. The name of their new company is **Periglobe**. They intend to concentrate on creating new products and leave the marketing to others.

Kunze notes that the R.G.S. Micro products have recently undergone minor revisions and that they they will be available from some of the larger Color Computer marketing companies. Periglobe is negotiating with several companies, according to Richards. The Hard Disk system will continue to be handled by Software Support. In addition, Kunze and Richards hint at several new products, about which Product News will report in future issues.

NationServ, the on-line information network, is a BBS with an annual subscription fee of $10. It offers job listings, classifieds, a shopping mall, users groups, downloading, games, business programs, information, a message center, and other options. The BBS also allows you limited access to the system as a "guest." Members have passwords. NationServ operates 24 hours a day, everyday, and works at 300 and 1,200 baud. For more information, contact the company by voice, modem, or mail.

The ***Lewis Clark Exchange*** is a soon-to-be-released news magazine for Color Computer owners living in the United States. It is looking for contributing writers and programmers. The magazine will cover news on the Color Computer and general computer markets. The education department will have a special column called Junior CoCo that will contain puzzles, crosswords, cartoon strips, and articles for and by kids. The *LC Exchange* intends to publish several personal productivity, business, and game programs in each issue. Potential advertisers should write in for ad rates and policy. For more information, contact the *Lewis Clark Exchange*. ■

List Of Manufacturers

Ark Royal Games
P.O. Box 14806
Jacksonville, FL 32238
904-786-8603
Reader Service ↙ 551

Baen Enterprises
8 West 36th St.
New York, NY 10018
212-947-8244
Reader Service ↙ 553

CoCo Devices
Box 677
Seabrook, TX 77586
713-474-3232
Reader Service ↙ 554

Crockett Software
P.O. Box 221
St. Ann, MO 63376
314-441-9278
Reader Service ↙ 555

Hayden Book Co.
10 Mulholland Drive
Hasbrouck Heights, NJ 07604
201-393-6306
Reader Service ↙ 557

J & M Systems Ltd.
15100-A Central S.E.
Albuquerque, NM 87123
505-292-4182
Reader Service ↙ 558

Kensington Publishing Co.
6300 Telegraph Ave.
Oakland, CA 94609
415-547-7100
Reader Service ↙ 559

The Lewis Clark Exchange
c/o Leslie Miller
1130 Bryden Ave.
Lewiston, ID 83501
Reader Service ↙ 560

NationServ
R.R. 5, P.O. Box 391
Fairfield, IL 62837-0391
618-847-2381 voice
618-847-2291 BBS
Reader Service ↙ 562

Periglobe
425 DeMaisonneuve West
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H3A 1L7, Canada
514-288-9169
Reader Service ↙ 563

Real Computers and Intelligence
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Santa Clara, CA 95050
Reader Service ↙ 565

Speech Systems
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Batavia, IL 60510
312-879-6880
Reader Service ↙ 568

Sunrise Software
8901 N.W. 26th St.
Sunrise, FL 33322
305-748-0775
Reader Service ↙ 569

The Zellerbach Group
Unit 216, 1335 Pacific Ave.
San Francisco, CA 94109
415-474-4252
415-673-3485
Reader Service ↙ 571

The Corner Office

by Jeff DeTray, Publisher

The CoCo And The Tandy 1000

The cover photo on last December's issue of our sister publication, *80 Micro,* could have been entitled "Why is this man smiling?" It showed John Roach, Tandy's Chief Executive Officer, grinning broadly and leaning on the just-announced Tandy 1000, a $1,199 IBM PC-compatible computer. Within weeks, the first reviews were in: The 1000 was a winner, and Mr. Roach had every reason to smile.

One recent estimate projects that 400,000 Tandy 1000's will be sold in 1985. The 1000 is selling at a faster clip than any new computer ever offered by Tandy. And just in time, too! Tandy computer sales had been in a bit of a slump, but the arrival of the 1000 seems to have turned things around. And that should come as good news for Color Computer owners, because there is a strong link between the CoCo and the 1000. The CoCo/1000 connection is most evident in the area of education.

Hotcakes. That's how the Tandy 1000 is selling to schools. Many administrators, feeling that IBM and its imitators are the computers of choice for the business community, have determined that simple computer literacy isn't enough. Students now need MS-DOS literacy to give them a head start on other graduates in the job market. I think that's why the 1000 is doing so well at the junior- and senior-high levels. It's a third less expensive than an IBM, offers almost complete PC compatibility, and comes with strong after-sale support from Tandy.

For all it has to offer, however, the 1000 does not seem particularly well-suited to younger students. The keyboard is excellent, but very large. Too many keys can intimidate a young beginner. And then there is the question of cost versus benefits. For the price of a single Tandy 1000, a third-grade classroom can have four Color Computers and a Network 2 controller. In all probability, the latter configuration will do the better job of handling the needs of the students, given the requirements of the third-grade classroom. The CoCo in the primary grades and the 1000 for older students—that is the essence of Tandy's one-two punch in the education market.

What's in This for You

One happy consequence of this education connection is that you can expect to see some interesting new software coming along. This software may be designed for the education market, but that won't stop all of us from using and benefiting from it. An example is a just-announced Color Computer program from TCE called Child Writer. This mouse-oriented word processor is getting enormous interest from educators because it's designed to be easy and fun for kids to use. But wait! Adults also appreciate software that's easy and fun. That's why Child Writer and other good programs written with education in mind won't remain behind the school-yard gate for very long.

Another interesting phenomenom is the development of some programs into versions for both the Color Computer and the Tandy 1000. The advantages in the educational setting are obvious. As students move from the CoCo to the 1000, they can avoid having to learn a whole new set of programs. And while hardware differences mean that the two versions won't look exactly the same, a similar command syntax and user interface can be employed to assure a painless transition. Tandy itself is encouraging this type of simultaneous program development. So once again, the linkage between the 1000 and the CoCo looks like a boon for users of both machines.

Time Out for This Message

Sales of our Best of '84 program tape are doing quite well, and buyers seem to like it. This year, we're including a small booklet with our "Best of '84. . ." tape that gives you the essential instructions for running each program. That way, you can use all the programs on the tape even if you're missing some of the 1984 issues of *HOT CoCo.* We also have a few "Best of '83" tapes still available. These are sold without docs, but they're great if you have the 1983 issues. Check the Instant CoCo ad on pages 64–65. Incidentally, most back issues of the magazine are still available. See page 6.

Happiness Is a Full Mailbox

Something on your mind? Well, put it on paper and send it in. My address is:

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