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45 Mathematics Helper, Wayne McArthur
Let your CoCo do complex math formulas.

48 Finding Firewood Best Buys, Delbert A. Baker
Calculate which heating fuel is the best buy.

53 Math Invasion, Simon Clift
Answer the math problems correctly and save the world.

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I
n my June 1984 Digressions, I called upon software authors to develop more serious software for the CoCo, such as a Lotus 1-2-3-like integrated package and a true relational database manager. It now appears that these two products will soon be available. (See this month’s Product News for more information.)

The announcement of these products is an encouraging sign. It shows that the better software authors are still developing state-of-the-art programs for the CoCo. The CoCo needs products such as these to maintain its user base in the face of new competition (Commodore 128 and Amiga, Atari 520ST, and souped-up Apple IIs). As long as there are companies willing to try to squeeze more function from the Color Computer with new products, the CoCo market will remain healthy.

Speaking of Atari

The new Atari 520ST is available now, as many of you are probably aware. It looks like a great deal: $799 for a 512K computer with monochrome monitor, 3.5-inch disk drive, mouse, and Atari Logo. Can it be too good to be true? Consider this: There is virtually no software base for the new Atari. At the present time, only a software developer would find a serious use for the 520ST.

If it breaks, where do you go to get it fixed? I called Atari to find a dealer near me. They didn’t have any in my area, but they did give me the phone number of a sales representative in a neighboring state. My nearest Radio Shack dealer is 6 miles away. Finally, Atari admits that it is having problems with the 520ST’s operating system, TOS (Tramiel Operating System, named after Atari chief Jack Tramiel), which is why it comes on a separate disk instead of on ROM. Early buyers should therefore expect to play guinea pig.

I’m not going to worry about the 520ST as serious competition for the CoCo yet. Tramiel and company must sort out the computer’s problems, establish a decent dealer network, and get some serious software to market. The Color Computer has at least a five-year head start.—Michael E. Nadeau
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 a listing used on the Instant CoCo tape. As an added sette. Shown first are the name of the article with a descriptive blurb and its author, included on the tape.

You've got to be quick and a good shot in this Assembly-language arcade game.

**Instant CoCo Directory November 1985**

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**Bonus Program**

```
Megashield/Washington
```

You've got to be quick and a good shot in this Assembly-language arcade game.

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.

- **October 1983**—Animation techniques: ROM disassembly, part 1.
- **November 1983**—Nuclear submarine simulation: ROM-pack primer; banner printer.
- **December 1983**—World capitals quiz program; talking spelling tutor; vocabulary-building program.
- **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 Revers 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 OS-9 review; database manager program; graphics tutorials: hurricane tracker.
- **September 1984**—Educational software buyer’s guide; typing-teacher program; the CoCo as a marketing aid.
- **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; POKER list; utilities.
- **April 1985**—Telewriter-64 mods; modem comparison; satellite-tracking program.
- **May 1985**—Sound digitization: blackjack program; disk-based smart terminal programs compared.
- **June 1985**—How to install 64K in any CoCo piechart program; custom fonts for Gemini printers.
- **August 1985**—Graphics utilities: auto-line-numbering program; how to connect the CoCo to a Model 10.

You’ll also find in each issue our regular features: reviews of popular software and hardware; and dozens of useful programs that are yours for the taking.

Each back issue costs $3.50 plus $1 shipping and handling. On orders of 10 or more back issues, there is a flat $10 shipping and handling fee. Quantities are limited, and we cannot guarantee that all back issues are available. Send your orders to HOT CoCo Back Issue Orders, 80 Pine St., Peterborough, NH 03458.
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Tell them "I saw it in HOT CoCo."

November 1985 HOT CoCo
Each month HOT CoCo provides a number of 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. Verify 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.

All this information is provided in the System Requirements box included with each article that has a program listing. This box gives you the memory requirements, the type of Basic used (Color, Micro Color, Extended Color, or Disk Extended Color Basic), functional equipment is listed as such. 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 listing 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 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. Also, don’t mistake certain characters for others that look similar, such as a zero instead of the letter O, a comma for a semicolon, and so on.

Weird Characters

The up arrow indicates exponentiation on the Color Computer. Unfortunately, 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 programs "talk" to your CoCo on a more direct level and, therefore, run faster. Unfortunately, it is much 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.

If you do not own an editor/assembler, 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 try to convert Assembly programs to Basic DATA statements. With a short Basic routine to execute the DATA statements, you have a program that you can type in just like a Basic listing, yet operates much like the one written in Assembly.

If you want 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 it appears 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. When this happens, the only way to recover is often to turn off the computer for a few seconds before turning 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 is 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 original program in any way. Write to HOT CoCo, attn. Technical Editor, 80 Pine St., Peterborough, NH 03458.
Out of Tune

In your review of CoCo Tuner (HOT CoCo, August 1985, p. 74) you state that the instrument "emits an audio signal in which A above middle C.” The frequency for the A above middle C is 220 Hz: 440 is the frequency for the A above middle C.

Furthermore, the Hale Sight-O-Tuner was not mentioned as one of the "electronic tuning forks." The product is sold by Tuners Supply Co., P.O. Box 950, Somerville, MA 02145.

Of course, it takes more than knowing the correct frequency in order to finely tune a piano. The tuner "hears" only the vibrations produced between bridges, making no allowance for equalizing the tension of the strings across the bearing points or taking the twist out of the tuning pins after they have been moved.

Bob Buzzell
Newtown, PA

Our apologies for the error and the oversight.—eds.

Program for Diabetics

I am interested in developing a program for educating young diabetics and have heard that programs of this type are already available. Could anyone provide information on obtaining such a program for the CoCo? I am eager to hear from other CoCo users with a similar interest.

Miss Wendy Ross
50 Sandwich Road
Beckenham, Christchurch 2
New Zealand

CoCo Connection

I'm looking for an interface (with cable) to connect my 32K CoCo to a Brother Compactronic 60 typewriter that is said to be computer compatible. I would appreciate advice on making the connection and the address of an interface manufacturer.

Norman A. Bleshman
165 Ames Ave.
Bergenfield, NJ 07621

Hi-Res World Map

Readers who want to use World Map (HOT CoCo, April 1985, p. 30) in PMODE 4, the highest resolution mode, are hampered because the identification circle does not appear on land masses. The modification below draws the portion of the circle over water in black and the portion over land in white. Edit line 30 as shown and add the other four lines.

30 PMODE4:1.PCLEAR4.PCLS:CLS
265 FOR TH = 0 TO 6.3 STEP .3
270 XC = XP + 5*COS(TH):YC = YP + 5*SIN(TH)
275 IF PPINT(XC,YC) = 5 THEN PSET(XC,YC):ELIESE PSET(XC,YC,5)
276 NEXT TH

The changes replace the CIRCLE command by PSEting each pixel around the perimeter of the circle after determining whether it should be white or black.

World Map is a great educational program.

R. Spencer Soanes
Brechin, Ontario

Program Correction

The Listings accompanying David Meredith's article, "All Sorts of Sorts" (HOT CoCo, July 1985, pp. 46 and 47) contained minor errors. Replace the first greater than symbol (>) in line 220 of Listing 3 with a colon (:). In line 180 of Listing 7, change the beginning of the line to read: IF V = A(1+1).

Redesign

It is impossible to use a slow screen dump from screen 0 in Designmaker (HOT CoCo, August 1985, p. 26). To accomplish this, edit line 1260:

1260 IF PPINT(ZX,ZY) = F*4 + 1 THEN 1320

There is one small error in the article. The System Requirements for Designmaker should state that it requires 16K RAM.

Thad Starner

Modem II Revisited

Despite my response to Jason Johnson's letter published here in July, HOT CoCo has received additional mail criticizing the review of Tandy's Modem II (HOT CoCo, April 1985, p. 24). The review, which was designed to be an examination of low-cost modems, included a cursory inspection of the higher priced Modem II because many readers might consider the Tandy product as well.

Most of the Modem II's features work fine on the Color Computer. However, the device does not perform autodial operations with all Color Computer software. In addition, the CoCo cannot monitor the carrier-detect line in the autotuner mode unless you run a special line into the joystick port or use Tandy's Deluxe RS-222 Program Pak (catalog no. 26-2226). The Program Pak, which sells for $59.95, was not available for the review. It will provide access to more control lines for maintaining control of the modem.

Another problem with the Modem II concerns its force DTR (data-terminal ready) switch. Turning this switch on when you are running a BBS always forces a carrier detect; consequently you can't determine if a caller has hung up. Instead, you must rely on a software time-out to make the disconnection. If you add Tandy's RS-222 ROM pack and leave the force DTR line off, carrier-detect is not forced and can be monitored. However, the force DTR switch is a flaw and a major problem for BBS owners. For autoanswer, I find many better modems on the market.

Use of the Modem II as an autodial modem is dependent on your software. The review should have stated more clearly that the autodial feature works with some, but not all, terminal packages. But the fact that some readers have found programs that perform this function on the Modem II (including Autoterm from PXE Computing and Vidtex from CompuServe) does not mean that the product will work universally. Several packages fail not autodial with the Modem II.

Bobby Ballard

MC-10 User

I own an MC-10 with 20K RAM and CCR-81 and CGP-220 printers. I would appreciate hearing from anyone who can offer advice on a few specific programming, hardware, and software problems.

First of all, can anyone tell me whether you can change the rectangular cursor, using one or more of the ASCII characters in the VDG instead? Or can you provide assistance with my robot and speech synthesis projects? I am looking for 25 inexpensive stepper motors and information on interfaces and programming for the robot. I would welcome tips for using Tandy's SP0256A-AL2 speech-synthesis IC with the MC-10.

I'd like to obtain a circuit-design program that prints text and graphics to the screen and printer and that also allows you to save and load designs to and from cassette. My final request is for a music program comparable to Tandy's Audio Spectrum Analyzer (catalog no. 26-3156).

Arne J. Gregor
1606 Lincoln Court
Reading, PA 19605
Six months ago a terrorist group demanded to be designated the rulers of Alpha Sigma III, under the threat of world starvation on the planet Earth. The Federation denied their demands, so they released a biological weapon which has destroyed all known edible plant species from throughout the known galaxy. To date no plant life has been able to survive on Earth. Recently, Federation undercover agents have reported a story told by a roving space trader, of a planet with abundant edible plant life. These plants have a reputation of being able to survive in all climates and in fact, are supposed to grow at an incredible rate. The Federation is desperate! If Earth's food source is not replaced soon, the Federation will have to evacuate all animal and Human life. Your mission is to go to the planet Zephyr and obtain the seed of these plants and return to Earth. Several Federation agents have been sent to obtain the seeds and none has returned! Can you get the seed and survive???

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CBASIC is fully integrated, easy-to-use Basic program Editor and Compiler package. CBASIC is 99% syntax compatible with Disk Extended Color Basic programs, so most Basic programs can be loaded and compiled by CBASIC with little or no changes required. The compiler is an optimized two-pass Basic compiler that can convert programs written in Disk Extended Color Basic into 100% pure 6809 Machine Language programs, which are written directly to disk in a LOAD compatible format.

The programs generated by the compiler can be run as complete stand-alone programs. A built-in linker/editer will automatically combine your programs with any other CBASIC programs that have been previously compiled. The linker/editer does not require any knowledge of machine language.

CBASIC adds many features not found in Color Basic, like Screen,臨时, and On Error handling. It also has advanced program editing functions. The most important is the automatic memory allocation feature, automatic 64K RAM control. The new functions are designed specifically for efficient, easy, and quick development of any Basic program. CBASIC is easy to use, even for the novice. CBASIC combines all the functions an Advanced Machine Language program contains with the comfort of a High Level Language editor.

FULL COMMAND SUPPORT & SPEED

CBASIC features full 100% Basic Command and Function support. Support for Disk, Tape, Printer, and Screen I/O. It also supports All the High and Low Resolution Graphics, Sound, Play, and Screen Operations available in Extended Color Basic, and all with 99% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 30 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a Basic program is much, much shorter. A machine language program that might take several weeks to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We have a report from a CBASIC user that claimed a Basic program that took 2 hours to develop with Basic took only 45 minutes with CBASIC.

MORE THAN JUST A COMPLIER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and Edit Basic programs for the compiler. It is a full-featured editor with functions designed specifically for writing and editing Basic programs. It has built-in Mouse and Copy functions with automatic program renumbering. Complete, easy-to-use insertion, deletion, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Displaying disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequential lines within existing lines. You can set the programmer baud rate and direct normal or compressed listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log." CBASIC tests an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to edit and when it is edited, display moved, the converter will show the data that the error is associated with. You can easily develop program lines, all of these display commands are compatible with Extended Basic and both Extended Basic and Disk Basic. This feature makes the editor very powerful and efficient and allows for the easy development of any Basic program. The programs generated by the CBASIC Editor can be compiled by the CBASIC Compiler. The CBASIC Compiler contains all the functions and commands an experienced Basic programmer would require.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic compiler that includes its own Hi-Res Resolution, 512 x 480, or 256 line display. It is also the only compiler that supports both the "Fres" Word Pack and the Double Density Res (RD) cards. All of these display formats are part of the CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling but CBASIC will also include them in your compiled programs if you want to use it. CBASIC also includes display driven- programs. Each program is written in a Basic program. It is similar to the display driven-program in Basic. With a Hi-Res display you can display text, graphics, characters, characters per line, underline, character highlight character erase, mouse and lineview on a screen. CBASIC allows you to control your own disk card commands. The other Basic compiler offers you this kind of flexibility.

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6809 16K RAM synchronous. Address Multiplexor in the Color Computer. It fully utilizes the 16K of address space available in the Color Computer RAM already used during program creation. Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the use of the upper 12K of RAM space automatically for variables or even program storage at run time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to access the upper 12K of RAM manually, under program control. No other Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can compile your program much faster than typical Basic compilers. CBASIC programs with extended fast speeding. It will compile a 2K program to disk in less than 2 minutes! That is without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O device (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen Displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run, Machine Language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work that way. Some of these compiled commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions like PRINT, PRINT and so on. CBASIC does this. All of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99% syntax compatibility. What does the other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic does. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast. It also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 string-64 characters each, you would DIM DA$(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. You want a single string to have 200 characters? You would DIM AX$(200). For string arrays, you would still access the element you want, the same as Color Basic. To get string #10 from the array DAS, you would have to look at DAS$(10). The only real change is in the DIM statement. For underdimensioned arrays of 64 elements or less, CBASIC automatically re-allocates space for the correct dimensions. Some other Color Basic compilers have you to declare EVERY string variable used in the program in a DIM statement. And to create an array of 40 strings 64 characters each, you would have to DIM AA$(2560), and then access string #10, you would have to multiply 40 X 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 12K RAM and an at least one Disk drive. We strongly recommend that you have a 40K CBASIC is compatible with all versions of Color Basic and Extended Color Basic and both Disk Basic V1.0 and V1.1. Programs compiled under one system will run on any system with systems different. CBASIC is NOT compatible with JOCS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete as CBASIC. Even though CBASIC was designed to be the most "User Friendly" compiler on the market we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. CBASIC has a manual, the manual includes approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. We did it this way, we could have had a few pages a page manual and a few hundred page manual. The manual index breaks down each manual into sections and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has nine sections, the Editor, Compiler, and Appender. Each of these is divided into sub-sections, with Screen and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by reading the entire section on the top of the pages. The Manual is an 80 x 11 Spiral-bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as bring the best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. CBASIC's features, to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, PRINT and so on. What about complex string statements, or string statements at all? How long is a program you can write? Can you use a complex string function? CBASIC requires a "String Pool," like Color Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, LET and PRINT, using the same syntax as Basic? Do you ever have to use a separate Basic program to compile it? Can you take complete Basic program and compile them without extensive changes? Will they work? How do you edit a program, when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and reviewing CBASIC, to make it the best, most Compact Color Basic compiler available. Most of our CBASIC users have already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll tell you one of those traded in, a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $149.00 plus $3.00 for shipping and handling to the address listed below.

Silly order by VISA, MASTERCARD or COD, call us at (702) 452-0620 Monday through Saturday from 9am to 5pm PST.

CER-COMP

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November 1985 HOT CoCo
Having technical difficulties? Let the Doctor solve them. Due to the volume of mail Doctor ASCII receives each month, we cannot guarantee that your letter will be published. Please enclose a stamped, self-addressed envelope with all letters for a reply. Send your questions to Doctor ASCII, c/o HOT CoCo, 80 Pine St., Peterborough, NH 03458.

Q. In your July 1985 column, you presented a two-column screen directory program. I tried without success to send the two-column directory to my printer. Can you help?—M. Talutto, Floral Park, NY

A. Delete lines 170-200, 220, 230, and 250. Then add the following lines:

```
170 IF N = I THEN I = I:GOTO 220
180 FOR I = 1 TO N – 1 STEP 2
190 PRINT# – 2:STRINGS$(10,” “);I$(I).I$(I + 1)
210 NEXT I
220 IF N = I THEN PRINT# – 2:STRINGS$(10,” “);I$(I)
```

Q. In your article, “64K Modification Revisited” (HOT CoCo, June 1985, p. 40), you mentioned a piggyback upgrade. Tandy is now selling sets of 200-ns 16K chips for $7.95 and 100-ns chips for $3.95 each. Can I use these?—Richard Davis, Yogkum, TX

A. With Microtek Inc. (2654 Baldwin Road, Dearborn Heights, MI 48127) selling 150-ns, 4164-type 64K chips for 69 cents each, why spend more for a 32K upgrade? Also, the piggyback upgrade is not compatible with software that puts a high-resolution screen above the 16K boundary. It made sense when 64K chips were selling for $50 each. But today I wouldn’t do a piggyback upgrade even if I got the chips for free.

Q. My Radio Shack catalog says that I can have up to four drives with my CoCo. Where do you hook them up? Do I need a new cable, or is the reference to double-sided drives?—Timmy Lindner, Patterson, CA

A. You need a new cable in any case. If you stick with Tandy drives, you need their four-drive cable with its missing teeth. If you go with double-sided drives, you can have a maximum of three using a non-Tandy cable without missing teeth. Tandy extracts three of the four teeth that connect to the disk controller’s drive-select lines, allowing you to move Tandy drives to different connectors on the cable and still have the one closest to the controller as drive 0. Other manufacturers use jumpers inside the drives to determine a drive’s number, so you don’t have to remove teeth from the cable. Double-sided drives use the drive 3 select as a side select, making it impossible for Tandy’s cable with its three missing teeth to select both drive and a side.

Q. I have an older TEAC full-width drive I purchased from Displayed Video with their controller and RS DOS 1.1. I want to add a Tandy drive 1 to my system, but I received no technical manual with the unit. Does it have a terminating resistor? Do I need a new cable? Should I remove the TEAC’s terminating-resistor pack?—Michel Grimard, Sherbrooke, Quebec

A. Since your TEAC has a terminating resistor and the Tandy drive does not (Tandy puts a terminating resistor on drive 0—move the resistor to the highest-numbered position when you add drives), use the Tandy as drive 0 and the TEAC as drive 1. Remove teeth 12, 14, and 32 from the drive connector closest to the controller connector on your cable. The teeth are numbered from bottom to top, with the open slot facing you. As shown below:

```
33 34
31 (32) — remove
29 30
27 28
25 26
23 24
21 22
19 20
17 18
15 16
13 (14) — remove
11 (12) — remove
9 10
7 8
5 6
3 4
1 2
```

You also need to move a jumper inside your TEAC to make it drive 1.

Q. Why is it recommended that you use the instruction A = RND (– TIMER) to seed the CoCo’s random-number generator? I assumed that TIMER would give a different value each time I ran the program, but typing PRINT (– TIMER) always returns a zero.—Jules LaFrance, Ottawa, Ontario

A. TIMER gives the time since you turned on your CoCo, but only if you have Extended Color Basic. Otherwise, the CoCo treats it as an ordinary variable, which has a value of zero by default. I’ll explain how RND works, since the CoCo’s manual does not do a good job of it:

• If the argument of RND is positive, RND gives you a random integer between one and that number.
• If the argument of RND is zero, RND gives a random decimal between zero and .99999999.
If the argument of RND is negative, the argument is used to reseed the random-number generator, hence the use of – TIMER.

I want to learn Assembly-language programming. Can you recommend some good books and an inexpensive assembler? How do you hand-assemble an Assembly-Language program?—Shawn Long, Hurdle Mille, NC

I reviewed five Assembly-language programming books for the CoCo in the March 1984 HOT CoCo, p. 38. The two most popular assemblers for the CoCo are Tandy’s EDTASM + ($39.95 ROM pack, catalog no. 26-3250; $59.95 disk, catalog no. 26-3254) and The Micro Works’ (P.O. Box 1110, Del Mar, CA 92014, 619-942-2400) SDS80C ($89.95 ROM pack) or Macro-80C/$99.95 disk). Bill Barden’s TRS-80 Color Computer Assembly-Language Programming (available from Tandy) supports the former, and Don and Kurt Inman’s Assembly-Language Graphics for the TRS-80 Color Computer (published by Reston) supports the latter. You can order technical information on the CoCo’s MC6809 microprocessor from Motorola Semiconductors, 3501 Ed Bluestein Blvd., Austin, TX 78721. Ask for Advance Information #AD1-S47. It contains data on the 6809E’s instruction set and other technical information. I believe it is still free for the asking.

You can use Basic POKE statements or a monitor program such as the one that appeared in Doctor ASCII, December 1983, p. 129, to hand-assemble machine-language programs. The problem with hand-assembly is that it is the time-consuming job of translating the opcodes and data into numerical inputs that you can enter into memory.

Where can I get information on the CoCo’s new video-display generator?—Allen Elmer, Fallbrook, CA

Write Motorola Semiconductors at the above address. Ask for advance information on the MC6847-T1.

How can I tell which PC board I have in my old grey CoCo?—USN CDR Robert B. Pinell, San Diego, CA

After removing the CoCo’s cover, with the keyboard facing you, look for a serial number below the ROM-pack port. It will end with either a D. E. NC, or 2S5. If it is one of the first two, that letter is the board type. If it is one of the latter two, your board is what Coco-nuts have christened the F board.

I recently purchased a 64K CoCo 2, but I get only 24,871 free bytes when I turn it on. Do I really need disk drives and OS-9 to get 64K?—William C. Privett, Roseville, GA

Your CoCo has 64K of RAM plus 16K of ROM for a total of 80K of memory. The CoCo can address a maximum of 64K at a time. When you turn on your CoCo, you have 32K of RAM, of which Basic uses 8K (6K for high-resolution screens and 2K for housekeeping). With Extended Basic, your interpreter is in ROM and is addressed from locations 32768 to 49151. Adding ROM packs or Disk Basic gives you up to 32K of RAM. This RAM/ROM mode is called memory map 0. You can access the other 32K of RAM in one of two ways: You could swap out the ROM for the other 32K of RAM for memory map 1. This is what OS-9 does, but so do a lot of other software packages such as Telewriter-64, which comes in a cassette version. Another way is to have two lower banks of 32K. This is the way print spoolers are usually implemented on the CoCo. With two lower banks, you get maximum memory use of your CoCo. Some programs using this method have 55K buffers.

I want to put machine-language programs into high memory at location 44560. In “Printer Answers” (HOT CoCo, March 1985, p. 24), you said, “Those of you with 64K can enable memory map 1 and offset load into high memory.” but you didn’t say how.—Albert M. Huntley, Windsor, VT

You need the program 64K Enable (HOT CoCo, June 1985, p. 45).

The Tandy manuals show how to use the cassette to form files for storing data, but they create files that are only 12 lines long. What do I do if I have more than 12 lines of data, and how can I scroll through it?—M.S. Casey, Sr., Casper, WY

You need an editor program. Better than an editor program is a word processor that generates ASCII files. There are many good ones for the CoCo, including Telewriter-64, VIP Writer, and Elite-Word.

I have Tandy’s Micropainter ROM pack. On my new CoCo, it produces green in color set 3 instead of blue. I finally swapped display chip AN48331 for chip number AN48324. I now have blue skies.—Dennis Sledge, Ty Ty, GA

Thanks. Perhaps this will help someone else.

Can you recommend a book on high-resolution moving animation?—William L. Warren, FPO, New York, NY

Try Don and Kurt Inman’s Assembly-Language Graphics for the TRS-80 Color Computer, published by Reston. You might also be interested in the series of articles from HOT CoCo called ”Anatomy of an Assembly-Language Game” (June through November 1984), by Mike Meehan.
The Wild Blue Yonder

If you were handed a sheet of paper containing your name and 999 others, you would probably be able to spot your own name so quickly you'd think it happened by chance. But it doesn't.

The human brain has the ability to quickly focus on those things that are most important. And your name is one of the most important things you possess.

In a world of sensory overload, this brain capability is especially useful. Executives scan mounds of memos, almost subconsciously discarding the chaff. Parents sleep soundly in an apartment next to a noisy interstate route but awaken if their baby whimpers in the next room. A loved one's features shape as the peanuts. As I watched, her eyes filled with a mix of peanuts and light chocolate patterns that are part of the puzzle-patterns that are extracted from chaos.

We have learned not only to focus but also to ignore, a two-edged ability that helps us solve problems. Answers are deJived from perspectives in the next room. A loved one's features shape as the peanuts. As I watched, her eyes filled with a mix of peanuts and light chocolate patterns that are part of the puzzle-patterns that are extracted from chaos.

When you run Wild Blue Yonder, you will see part of a large oblong group of single-digit numbers between one and nine on a field of blue. The puzzle is first drawn, only the upper half of the number field is visible. You move up and down the oblong by tapping the up-and-down-arrow keys. As the puzzle begins, the flashing orange cursor is on a number 3 at the center of the oblong.

You can move the cursor in any of eight compass directions by tapping the following two-character commands: NN for north, SS for south, EE for east, WW for west, NE northeast, SE southeast, NW for northwest, and SW for southwest. The number on the space that the cursor is resting determines how many spaces the cursor will move in the direction you choose. The first direction you select in Wild Blue Yonder will always move the cursor three spaces.

The object of the puzzle is to find your way yonder—to the blue area of the screen surrounding the oblong. However, don't go too far. A winning position is any blue space touching the perimeter of the oblong field of numbers. If you direct the cursor more than one space outside the oblong, you'll have placed it in limbo. You cannot move from a position that is not within the field of numbers, and your only recourse is to restart the puzzle. There is one other important rule: The line of travel to reach a winning position cannot fall over any of the blue area.

The program purposely allows the possibility of game-ending Basic error messages. Keep in mind that the number position to which you will move the cursor in making a direction selection must be visible on the screen. A move that takes the cursor "off the screen" will produce an FC (illegal function call) error.

When you make 61 moves without finding your way out, the program ends with an OS (out of string) error. This is also purposeful, for the solution takes fewer than 61 moves. Once you have solved Wild Blue Yonder or completed an attempt, you can display a list of the moves you made by typing "PRINT SCS" and pressing the enter key. One last note: Be sure to turn up the sound on your TV or monitor: random tones will sound if you beat the puzzle. Ladies and gentlemen... fry your brains!

The program allows for the solution to be entered by typing "PRINT SCS" and pressing the enter key. However, this is also purposeful, for the solution takes fewer than 61 moves. Once you have solved Wild Blue Yonder or completed an attempt, you can display a list of the moves you made by typing "PRINT SCS" and pressing the enter key. The first 10 moves have more than a billion combinations.

Puzzle Contest VII

This month's puzzle contest involves the solution to Wild Blue Yonder. When and if you solve it, type "PRINT SCS" to see the move string. Using some or all letters in the string, spell the longest English word you can. The winning move string and the word you form will constitute your entry. The winner will receive a one-year subscription or extension to HOT CoCo. Next month: Uncle Arnold's coin game.

Eds. note—To enter Puzzle Contest VII, send your name, address, move string, and the word you spelled to Richard Ramella, 1493 Mt. View Ave., Chico, CA 95926. The winner will be the entrant who offers the correct move string and the longest English word spelled with its letters. Incase of a tie, the winner will be selected at random from the tying entrants. Entries must be postmarked by November 30, 1985.
OR BASIC
Program Listing. Wild Blue Yonder

$4 9496755587 6685$ B3$

230 A$(4)=B4$+145111 4517135$+B4$

180 IF A$=6 THEN B6$=B$

370 A$(18)=B$+254787561537829$

170 IF A$=5 THEN B5$=B$

3*+B3$

430 X$=INKEY$

240 A$(0)=B$ : A$(1)=B$ : A$(5)=B$3$

440 H$=H+32$

500 IF X$="N" OR X$="S" OR X$="W$

580 IF C$="S" OR X$="S" OR X$="W"

" OR X$="E" THEN CS=C$+X$

510 PK=VAL(CHR$(H$-64)) ; PRINT @ 93,C$ ; IF LEN(C$)<2 THEN 430$

520 IF C$="*" THEN H=H-1$PK$ ; C$="*" THEN CS=C$+X$

540 IF C$="S" THEN H=H+1$PK$ ; C$="S" THEN CS=C$+X$

560 IF C$="E" THEN H=H+1$PK$ ; C$="E" THEN CS=C$+X$

580 IF C$="NE" THEN H=H+1$PK$ ; C$="NE" THEN CS=C$+X$

600 IF C$="SW" THEN H=H-1$PK$ ; C$="SW" THEN CS=C$+X$

620 IF C$="SE" THEN H=H+1$PK$ ; C$="SE" THEN CS=C$+X$

640 IF C$="NW" THEN H=H-1$PK$ ; C$="NW" THEN CS=C$+X$

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The Computer Room

by Scott L. Norman

Catching Up with Appropriate Technology

During the energy crisis of the seventies, we heard a lot about using "appropriate technology," which meant that you should use no more than the minimum amount of sensible technological leverage to perform a given task, so as to consume the fewest resources and do the least damage to the environment.

Perhaps we should extend the same thinking into the area of personal software. Have you ever shown off your CoCo only to be met by yawns from the technically minded members of the household? They understand the software packages to be of more use to the less technically inclined than to those who make a living writing software. For this, I find smaller, specialized software packages to be of more use to the less technically minded members of the household than to powerful, general-purpose programs that require more computing expertise. More important than software that offers raw computing power are such factors as acceptance of user input in a variety of formats, the ability to retrieve information based on partial or imperfect matches to a request, and extensive error trapping: user friendliness, in other words.

For Dedicated Shoppers Only

If you do much grocery shopping, especially for a large family, a data-file manager that keeps track of your grocery coupons could be a significant aid to your budget.

Kolourdex for Koupions is a product of the Kensoft company (2102 50th St., Kenosha, WI 53140). The program requires 32K and comes on tape for $24.95 or disk for $28.95. (You can also buy a tape-to-disk upgrade for $75.) It can tell you if you have a coupon for a specific product. List all your coupons that apply to a particular type of item. and display all the coupons that expire on or before a specified date or that are worth more than a specified amount. The tape version can keep track of 400 coupons, while the disk edition can handle 720.

Programs like Kolourdex have a place in certain homes, and I'm going to use it to illustrate some good and bad practices found in home software. This isn't meant to be an exercise in picking on the product: it's by no means the worst offender. I've ever come across. Kolourdex does, however, contain features that exemplify some of my thoughts about using the appropriate technology to computerize everyday activities.

The nonprotected Kolourdex disk contains three Basic files: KDXXPNSD, the main program; KDXXPNLD, which reorganizes data; and KDXXPFIN, which initializes a new file when you first run the system. The single data file on a given disk is always assigned the default name KPNSD. This file, and some necessary indices, are created as you work with the program.

But why such confusing file names? I prefer something easier to remember. A quick fix to this problem is to add a couple of one-line "shells" to your program disk to call the real program. For example, you might store the one liner. 10 RUN "KPNSD". under the name COUPONS/BAS, so that your Kolourdex command line would be the easily recalled RUN "COUPONS". I use such calling routines with a lot of my favorite applications software and frequently include a POKER statement in the startup routines to establish 9,600-baud communication with my printer. as well.

If you could simply rename the main program and be done with it, but I prefer to use a separate routine whenever I think portions of a commercial program might call each other by their original names. I wouldn't want to rename the main Kolourdex file and then find that part of the code contained an explicit reference to the original name, KDXXPNSD.

Once underway, Kolourdex lets you add coupons to a file, examine records selected according to several criteria, and change or delete records; in other words, it's a well-behaved little data manager. A coupon record consists of just a few items: the description (the specific name of the product), the coupon value, the expiration date, and the product type. The latter is a number from 1 to 12 and is used for selecting subsets of a data file. Normally, you use the codes that Kolourdex assigns: number 1 for baby food, cereal, and other breakfast foods; 2 for dairy products; margarine, diet products, and oils; and so on. You can assign your own meanings to these codes as long as you use them consistently within a given file. but I can't find a reason to make such changes. The originals seem to cover everything on a typical shopping list.

You enter data for each coupon in response to video prompts. Kolourdex accepts coupon value data in several formats. For example, if you have a 25-cent coupon, you can answer the amount prompt with $0.25, .25., or .25. That's the way a consumer-oriented program should behave. On the other hand, coupon descriptions cannot exceed 19 characters. That's not enough. especially when you include the manufacturer, which is necessary information.

If you've got the patience, you could go into Kolourdex and change the 19-character limit by altering all references to the length of the description field and the total space set aside for each record. However, lengthening the individual records means reducing the capacity of your file.

Kolourdex can deal with multiple identical entries—a good feature that lets you keep track of several copies of the same coupon. However, the program's ability to search for a particular entry is somewhat limited. Any target string you enter must match the first part of the coupon description. If you have an entry entitled ABC Corn Flakes, you'll never find the coupon listing unless you specify a string beginning with ABC as your search target. (Actually, just specifying A is acceptable, but you'll generate a lot of false "hits." )

This method works fine if you adhere to a fixed format when you enter your coupon data. I prefer a more forgiving type of search for a consumer product—one that reports a hit whenever the target matched any substring of the description. For example, at one time I might be interested in a coupon specifically for ABC Corn Flakes, while at another I might want a coupon for any old corn flakes.

Kolourdex should also include a print routine, just in case you don't have your coupon files right in front of you as you run the program, or so you can pick items of interest as you type your shopping list. Kolourdex author Glenn Janes suggests that the Delete Koupions (sic) routine might be a good place to insert a couple of PRINT#s—2 statements to provide printout capability.

Kolourdex is inexpensive and includes enough file-handling code to form the basis of a useful piece of home software. It does need a couple of modifications, though. Let me know if patches of the sort I've outlined are of interest to you; perhaps we can return to the program and do some polishing up. I'd also like to have your thoughts about the practicality of household software. user friendliness, and related matters. ■

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.
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November 1985 HOT CoCo 19
The P51: No Milk Run

by Scott L. Norman

Tom Mix Software has sent us on perilous high-tech reconnaissance missions with SR-71 and challenged our weekend airmanship with Worlds of Flight. (See the reviews in the April and December 1984 issues of HOT CoCo, pp. 32 and 20, respectively.) P51 Mustang Attack offers armchair aces the chance to recreate a bit of the tough World War II fighter combat. So slip into your old leather jacket, strap in, and follow me.

The Cockpit and Flight Plan

P51 makes use of some of the out-the-window display technology introduced by Worlds of Flight. The scenery is much less detailed, however. All you see through your P51's windscreen are the horizon, a few airfields, and enemy aircraft. The engine sounds are gone, too. I presume that these simplifications were made in order to speed up the action. P51 comes close to giving real-time response. That's critical to the program's major innovation—the ability to link two CoCo's in mock combat!

Although there is a solo mode in which you can sharpen your flying and gunnery skills, the real action begins when you connect two computers, fire up a copy of P51 in each, and do battle. The computers can either be right next to one another linked with a short null-modem cable or at opposite ends of the country connected by modems and telephone lines. The latter method slows down screen responses by a factor of two or so and opens up the possibility of horrendous telephone bills, but it does work.

The cockpit display consists of the windshield with gunsight and a small but busy instrument panel containing airspeed indicator, altimeter, various status readouts, and navigation aids.

P51's action takes place in the skies above four 10-mile quadrants arranged in a square grid like this:

1 2
3 4

Its square world wraps around, so if you fly past the border of one quadrant, you merely enter the next one along the aircraft's projected track.

Each quadrant contains a single runway, and in the war-game mode, you can capture an enemy airfield by scoring gunnery hits on its landing beacons, denying use of the runway to your opponent.

You can call for a birds-eye view of any world on radar or switch over to a conventional compass. The radar can even be reset to eliminate the clutter of old flight tracks.

This is handy after combat when you are trying to get your bearings to return to a friendly airfield.

Flight Control

As befits software named for the best fighter-bomber of its time, the simulated P51 is a hot aircraft. Fully controlled rolls and inside and outside loops are possible. And the performance figures seem realistic: at full throttle, an inside loop takes about 15 seconds and a 360-degree roll about half that. The manual contains a concise discussion of the principles of flight, including those aspects that have been simplified for the purpose of this program.

The throttle, landing gear, and flaps are controlled from the keyboard, while the ailerons, elevators, and guns are operated by the joystick connected to the right joystick port. (The simulated P51 does not have a rudder control.) I recommend, as does the manual, that you use joysticks with P51 Mustang Attack that provide spring centering and adjustable trimmers, such as Tandy's Deluxe Joystick made by Kraft.

A final control feature is the wing leveler, a kind of fictitious autopilot that keeps the wings horizontal and the aircraft heading constant unless you continuously force the aircraft into a banked turn. The wing leveler is a boon to the novice, but it slows down the P51's roll rate and should be switched off for combat.

The Dog Fight

In the solo practice mode, the CoCo generates an image of a drone aircraft at which you can shoot. The drone always flies a straight course, descending continuously from...
51,000 feet down to the ground. That doesn’t make it a sitting duck. First you have to find it, using your radar and your Mark I eyeballs; then you have to maneuver your plane into a good firing position and shoot accurately. You have 99 shots in each of your two wing guns, and you can squeeze them off one at a time or fire continuously.

Although 99 rounds per gun is a little skimpy, the actual firing time available to you seems realistic. Your fighter’s limited fuel supply is also a factor. If you keep the throttle wide open, you’ll only have enough fuel for 10 minutes of flight! You can refuel and rearm by landing at a friendly airfield.

I found P51 surprisingly easy to land, although multiple bounces (complete with sound effects) are not uncommon. The rapidity with which the screen updates helps the learning process. However, the landing skills I acquired in Worlds of Flight might have something to do with how easy the landing process seems to me. And landing is by no means guaranteed. Attempts at high-speed landings will result in damaged landing gear or worse.

Players in a two-person game can signal each other as to the status of the hostilities. The categories of which are peace, war, talk (a game-freeze mode), and “turkey.” The last category is equivalent to declaring war, but it allows you to insult your opponent first!

Once engaged in a dog fight, the displays of the two computers are updated simultaneously. Enemy hits cause bullets holes to appear on your windshields and control panel. The manual has a chart that shows the damage inflicted on your plane based on the location of bullet holes. These damages, plus the distance, if any, by which you miss the runway in landing, govern the time it takes to repair your aircraft after you land. In the meantime, your opponent could be shooting up your runway beacons.

The actual conduct of P51 Mustang Attack warfare is complicated: the details of aircraft replacement, repair times, and so on are in the documentation. It is possible to specify one of three skill levels for each player: the higher the skill level, the greater the number of hits is required to inflict each kind of damage to your opponent’s plane.

Debriefing
I am enthusiastic about this latest Tom Mix flight simulation. What would I change if I could? The altimeter (the two-hand type) should be modified to include a multiples-of-10,000-feet indicator. It is easy to lose track of your altitude in a dogfight when your sole concern is concentrating on getting your opponent into the sights. By the time the P51’s altitude warning goes off at 500 feet, it might be too late to take corrective action. This is no particular fault of the simulation, however. A human-factors specialist once told me that World War II altimeter designs often invited misinterpretation by pilots during stressful moments.

Outside of that, I found only one potential glitch in the program. As an experiment, I deliberately took off with the wing flaps lowered. By the time I got the flaps cleaned up, I found that I couldn’t retract the landing gear. Although this is an unlikely situation, it’s a tough way to fight a war.

P51 Mustang Attack is a fine program and an outstanding simulation that leaves very little room for criticism. But I do have one historical bone to pick: The airplane pictured in the promotional material for P51 Mustang Attack is actually the P40 War Hawk. Sloppy, guys, very sloppy.

SUPPORT:

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Tell them “I saw it in HOT CoCo.” November 1985 HOT CoCo 21
Marooned

by Richard Ramella

Marooned is a graphics-adventure game marketed by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, 303-728-4937. It requires 32K. Extended Color Basic, and a disk drive. It sells for $29.95.

In every mystery there is a door that must be opened, no matter the danger. When the UFO lands in the cornfield, you won't just wave at it and go to bed. You are adventurous, so you'll walk up to the strange craft and step inside. And then it will take off, so you'll walk up to the strange ship takes off, you wander among the rooms of the alien aircraft, finding and using articles. It isn't telling too much to reveal that you will probably succeed in crashing the ship onto an alien planet—where the game continues. The landscapes of the planet are more artful than the sterile rooms of the ship, but I was confused at times when the same landscape showed up in several places.

Marooned's title screen shows the alien spacecraft in flight.

Marooned is essentially a Basic listing overlaid on scenes drawn from binary files. This makes the game fairly fast. The program also features text in the Extended Color Basic graphics mode. I found a minor bug while adventuring in a cave location, where I insisted on going in an illogical direction. It caused a BS (bad subscript) error and loss of the game. This single flaw is no reason to rule out this interesting game, however. Saguaro Software guarantees the program disk to load for the original owner for life and offers to replace the disk if it fails. You can also make a copy of the disk for safekeeping. The program's documentation is simple and to the point. It consists of only two pages, but it is enough to get you started. You'll take it from there.

Marooned's theme—wandering aboard a deserted UFO and being stranded on an alien planet—is not a strictly new idea to computer adventure. But if you have never been on an alien planet, Marooned will be new to you. The game is both fun and challenging. Its graphics are good, and its mysteries are not so overpowering as to verge on boring most players. I recommend Marooned, especially to first-time adventurers.

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22 HOT CoCo November 1985
On top of that, the sophisticated Telewriter user friendliness and pure power. Writing fun. With single-letter mnemonic looks like a printed page, with a good chunk of lower case characters.

TI, Victory TRS-80 Model III. Screen text than you'd get with Apple II, Atari, text on screen at one time. In fact, more on formatting, Telewriter surpasses all others for no feel for how your writing looks or reads.

Telewriter's chain printing feature means that the size of your text is never limited by the size of your 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.

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.

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.

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.

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!)

Before you are ecstatic praise from thousands of satisfied owners. And rightly so.

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

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

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

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, DPM-100/200, Epson, Okidata, Centronics, NEC, Brother, 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, hault rate (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.

3 display formats: 51/64/85 columns × 24 lines
True lower case characters
User-friendly full-screen editor
Right justification
Easy hyphenation
Drives any printer
Embedded format and control codes
Runs in 16K, 32K, or 64K
Menu-driven disk and cassette I/O
No hardware modifications required

THE ORIGINAL

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

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

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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.

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 checks (like Spell 'n Fix). Cassette verify command for sure saves. Cassette auto-replay 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-repair 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.

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

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

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Add $2.00 for shipping & handling. CA residents add 6% state tax.

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### Hot for Trivia Fever

**by Mark E. Reynolds**  
HOT CoCo staff

Trivia Fever is manufactured by Professional Software Inc., for Tandy Corp. (catalog no. 26-3295), 1400 One Tandy Center, Fort Worth, TX 76102. The game requires 64K and a disk drive. It sells for $29.95.

What do tree trunks and fish scales have in common? Who played the piano-playing Sam in Casablanca? Where did Davy Crockett make his last stand?

These are some of the 32,000 questions that come with Professional Software's Trivia Fever, an entertaining outlet for anyone caught up in the wave of trivia gaming that has swept the country recently.

From the top down, Trivia Fever is a nice product. Everything about it shows that its designers paid attention to quality: The sturdy and attractive box contains the game disk, startup instructions on heavy paper (including troubleshooting tips), a handsome book of questions and answers, a pad of tally sheets, a game spinner, and three color-coded bookmarks.

One of the best aspects of the game is that you can play it with or without a computer. To play the computer version, all you need is the game disk and your CoCo. The book, tally sheet, spinner, and bookmarks let you play without electricity. And yes, both versions require a sharp memory.

Program quality is also excellent. The first thing you'll notice is that Trivia Fever doesn't look like most programs you're used to because it is written in OS-9 compiled Basic and requires an OS-9 loading routine. Professional Software ported the game to the Color Computer under license from Tandy, which wanted OS-9 included for upward compatibility with future versions of the Color Computer.

If you have Disk Extended Color Basic version 1.0 and don't have OS-9, you must type in an 18-line program (provided with the startup guidelines) to create a Trivia Fever boot disk to load the game. If you have Disk Extended Color Basic 1.1 or later, you simply type DOS and press the enter key.

Playing instructions are on the disk. After you read them, you type in the game master's (or moderator's) name and the names of the players or teams. Trivia Fever can be played by one to eight players. There are three ways to handicap individual players or teams, making it possible for players of varying abilities to compete with each other. Better players can select shorter time limits in which to answer questions, choose a higher level from the three levels of difficulty, and pick those categories (from the seven the game offers) that they find more difficult.

Once you have set up Trivia Fever the way you want it, you remove the disk from your disk drive, flip it over, and reinsert it to load the questions. Game instructions and questions appear on screen in attractive upper- and lowercase letters. The game master, who may also be one of the players, controls the keyboard and answers prompts for information. Upon receiving an answer from a player, the game master presses keys to stop the clock, display the correct answer, and tell the computer whether or not the correct answer was given. Play moves along quickly and smoothly.

The program keeps score, gently chiding players for wrong answers and rewarding those who answer correctly with encouraging words. Successful players might also elicit a few bars of such tunes as "I'm Looking Over a Four-Leaf Clover," the "William Tell Overture," and "Whistle While You Work."

Error trapping is excellent. Trivia Fever will only accept keyboard input that reasonably answers program prompts. That means that even younger members of the family can safely have a turn at being game master. Trivia Fever is very easy to use and play. The few paragraphs of documentation that come with the package are all you need to get going. And if you exhaust the 32,000-questions data file, you can order Volume II, an additional set of questions, from Professional Software Inc., Box 533, Needham, MA 02194. Or phone their toll-free number, 1-800-343-4074. Sports buffs can order Super Sports, a separate game that offers thousands of sports-related questions in seven categories.

And don't forget that you can also play Trivia Fever without a computer. It is one CoCo game that can amuse everyone on long car trips. Even the person behind the wheel can play as long as someone else is asking the questions.

If you enjoy the mental exercise and friendly interaction that are a part of trivia gaming, you'll appreciate Trivia Fever. Even if you are not much for trivia, you'll have to admire the high quality of this product's programming and packaging, which makes it compare favorably with many other Color Computer programs.

So, are you ready to play Trivia Fever? I'm still trying to remember who played Sam in Casablanca.

---

### A Spelling Adventure

**by Richard Ramella**

Spelling is a series of 16 programs, contained on eight program cassettes, that covers the rules of spelling for grades 4 through 6. The series is available from Dorset Educational Systems, P.O. Box 1226, Norman, OK 73070, 800-654-3871, 405-288-2301 in OK. The package requires 16K and sells for $59.95.

Before completing my evaluation of this package, I told my son: "I'd like you to help me test some educational software called Spelling."

"No, thank you," the 9-year-old replied evenly. "I'd planned to go swimming in a volcano."

"Aw, come on!"

"Don't you get it, Dad? No! N-O!"
Later, when the boy was tightly bound to a chair in front of the computer, I loaded TalkfTutor, a monitor program that activates each of the 16 lessons in this eight-tape collection. "Let's try some homonyms," I said as I slipped in the lesson cassette.

He threw his forearms over his eyes like Dracula reacting to sunlight and screamed, "Child abuse! Mom! Help!"

"Glad to see you're getting in the spirit of things," I told him between gritted teeth.

"Child abuse! Mom! Help!"

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"Child abuse! Mom! Help!"
An Introduction to Personal Finance
by Stuart Hawkinson

Personal Finance is a series of 16 educational programs on eight cassettes for adults of all ages. It is available from Dorsett Educational Systems Inc., P.O. Box 1226, Norman, OK 73070. 800-654-3871, 405-288-2301 in OK. It requires 16K and comes on cassette. Personal Finance sells for $59.90.

Personal Finance is an audio home-finance tutorial that takes advantage of the Color Computer's capable hardware. The series provides basic information and quizzes on the subjects of home budgeting, taxes, loans, investments, and insurance. The presentation combines text, graphics, and audio material smoothly, using a mix of questions in multiple-choice and one-word-response formats.

Personal Finance covers a wide range of personal-finance topics. The subjects are presented at about the high-school level and could supplement a personal-finance course. Lessons on planning a personal budget are followed by an elementary discussion of basic economic theory. One lesson covers income-tax preparation and planning. Borrowing, credit, loans, and real-estate mortgages make up four lessons. Plans for life, property, and health insurance are each addressed by their own lessons. The final section of the package contains five lessons on saving money and investments, including stocks and bonds, securities trading, and various investment funds.

The lessons are uniformly presented at the introductory level. You will not get extensive help for preparing income-tax forms or learning about the latest investment fads and shelters. However, you will get a comprehensive review of the fundamentals.

You start a session by loading and executing a machine-language driver. The program will not run while there is a ROM pack or disk controller in the expansion port. Loading and startup take less than a minute. Thereafter, the program controls the cassette player—loading text and graphics, and feeding the audio to your monitor speaker. The two lessons on each cassette are on opposite sides. Normal playing time is 20 to 30 minutes, depending on your responses. The driver program is virtually "bullet proof" and needs to be loaded only once for a day's use.

Pressing the break key will get a response to load a new tape, but you can also continue with the current lesson.

The drill questions, of which there are about 20 for each topic, reinforce the lesson material. The narration on the tape is perfectly synchronized to text and graphics, including frequent "right" and "yes" responses to correct answers. Like many tutorial programs, you must answer correctly to proceed. A wrong answer elicits an error tone and a screen containing the expected response. The multiple-choice questions are often easy, while the one-word-response answers are sometimes difficult to guess. The program has no tolerance for misspellings or errors in capitalization.

The driver program keeps a record of your right and wrong answers, presenting your score at the end of each lesson. Students can try to improve their scores by replaying a lesson cassette at a later time. This might motivate younger students, but teens and
Checking on
ChesSD
by Terry Kepner

ChesSD was created by Software Dynamics and is distributed by Computer Systems Distributors, P.O. Box 9769, Anaheim, CA 92802, 714-772-1390. It requires 64K, Extended Color Basic, and a disk drive. It sells for $49.95 plus $2 for shipping.

If you have been waiting for a superior chess program, wait no longer. ChesSD is a disk-based program that stores almost 35,000 opening moves.

Starting the program is simple. You just put the ChesSD disk into drive 0 and press the Color Computer's reset button. While the game loads, a procedure that takes about 10 seconds, a checksum is calculated. A checksum failure indicates either a worn disk or possibly a drive-alignment problem. In the first case, just make a new backup of your master disk. (ChesSD is not copy-protected.) If you have the second problem, adjust your drive and try again.

Once loaded, ChesSD displays a high-resolution image of a chess board with all the pieces in place. While this isn't the most impressive chess display I've seen, it is more than adequate for its purpose—clear display of the individual chess pieces. Below the chess board is a comment line where the program provides messages relating to the state of the game, such as "thinking...", "book move," or "Check!"

To the right of the game board is a move table that indicates several game statistics. In the first case, just make a new backup of your master disk. (ChesSD is not copy-protected.) If you have the second problem, adjust your drive and try again.

All of the innermost operating processes are exposed. This book is an indispensable tool for the programmer seeking a full, in-depth knowledge of Basic. The Basic UNRAVELLED SERIES will make it easy for you to write your own Basic commands or modify Basic for whatever purpose you desire.

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November 1985 HOT CoCo 27
point of view. The latter is based on a point scheme for pieces taken: pawns equal 100, knights and bishops equal 300, rooks equal 500, queens equal 900, and kings equal 20,000. A positive score indicates that the computer is winning; a negative score means that you are winning. Other statistics on the move table are an estimate by the program of how its next move will affect the score. The rows are numbered from one to eight and the columns are labeled from A to H. ChesSD supports all the standard moves in chess, including castling, en-passant, pawn capture, and pawn promotion to queen, rook, bishop, or knight. An unusual feature of the game is that it doesn't progress. If you accidentally move into check and you cannot back up before completing it, you are out of luck unless you write down all moves as you played. But the largest shortcoming of ChesSD is that you cannot reverse a move. If, for example, you accidentally move into check and ChesSD takes your king, you cannot back up and replay the move. This last inconvenience will be especially apparent when experimenting with chess problems or exploring different strategies.

ChesSD's flexibility in letting you select the number of moves ahead it may look before moving a piece lets you tailor the game to your time and ability. The time required for the computer to calculate each move is fairly short, only about three seconds or less in the lower levels (one, two, and three). Moves in levels four, five, and six take the computer 30 seconds, three minutes, and 30 minutes, respectively. The seventh level is strictly for chess-by-mail fanatics. It requires five hours for each computer move. Tournament play usually takes place at level five. All in all, ChesSD plays a mean game of chess—even at the lower levels—because of its extensive disk-based opening book. If you make the mistake of accidentally tapping into a sequence of moves in this book of plays, the computer's moves come quickly and are devastating. Although the game is not rated, it seems to have a playing strength of about 1,500. ChesSD is not a tutorial, it assumes that you are familiar with the moves and assign positions to pieces for endgame or special chess problems. Although it is a powerful chess program, ChesSD does have a few problems. There is no way to obtain a written record of the various moves played in a game. If you want a record you must write it down as you play. You also cannot save a game that is in progress. If you must leave an interesting game before completing it, you are out of luck unless you wrote down all moves as you played. But the largest shortcoming of ChesSD is that you cannot reverse a move. If, for example, you accidentally move into check and ChesSD takes your king, you cannot back up and replay the move. This last inconvenience will be especially apparent when experimenting with chess problems or exploring different strategies.

The skill option specifies the number of moves ahead the computer may look when searching for its next move (to a maximum of seven). Choosing tournament sets the program for timed tournament play. Selecting play instructs the computer to trade places with you and play your color. You use this command to tell the computer to play the white pieces instead of its default setting to black pieces. En­merges moves the board to a predetermined arrangement, which is preset by manually entering the sequence of moves needed to play to that position. Although this is a time-consuming process, it is the only way to ensure that the board setup is correct. The last command is clearboard. You use it to clear the board of all pieces and assign positions to pieces for endgame or special chess problems.

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Tell them "I saw it in HOT CoCo."
One great feature of a disk-operating system is that it provides you with a disk's table of contents—the directory. Because you can see at a glance what a disk contains, it's easier to keep tabs on your files. But Disk Extended Color Basic doesn't fully exploit the directory's potential: you still have to remember command formats to copy, kill, rename, or load a file. File Directory lets you initiate these functions with one keystroke. It also sorts files alphabetically, dumps the sorted directory to a printer, lists an ASCII file on the screen, and protects 56 files per disk.

### Program Operation

The program reads the directory of a disk and displays it in screens of 10 files. Statistics are displayed and the files are presented in alphabetical order by a machine-language sort. The arrow keys control the cursor. The left arrow moves you to the previous screen; the right arrow moves you to the next one. The down arrow moves the cursor to the next file; the up arrow moves it to the previous file. Holding the arrow keys down makes them autorepeat. The cursor wraps between the first and last screens and between the first and last files in each screen. Figure 1 shows a sample session.

Initiate operating-system commands by positioning the cursor next to the file and typing the appropriate letter:

- **A**—Re-sorts the directory. This is especially useful after you have renamed a file.
- **B**—Re-reads the directory again. Use this command after inserting a different disk in the drive.
- **C**—Copies the file to another disk.
- **D**—Dumps the sorted directory to the printer.
- **G**—Quits the program.
- **L**—Lists a file in ASCII format.
- **R**—Renames the file. The program prompts you for a new name. If you press the enter key without typing a file name, the program ignores the rename command.
- **H**—Displays the help screen.
- **F**—Protects the disk by copying the file-allocation table and seven sectors of the directory to track 17, allowing you to protect 56 files per disk. (The date is stored in the last 8 bytes of granule 68.) This option also restores information from granule 68 to its proper location in track 17. A submenu asks you whether you wish to protect or restore. Before restoration, the date of the last protection is displayed and you must confirm your desire to continue. If granule 68 contains information other than a previously saved directory, the program asks if it should continue with the protection function.
- **K**—Kills the file. The program asks if it should continue with the protection function.
- **P**—Displays the directory in ASCII format.
- **O**—Opens the file-management program, they overlay the file-management program, they might not execute. End Basic programs with RUN "File Directory"; instead of STOP or END, to return control to the file manager. In this way, you can create a menu-driven disk.

### Program Listing: File Directory

```
10 CLEAR 2800
20 TS= "FULL SCREEN DIRECTORY"
30 PRINT@320, " <===== ====== options ====== >
40 IF PERK(6HE2)=190 THEN 6
50 GOSUB 1470:PRINT"DIRECTI
60 ELSE IF AS="Y" THEN 1530
70 CLS:PRINT@164,T$;"reading directory"
80 PRINT@164,T$'DIM NAS(16)

90 ' 180 'READING DIRECTORY
110 TRACK = 17
120 FOR S= 3 TO 11
130 DSKTSP,17,S,AS,B$'SPACE LEFT
140 A$=A$+LEFT$ (B$, 127)
150 FOR P= 1 TO 256 STEP 32
160 NAMES=MID$(A$,P,8)
170 EXT$=MID$(A$,P+8,3)
180 IF EXT$="." THEN Ext$=" "
190 IF EXT$="." THEN Ext$=" "
200 IF LEFT$(NAMES,1)=CHR$(255) THEN 240
210 NAS[Q]=NAS[Q]+1
220 NEXTP
230 NEXTS
240 GOSUB 1380 'SORT DIRECTORY
250 QO=QQ=1:GR=FREE(') 'FILES

X—Loads and executes a machine-language file or loads and runs a Basic file. Exercise caution with machine-language files. If they overlay the file-management program, they might not execute. End Basic programs with RUN "File Directory"; instead of STOP or END, to return control to the file manager. In this way, you can create a menu-driven disk.

### Program Techniques

It is worthwhile pointing out some of the techniques I used in File Directory. Line 30 checks to see if the machine-language program has already been loaded. Lines 100–230 read the disk directory into an array called NAS(). Line 280 creates a command string that is decoded in line 410 to branch control to the appropriate code. This is an excellent way to create a menu without excessive use of IF statements.

The FOR...NEXT loop in line 390 implements autorepeat by putting &HFF into the keyboard rollover table. EXEC 44519 is an efficient way of halting program execution until a key is pressed. POKE &HFF40 in line 730 stops the disk drive to allow the user to exchange disks. Line 980 shows how to run a program whose name is a variable. Notice the use of double quotation marks.

William S. Bonnell is an industrial engineer who specializes in simulation. Address correspondence to him at 239 Mason Ave., Rochester, NY 14626. Please enclose a stamped, self-addressed envelope for his reply.

---

*FULL SCREEN DIRECTORY*

---

**Options**

**A** B C D H K L P Q R X ARROWS

---

**Utility**

by William S. Bonnell

---

**System Requirements**

32K RAM

---

**Disk Extended Color Basic**

---

**Directory Assistance**

---

**Load, copy, and rename files from a disk directory.**

---

**Program Listing: File Directory**

---

**Program Techniques**

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**William S. Bonnell**
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November 1985 HOT CoCo 31

Listing continued
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You have just been elected secretary of your local (a) garden club, (b) Lions Club, (c) soccer league, or (d) all of the above, and you are looking for a mailing-list program that's easy to use and inexpensive. If you have the Telewriter-64 word-processing program, look no further—you already have a terrific mailing-list program. Check the ads to see if you can find one with full-screen editing, a 51-column display, imbedded printer codes, variable line spacing, merging, chain printing for long lists, plus search and replace features for deleting names or changing addresses. If you find such mailing-list software, you can bet it will be expensive. But with careful formatting, you can type your mailing list with Telewriter-64 and get all these features without paying a cent.

There is, however, one essential feature that Telewriter-64 lacks. A mailing list program must be able to sort and rearrange the list, usually alphabetically by last name or according to zip code. Such sorts are useful for finding duplicate entries and for postal bulk-rate pre-sorting. With the ASCII Save/Read-In program provided with Telewriter and the program described in this article, you can easily sort your mailing list by name, zip code, or—with simple program modifications—by membership number, shoe size, hair color, or any other item you want to include in your mailing list.

Typing the Mailing List

The key to using Telewriter for mailing lists is the format, which, as you can see from the example in Table 1, is simple. As with any Telewriter-64 text that you don't want right- and left-justified, you must use a caret semicolon (;) for the beginning and ending lines. The second line is used for the mailing-list title, which must be preceded by a caret T (^T)—the code for a nonprinting comment. Finally, after the title line and between each name-and-address block, you must type a caret N (^N). This advances the printer to the next mailing label when the list is printed.

Using this format, a 32K Color Computer with Telewriter-64 has room for 200 to 300 names per mailing list, depending on the average length of the names and addresses. A 16 or 64K computer would hold correspondingly shorter or longer lists. Fortunately, Telewriter-64 has provisions for chain printing any number of files, so this maximum is not really restrictive. For a list of 1,000 names, for example, you could quickly presort the names into those beginning with the letters A-G, H-M, N-S, and T-Z: type them as four lists; sort each one; and chain print them.

Printing the Mailing List

The Telewriter format menu offers several choices that are useful for printing mailing lists. The most common printing requirement is to put each name and address on a separate mailing label. For the standard 1/4-inch labels (1-inch spacing from label to label), set the printer for six lines per inch and the Telewriter-64 format menu to six lines per page. You will probably also want to set the left margin to five. With the one-line format-menu choice set at zero, the entire mailing list will be printed at once. For larger or smaller labels, set the lines per page on the format menu to the appropriate number.

The printing sequence is flexible. If you would like to use sheets

System Requirements

16K RAM
Disk Drive
Disk Extended Color Basic
Telewriter-64
Printer
containing two or three columns of labels, use the partial-print feature to print the first half or third of the list. Then reset the margin, roll the paper back to the start, and use the partial print for the next portion of the list. Another variation lets you print names and addresses directly on envelopes, flyers, or catalogs. In this case, set the lines per page to 66 and the one-page statement to one. Now each time you roll in an envelope and press the break key, the printer will print the next name and address and roll the envelope out into your hand.

Sorting the List

To sort a Telewriter-64 mailing list, type in and save the TW Sort program shown in Listing 1. The program is designed for the list format given in Table 1. If your mailing list requires a different format—an extra address line for a membership or phone number, for instance—refer to the last section for help in modifying the program. Unfortunately, you cannot use commas or colons in addresses because they are interpreted as Disk Basic commands.

The procedure for sorting mailing lists is simple. First, type the mailing list in the proper format using Telewriter-64; then return to the Telewriter-64 menu and enter Basic by pressing B. Load the ASCII Save/Read-In program provided with Telewriter-64. Put a newly formatted disk in the drive and save the mailing list as ASCII code. Be sure to use the file name, SORT ML, when saving the list. Turn off and restart the computer; then load and run TW Sort. The program prompts you to press the play button and select the sort method. Go to the prompts to save the sorted list on disk.

Now, reload Telewriter-64 and the ASCII Save/Read-In program as before. Read in the sorted mailing list, which is now called SOR TEDML. Return to Telewriter-64’s edit mode and check the list to be sure it is still properly formatted. Then return to the Telewriter-64 menu and save the sorted list on another disk in the normal (non-ASCII) Telewriter-64 file format. This will make it easy to load and use later without the ASCII Save/Read-In program. You can now print labels, periodically update the list, or pass it along to the next person that gets stuck with the secretary’s job.

The Sorting Program

TW Sort is designed so that you can easily adapt the format to your needs. Each section of the program is labeled to show its function, and the structure follows—as much as possible—a logical order. To see how you can modify the program, let’s add a membership-number line above each name.

First, you must dimension a new variable, call it MEMNUM$, in line 15. Change the input routine to read four lines per address block by changing the 3 in line 1025 to a 4. Next, add a new membership-number sort routine after the zip-sort routine. Since the first line of each list item would contain only the membership number, you don’t need a subroutine to separate that number as you do with the last-name and zip sorts. Simply write program lines to compare each membership number with the other.

Table 1. Example of Proper Format for Original (Unsorted) Mailing List

<table>
<thead>
<tr>
<th>Name</th>
<th>Address</th>
<th>State</th>
<th>Zip</th>
</tr>
</thead>
<tbody>
<tr>
<td>John Doe</td>
<td>123 Fourth Street</td>
<td>NY</td>
<td>10102</td>
</tr>
<tr>
<td>Mary Smith</td>
<td>987 Main Street Apt. #4</td>
<td>FL</td>
<td>35508</td>
</tr>
<tr>
<td>Bill Jones</td>
<td>55 Washington Ave.</td>
<td>TX</td>
<td>75234</td>
</tr>
<tr>
<td>Pat Hill</td>
<td>P.O. Box 456</td>
<td>CA</td>
<td>98240</td>
</tr>
<tr>
<td>J. C. Nickel</td>
<td>Route #1 Box 76</td>
<td>NM</td>
<td>87649</td>
</tr>
</tbody>
</table>

Table 1. Example of Proper Format for Original (Unsorted) Mailing List
ers. (Lines 2525-2560 perform this function for the zip codes.) Finally, write PRINT statements for MEMNUM$(I) in the print-sorted-list and save-sorted-list routines.

In an effort to keep the program short and simple, I used a rather primitive sorting technique. As a result, the sorting times get long for large lists—over two hours for 250 names. But since you don’t have to perform sorts frequently, this shouldn’t be a severe shortcoming. If none of the zip codes you use contains nine digits, delete line 210 to speed up the sort.

Two final notes on the TW Sort program. If you have an early version of the CoCo, you might have the ROM (read-only-memory) version with the PCLEAR bug in it. If you get only an OK prompt when you run TW Sort, type RUN again. You can also omit all comment lines to reduce your typing. The GOTOs and GOSUBs transfer control to the line following the comment, so the program runs with or without the comments.

Address correspondence to J.D. German, Creative Technical Consultants, Box 652, Cedar Crest, NM 87008.

---

Program Listing: TW Sort.

10 CLS
20 CLS
30 GOTO 700
100 ***SUBROUTINES***
200 NAME SEPARATOR***
120 Z = LEN(NS)
130 FOR K = 1 TO Z
140 IF VAL(ZIP$(K)) = 0 THEN ZIP$ = "" ELSE NEXT K
150 DIM NAME$(250), ADDR$(250), CSZ(256)
160 IF LEFT$(L$(K),1) = " " THEN L$(K) = RIGHT$(L$(K),LEN(L$(K)) - 1)
170 IF L$(3) = LEFT$(L$(1),LEN(L$(3)) - 1):
180 IF CSZ$(J) = CSZ$(J - 1):
190 IF NAME$(J) = NAME$(J - 1):
200 FOR RL = 1 TO J
210 IF ZIP$(J) = " " THEN NEXT J
220 IF CSZ$(J) = CSZ$(J - 1):
230 IF NAME$(J) = NAME$(J - 1):
240 IF NAME$(J) = NAME$(J - 1):
250 IF ZIP$(J) = " " THEN NEXT J
260 IF CSZ$(J) = CSZ$(J - 1):
270 IF NAME$(J) = NAME$(J - 1):
280 IF NAME$(J) = NAME$(J - 1):
290 IF ZIP$(J) = " " THEN NEXT J
300 FOR J = EL TO I + 1 STEP -1
310 NEXT J
320 END

---

2000 ***LAST NAME SORT***
210 IF ZIP$(J) = " " THEN I = 1: GOTO 3050
220 IF NS = L$(1): GOSUB 120
230 IF NAME$(J) = NAME$(J - 1):
240 IF ZIP$(J) = " " THEN NEXT J
250 NS = L$(1): GOSUB 120
260 IF NAME$(J) = NAME$(J - 1):
270 IF ZIP$(J) = " " THEN NEXT J
280 NS = L$(1): GOSUB 120
290 IF NAME$(J) = NAME$(J - 1):
300 IF ZIP$(J) = " " THEN NEXT J
310 NS = L$(1): GOSUB 120
320 IF NAME$(J) = NAME$(J - 1):
330 IF ZIP$(J) = " " THEN NEXT J
340 NS = L$(1): GOSUB 120
350 IF NAME$(J) = NAME$(J - 1):
360 IF ZIP$(J) = " " THEN NEXT J
370 NS = L$(1): GOSUB 120
380 IF NAME$(J) = NAME$(J - 1):
390 IF ZIP$(J) = " " THEN NEXT J
400 NS = L$(1): GOSUB 120
410 IF NAME$(J) = NAME$(J - 1):
420 IF ZIP$(J) = " " THEN NEXT J
430 NS = L$(1): GOSUB 120
440 IF NAME$(J) = NAME$(J - 1):
450 IF ZIP$(J) = " " THEN NEXT J
460 NS = L$(1): GOSUB 120
470 IF NAME$(J) = NAME$(J - 1):
480 IF ZIP$(J) = " " THEN NEXT J
490 NS = L$(1): GOSUB 120
500 IF NAME$(J) = NAME$(J - 1):
510 IF ZIP$(J) = " " THEN NEXT J
520 NS = L$(1): GOSUB 120
530 IF NAME$(J) = NAME$(J - 1):
540 IF ZIP$(J) = " " THEN NEXT J
550 NS = L$(1): GOSUB 120
560 IF NAME$(J) = NAME$(J - 1):
570 NS = L$(1): GOSUB 120
580 IF NAME$(J) = NAME$(J - 1):
590 NS = L$(1): GOSUB 120
600 IF NAME$(J) = NAME$(J - 1):
610 NS = L$(1): GOSUB 120
620 IF NAME$(J) = NAME$(J - 1):
630 IF NAME$(J) = NAME$(J - 1):
640 IF NAME$(J) = NAME$(J - 1):
650 IF NAME$(J) = NAME$(J - 1):
660 IF NAME$(J) = NAME$(J - 1):
670 IF NAME$(J) = NAME$(J - 1):
680 IF NAME$(J) = NAME$(J - 1):
690 IF NAME$(J) = NAME$(J - 1):
700 IF NAME$(J) = NAME$(J - 1):
710 IF NAME$(J) = NAME$(J - 1):
720 IF NAME$(J) = NAME$(J - 1):
730 IF NAME$(J) = NAME$(J - 1):
740 IF NAME$(J) = NAME$(J - 1):
750 IF NAME$(J) = NAME$(J - 1):
760 IF NAME$(J) = NAME$(J - 1):
770 IF NAME$(J) = NAME$(J - 1):
780 IF NAME$(J) = NAME$(J - 1):
790 IF NAME$(J) = NAME$(J - 1):
800 IF NAME$(J) = NAME$(J - 1):
810 IF NAME$(J) = NAME$(J - 1):
820 IF NAME$(J) = NAME$(J - 1):
830 IF NAME$(J) = NAME$(J - 1):
840 IF NAME$(J) = NAME$(J - 1):
850 IF NAME$(J) = NAME$(J - 1):
860 IF NAME$(J) = NAME$(J - 1):
870 IF NAME$(J) = NAME$(J - 1):
880 IF NAME$(J) = NAME$(J - 1):
890 IF NAME$(J) = NAME$(J - 1):
900 IF NAME$(J) = NAME$(J - 1):
910 IF NAME$(J) = NAME$(J - 1):
920 IF NAME$(J) = NAME$(J - 1):
930 IF NAME$(J) = NAME$(J - 1):
940 IF NAME$(J) = NAME$(J - 1):
950 IF NAME$(J) = NAME$(J - 1):
960 IF NAME$(J) = NAME$(J - 1):
970 IF NAME$(J) = NAME$(J - 1):
980 IF NAME$(J) = NAME$(J - 1):
990 IF NAME$(J) = NAME$(J - 1):

---

MAT, INPUT LIST TO TELEWRITER USING ASCII READ-IN PRINT OGRAM.*
5000 OPEN "S" ,1,"SORTEDML"
5100 PRINT1,CCS
5120 PRINT1,TITLE$ 
5125 PRINT1,NPS
5130 FOR I=1 TO EL
5140 PRINT1,NAME$(I)
5150 PRINT1,ADDR$(I)
5160 PRINT1,CCS$(I)
5170 IF I<EL THEN PRINT1,NPS
5180 NEXT I
5190 PRINT1,CCS
5200 CLOSE1
5210 CLS
5220 PRINT SORTED MAILING LIST IS SAVED. PRESS ANY KEY TO RETURN TO THE LAST MENU.*
5230 GOSUB 260: GOTO 3505
7000 ***INSTRUCTIONS***
7010 PRINT@6, "tw sort instructons*
7020 PRINT@32," 1> USE TELEWRITER TO CREATE A MAILING LIST IN THIS FORMAT:*
7030 PRINT@10,* ;*;
7040 PRINT@132," T CLUB MAILING LIST:*
7045 PRINT@164, "N:"
7050 PRINT@196," JOHN A. DOE"
7060 PRINT@228, "123 FIRST STREET"
7070 PRINT@26, "ALBUQUERQUE, NM 87109"
7080 PRINT@292," N:" 
7090 PRINT@324," JANE SMITH"
7100 PRINT@356, "2468 MAIN STREET"
7110 PRINT@388," AURORA, IL 60516 *
7120 PRINT@429, "*: *
7130 PRINT> ASCII SAVE LIST AS "S ORT ML:"
7140 GOSUB 260
7150 CLS
7160 PRINT10," to use tw sort:"
7170 PRINT@64," A> INSERT ASCII MAILING LIST DISK TO BE SOR TED:" 
7180 PRINT@192," B> SELECT SORT OPTION 1 OR 2:" 
7200 PRINT@324," 1) NAME SORT:" 
7210 PRINT@356," 2) ZIP SORT:"
7220 GOSUB 300
7230 CLS
7240 GOTO 1010

---

END
Listen to the clues to find the thief before your opponents.

Someone has committed a crime. You and your opponents are private detectives assigned to track down and arrest a thief. The detective who makes the arrest receives a reward. Your challenge—to be the first detective to accumulate enough reward money to win.

This thief is computer controlled and completely invisible. But you can hear him. Each time the thief makes a move on the board, he triggers a sound on your CoCo. This remarkable device follows every move the thief makes on the board so you can hear him in the very act of committing the crime, crossing a squeaking floor, opening a creaky door, or escaping on the elevators.

Each sound you hear on your CoCo provides you with a clue to the thief's location: with these, you can track him down.

Use your CoCo to call the cops, direct them to the thief, and with a little luck, the cops will arrest him.

System Requirements

32K RAM
Extended Color Basic

Loading

To load, type in the Listing. Check every line to be sure it agrees with the Listing. Count the number of items in each DATA statement to ensure the correct number for the required READ loops and DIM statements.

After you run the program and display the board, make sure the yellow, orange, and dark blue squares are lined up horizontally, vertically, and diagonally. If they don't line up, the program will not run correctly. Check the main body of DATA statements for errors.

The Board

The board is made of graphic character blocks POKEd onto the screen with two blocks making up each square space. The players' and thief's symbols displayed on the board cover only half of each space so you can see the color of the space you are on.

The green spaces represent walls that neither the player nor the thief can move onto or cross. The yellow and black spaces are empty: the players can move onto either of these areas, but the thief can only move on the yellow spaces. The orange spaces represent places where the thief might commit a crime and are treated as yellow spaces for movement purposes. The dark blue squares represent doors through which both the thief and the player can move. The light blue areas can cover one or more spaces and represent items such as checkout counters, desks, statues, and plants. Neither the thief nor the players can move onto these areas. The white spaces represent windows into which neither the thief nor the player can move. (See Table 1.)

In the top right and the bottom left corners of the board is the symbol EL, which represents the two elevators on each level. To use an elevator, position your character on the E of EL and press U for up or D for down. The CoCo reprints the screen to the level above your present level (1–4) is printed in the bottom left corner of the screen.

Along the bottom is a line of information. If a question mark appears, it is your prompt to press a key. Next, in response to this, a “NO” or an “OK” appears on the subline. OK indicates that the CoCo can carry out the function of that key. The next item to appear is a two-character symbol representing the last sound clue given, and finally, the name of the current player, the amount of money he has, and the number of moves he has left.

Your Turn

At the beginning of your turn, the CoCo moves the thief and gives corresponding sound clues and a random number of moves from 1 to 12. You use one card per turn by pressing C. The CoCo clears the screen and displays your three cards. Press the number of the card you wish to use, and the CoCo carries out your wish. If you don't want a card, press five and the CoCo reprints the screen. You can use a card later: the CoCo replaces it with another random card.

Table 1. Board Information

When you use a “tip” card, watch the screen carefully because the CoCo only displays a T (the thief’s location) for a few seconds. After you use a “take another turn” card, the CoCo gives you more moves and a chance to use another card. On your turn you can use all, part, or none of your moves. When you press F to finish, the next player starts.
**Player Movement**

Eight different keys let you move your symbols as follows: N moves north; T, northeast; E, east; R, southeast; S, south; Z, southwest; W, west, and Q, northwest. Seven other keys, including U and D, help you on your mission. R repeats the last clue, and X alternately prints the thief's and the player's level. (See Tables 2 and 3.)

**Player Movements**

| N | North |
| T | Northeast |
| E | East |
| V | Southeast |
| S | South |
| Z | Southwest |
| W | West |
| G | Northwest |
| U | Up |
| D | Down |

*Table 2. Player Movements*

| A | Arrest |
| R | Repeat Clue |
| C | Use Card |
| X | Display Thief Level |
| F | Finished |
| H | Help Table |

If the only item displayed on the subline is a question mark, press X until the complete location of the thief is heard. The CoCo then congratulates you and starts an arrest by taking away $100 and all your remaining moves.

**Thief Movement**

The CoCo only moves the thief in three circumstances: at the beginning of each player's turn and when a player uses a "take another turn" card, when a player uses a "take an extra clue" card, and when the thief gets away during an arrest. Every time the thief moves, the CoCo announces a clue and prints the symbol on the subline. For every clue sounded, the thief moves two full spaces horizontally, vertically, or diagonally. When the thief escapes an arrest, five clues sound, so he moves 10 spaces for every use of an "extra clues" card, he moves two spaces per clue. When a thief moves, he never goes directly to his previous space, but may do so in two moves. The thief moves on every other space and is never found on a black space.

Four clues can appear on the subline. The first clue to appear in the game is CR, meaning the thief has just committed a crime and is on an orange space. When he has opened a door, DR appears on the subline and he is on a dark blue space. If the thief has just taken two steps across an open floor, SP appears and he is on a yellow space. You know that the thief is on one of the two EL spaces when EL appears on the subline.

When the thief uses an elevator the CoCo picks a random number to see if he goes up or down. He will always go from the first to second level or from the fourth to the third. The CoCo prints the thief's level and the current player's level. As long as the thief's level differs from the player’s, the CoCo reprints the thief's level before giving the next clue.

*Table 4. Influence of Difficulty Level*

<table>
<thead>
<tr>
<th>Difficulty Level</th>
<th>Number of Cards</th>
<th>Chances of Thief Escaping</th>
<th>Maximum Rolls</th>
<th>Reward</th>
<th>Money to Win</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>20%</td>
<td>12</td>
<td>$800</td>
<td>$2,000</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>25%</td>
<td>10</td>
<td>$700</td>
<td>$2,500</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>33%</td>
<td>8</td>
<td>$600</td>
<td>$3,000</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>50%</td>
<td>6</td>
<td>$500</td>
<td>$3,500</td>
</tr>
</tbody>
</table>

**Tracking the Thief**

At any given moment, the thief might be at one of several locations. You must use your knowledge of where and when a thief moves, along with his previous location to determine where he might be. When tracking the thief, watch every space that is exactly two spaces away from the thief's possible location. Remember also that the clues given during the other players' turns are just as important as the clue given during your turn. You can narrow the possibilities down to two or three if you don't know the thief's exact location.

**Playing the Game**

After displaying the help screens and prompting you to choose the level of difficulty, the CoCo asks for the name of each player. Submit a name containing three to eight characters. The program renumerates the names in a semirandom order. Assigns a symbol to each name, and prints the renumbered names and the players' symbols for use on the board. The CoCo randomly assigns each player three cards and displays them for each player. The game starts on a randomly chosen floor. Finally, the CoCo places the thief on a random crime space. sounds the clue, and turns the keyboard over to the first player.

To start another game, press the Y key after a player has won the game or press the break key and type GOTO 58. For a longer game, choose a higher difficulty level.

Address correspondence to Wade Jense, 440 E. 300 N., Pleasant Grove, UT 84062.

**Program Listing. Halt Thief**

```
2 ** HALT THIEF II
6 CLS: FORL=29696+3287:POKEL,12 8:NEXT
7 POKE65478,0:POKE65481,0:POKE65492,0:POKE65485,0:POKE65487,0:POKE
65489,0:POKE65493,0:POKE65494,0:POKE65495,0
8 FORL=1TO110
9 READST @POKE(ST+29696),255
11 SOUND55,1:NEXT
12 FORR=1TO250
13 READY,1
14 POKE(V+28674),2
15 SOUND200,5:NEXT
16 DATA37,41,43,44,45,46,47,49,5
17 $800 $2,000
18 DATA1403,9,1404,9,1442,6,1443,6,1444,3,3,1444,14,1446,49,1447,57,1448
19 FORLV=3287:TO32255
20 READ LE
```

November 1985
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. Its 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, ellipse, etc.) to create perfect illustrations with speed and ease. There's a Pencil, an Eraser and even a selection of Calligraphy 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-to-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 3½ 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 CoCo screens to less than a page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ½ page size.
**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.

**THE COCO MAX SYSTEM**

**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 4096 164 x 64 points on the CoCo screen? Yet, the Color Computer's high resolution screen has 49,152 (256 x 192) pixels. This means a joystick, mouse or even a touchpad 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 limitation 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 touchpad 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 touchpad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

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Take the confusion out of performing mathematical and geometric computations.

Calculators are nifty devices that make mathematical computations easier. The trouble with calculators, even the ones with memories, is that it's easy to lose track of the numbers you're entering if you have to go through a series of steps to obtain an answer. That's especially true if you're trying to remember geometric formulas at the same time. With Mathematic Helper (see Listing), your CoCo becomes a calculator that prompts you for input and stores (for some calculations) the result of your last computation on the screen for easy reference. It helps you with problem solving when you need to perform addition, subtraction, multiplication, division, or square roots; raise numbers to a certain power; or do figuring for solid cubes, triangles, circles, cones, cylinders, solid rectangles, pyramids, or prisms. (Refer to Table 1 for an outline of program flow.)

Using the Program
In the opening screen, a blinking cursor marks the instructions. The first operation, addition, is highlighted in the line below, and another highlighted box at the bottom of the screen contains the result of the last operation—zero when you first run the program. Use the right- and left-arrow keys to move through the list of operations until the one you want appears in the top highlighted box, then press the enter key to bring up the screen for that operation.

The first five operations are addition, subtraction, multiplication, division, and square root. The program prompts you to input the values (only one value is required to compute a square root) and then displays the answer.

System Requirements
16K RAM
Extended Color Basic
To carry the result of these equations from one to the other, type Y in response to the save-result prompt.

The next operation, solid cube, requires only one entry: the length of one side. The program computes the cube's cubic contents and the square surface area. Although you can carry a result from a single-answer calculation (e.g., multiplication) into the solid-cube calculation, you cannot carry an answer from it to another problem because the program gives more than one result. The program displays the cubic contents as the answer in the last-result box.

When you select the triangle function, the program asks whether it is a right triangle—one that has a 90-degree angle. For right triangles, you must enter at least two more items of information; for other triangles, you need at least three pieces of information. Use the up- and down-arrow keys to select an item; press the enter key to bring up the input prompt for your selection. When the program has sufficient data, it computes the values for the triangle you entered. If the program computes the triangle's values, it displays the result.

The next operation, solid cube, requires some operations. Use the up- and down-arrow keys to move through the list and reveal the computed values.

The power calculation involves three values: the base (X), power (Y), and result (Z). When you submit two of the values, the program asks whether it is a right triangle—has angle C is 90 degrees. For right triangles, you must enter at least two more items of information; for other triangles, you need at least three pieces of information. Use the up- and down-arrow keys to select an item; press the enter key to bring up the input prompt for your selection. When the program has sufficient data, it computes the values for the triangle you entered. If the program computes the triangle's values, it displays the result.

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This program is available on our Instant CoCo cassette. See the Instant CoCo ad elsewhere in this issue.

HOME
by Delbert A. Baker

Finding Firewood
Best-Buys

Calculate the most economical way to fill your woodshed.

One day in October 1982, a friend asked if I'd like to buy pine firewood at $60 per cord, cut and delivered. I bought two cords and split and stacked it. But as I burned it to keep warm that winter I kept wondering if I had made a good deal.

I reasoned that my CoCo should be able to do the calculations and store the necessary data with ease. However, before I could write equations for the program, I had to decide what kind of comparison would help me make a quick decision about which firewood to purchase. I wanted to be able to look through the classifieds and compare the woods offered to oak, which was selling for $70 to $75 (cut and delivered), and determine whether they were a good value in heat content per dollar.

How the Program Works

I wrote an equation that would make the comparison and return an answer in cost per cord as if I had spent the same amount of money on oak. For example, if I were offered wood with half the heat content of oak, the program would tell me that the equivalent price for a cord of oak was twice the price of the wood in question. I could then check the newspaper to find out the prevailing cost for a cord of oak. If the price of oak were higher than the calculated price of the other wood, then the other wood would be a good deal, comparatively. If it were lower, it wouldn't be such a bargain.

Research at the local library yielded the total heat value per cord of several kinds of wood and the heat value of several nonwood fuels. (See Table 1 for a short bibliography on wood heat.) I used this information to produce a program with five options:

Option 1 performs the calculation that allows you to compare the price of a certain wood to the prevailing cost of oak. Option 2 displays the heat content (in millions of BTUs per cord) of all the types of wood for which I could find data. You must type in the name of the wood exactly as it appears in the DATA statements; otherwise you receive a message that reads, "I do not have that wood data." Option 3 explains the meaning of the calculation in option 1.

Option 4 displays the nonwood-fuel data and prompts you to select one of the items. It then asks you which wood you wish to compare. The result given is the amount of the nonwood source that replaces one cord of the chosen wood if both are burned at 100-percent efficiency.

To make true comparisons, you need the efficiency ratings of the respective heating units—e.g., a wood stove and an oil furnace. If the stove is 50-percent efficient and the furnace is 75-percent efficient, multiply the wood amount by .5 and the nonwood amount by .75 to find out how much heat is delivered. Compare the prices to decide which fuel is most economical. You could also use this option to compare operating costs before installing a heating system.

A word of caution: The program evaluates natural products that are highly variable in their properties. Consequently, the calculated results are approximate. Furthermore, the program does not take all factors into account; you must decide what value to attach to such things as delivery, splitting, and stacking.

Program Structure

Lines 100-620 contain the main program.
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November 1985 HOT CoCo 49

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including the menu, subroutine directions, and the wood data. Lines 630–890 control option 1. Line 640 prompts for a wood type; lines 660–690 search for a data match. If a match is not found, control passes to lines 910–960. The data is restored, the no-match message is displayed, and the program asks you if you want to see all the wood types available. If you elect to see the data, control passes to the subroutine in option 2. If a match is found during the search, the program jumps to lines 710–890, where you input an asking price and confirm it. The calculation is performed in lines 760–780: the results are reported by lines 840–870.

Lines 980–1130 are the data-display routine. The program displays the data in screens of 12 lines until it reaches STOP. You then return to the main menu. Lines 1150–1420 contain a short explanation of the result of the calculation in option 1. Delete this section if you wish to conserve memory.

Lines 1440–1990 control option 4. Lines 1440–1460 set the data pointer to the first entry of the nonwood data. Line 1470 reads the nonwood data and stores it in an array. Lines 1490–1590 display the nonwood data. Ask you to enter the wood type that you want, and check your input. When you confirm your selection, control passes to lines 1600–1640. After you submit the wood type, the wood data is retrieved from the DATA lines. Line 1650 makes the comparison calculation and adjusts the result to read in whole numbers for nonwood materials measured in tons. Line 1660 adjusts the calculation result to two decimal places for nonwood materials measured in tons. Lines 1760–1740 display the results of the calculation. Lines 1810–1940 provide a short explanation of option 4. Lines 1960–1990 offer the option 2 data display if an invalid wood type is entered in line 1600.

Modifying the Program

If oak is not a common firewood in your area, you might want to choose another standard for comparison. Select a wood that is widely enough used that the price does not vary between suppliers.

If, for example, you live in an area where maple is the standard and you know (or find out) that it is all from one of the hard species like sugar maple, list lines 470–570 to find the data entry for hard maple. Substitute the basic heat value for hard maple (24,000) in the equation. \( X = 25,000 \) in line 760. Edit line 820, deleting “oak” and replacing it with “hard maple.” The program will then use maple as the standard for comparison. You might also want to change the explanatory subroutine (option 3) to reflect your modification.

You can add another kind of wood or nonwood fuel to option 2. To add a wood source, you must know the total heat value of a cord of that wood in thousands of BTUs. If the value is given in millions of BTUs, move the decimal point three places to right: 26.5 million BTUs equal 26.5 00 thousand BTUs. For example, kerosene has a total heat value of 25,000 BTUs per gallon, so you would enter 25.000. You must have a program that will use your new option.

As written, the program uses about 6.600 bytes. To run the program in Color Basic, change the LINE INPUT statement in line 640 to INPUT statement. Be careful when typing in the program and answering the prompts—I have included only minimal error checking. If you have problems with the program, please write to me, enclosing a self-addressed, stamped envelope for my reply. ■


Table 1. Bibliography

Address correspondence to Delbert A. Baker, 4780 Christopher Ave., Albany, OR 97321.

---

Program Listing. Firewood

```
110 REM FIREWOOD COST PROGRAM
120 REM D. BAKER 1983
130 REM TRS=80 COLOR COMPUTER
140 REM
150 REM Q, QS=USER RESPONSES
160 REM W$=INPUT, WOOD TYPE
170 REM P=INPUT, WOOD PRICE
180 REM NS=DATA, WOOD TYPE
190 REM H=DATA, HEAT VALUE
200 REM X=HEAT VALUE OF OAK
210 REM C=CALCULATED WOOD COST
220 REM E=HEAT IN KILOWATT HOURS
230 REM G=HEAT IN CUBIC FEET OF NATURAL GAS
240 REM AS(L)=DATA, NON-WOOD SOURCE
250 REM RL(L)=DATA, NON-WOOD SOURCE
260 REM US(L)=DATA, NON-WOOD SOURCE
270 REM V=CALCULATED NON-WOOD QUANTITY
280 REM Y=FOR-NEXT VARIABLE
290 REM
300 REM P=H; Q=H; C=B; E=G; G=B
310 DIMAS(12),R(12),US(12)
320 CLS
330 PRINT TAB(13) "MENoU": PRINT
340 PRINT *1 "CALCULATION": PRI
350 PRINT *2 "AVAILABLE WOOD DATA": PRINT
360 PRINT *3 "EXPLANATION":PRIN
370 PRINT *4 "NON-WOOD CONVERSIO
380 PRINT *5 "QUIT":PRINT
390 INPUT "IN WHICH DO YOU WANT":Q
400 IF Q<1 OR Q>5 GOTO 320
410 IF Q=5 THEN 440 ELSE 420
420 ON Q GOSUB 630,980,1159,144
430 PRINT "ENTER <M> FOR THE MENU U"
440 INPUT "PRESS <ENTER> IF FINI
450 IF QS=M*"THEN 320
460 PRINT "GOODBYE FOR NOW":
470 DATA APPLE, 26500, BLACK ASH,19100, WHITE ASH, 23600
480 DATA ASPEN, 14700, BASSWOOD, 13500, BEECH, 24000
490 DATA PAPER BIRCH, 20300, YEL LOW BIRCH, 23600, BOXELLER, 1700
500 DATA CEDAR, 12200, CHERRY, 20000, COTTONWOOD, 1350
510 DATA ELM, 19500, FIR, 14300, HACKBERRY, 28300
520 DATA HEMLOCK, 15900, HICKORY, 21700, HORNBEB, 27300
530 DATA HARD MAPLE, 24800, SOFT MAPLE, 18700, OAK, 25000
540 DATA JACK PINE, 17100, NORMA Y PINE, 17100, WHITE PINE, 14300
550 DATA SPRUCE, 15900, TAMARACK ,20800, ALDER, 15900
560 DATA DOUGLAS FIR, 17600, LAR CH, 20800, PONDERosa PINE, 18100
570 DATA REDWOOD, 18300, STOP, 
580 DATA ANTHRACT COAL, 23000, TON,HI VOLATILE BITUMINOUS COAL, 22000, TON,LO VOLATILE BITUMI OUS COAL, 28600, TON
590 DATA LIGNITE COAL, 13800, TON,NO.1 FUEL OIL, 135, GAL, NO.2
600 DATA KEROSENE, 135, GAL, PRO PANE, 91, GAL, NATURAL GAS, 1, C
610 DATA CHARCHOCAL, 13, LB, ELECT RICITY, 3.413, KWH, XXXX, 00, XX
620 END
630 CLS
640 LINE INPUT "WHICH WOOD DO YO
650 PRINT "YOU WANT TO BUY?":W$ 
660 PRINT
669 PRINT
670 IF NS="STOP" THEN 910
680 IF NS=W$ THEN 780
690 GOTO 660
```
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 8-bit 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 ALILOGIC.
- Full Floating Point arithmetic expressions with functions.
- SUBROUTINE and CALL commands allow for sub-programming.
- Full sequential and direct access disk file allowed.
- BASIC source code can be loaded into disk tape or memory.
- Many new commands that expand your programming capability.

Commands Supported

1. I/O Commands
   CLOSE CLODN  CREAD  DIR  DRIVE  DSK18
   DSK0$  FLD0S  GET  INPUT  KILL
   LSET  OPEN  PRINT  PUT  REBT

2. Program Control Commands
   CALL  END  EXEC  FOR  GOSUB  IF  NEXT  ON  OR  RETURN  STOP  SUBROUTINE

3. Math Functions
   ABS  ARC  ATN  COS  CYS  EDF
   EXP  FIX  INRT  IWK  LOG  MCI
   MOV  PEEK  POINT  PRIN  RND  SQR
   SIN  SQR  TAN  TMR  VAL

4. String Functions
   CHR$  INKEYS  LEFT$  MID$  MKS$  RIGHT$  STR$  STRINGS
   TYPE  WRITE

5. Graphic/Sound Commands
   COLOR  CLS  CIRCLE  DRAW  LINK  PAINT  PCLREAD  PCLS  PLAY  PNODE  PSET
   RESET  SCREEN  SET  SOUND

6. Other/Special Commands
   DATA  DIN  DDLIST  EOUT  FOR  IF  POK$  READ  REM  RESTORE  RUN  TAB  TBL
   VERIFY  UGD  DSDT  LREF  MEND  PCB  PAUSE  PNODE  PTV  PRINT  PRNG  PRN
   PRT  RLD  SET  SETUP  SETC  SOFT  SPACE  STD  STRS

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130 PRINT "I LEAVE ANY EFFICIENCY OR ELECTRICAL COST CALCULATIONS ON YOU."
140 PRINT "I REALLY DON'T HAVE ROOM FOR ALLOF THE DATA THAT WOULD REQUIRE."
141 INPUT "PRESS <ENTER> TO CONTINUE":Q
142 RETURN
143 REM GENERATE CONVERSION ROUTINE
144 CLS: READ NS,H
145 IF NS="STOP" THEN 147 ELSE 144
146 GOTO 144
147 IF Y=1 TO 11: READ A$(Y),R(Y),US(Y),NEXT Y
148 GOTO 147
149 CLS: PRINT TAB(4) "NON-WOOD HEAT SOURCES": PRINT
150 FOR Y=1 TO 11: READ A$(Y),R(Y),US(Y),NEXT Y
151 PRINT "12 CONVERSION EXAMPLE": PRINT
152 PRINT "INPUT WHICH ONE": PRINT
153 PRINT: INPUT "WHICH ONE (1-12) ":Q
154 IF Q=12 THEN 181 ELSE 155
155 IF Q<1 OR Q>11 THEN 149 ELSE 156
156 L=Q
157 CLS: PRINT "YOU SELECTED": PRINT
158 INT AS(L)
159 PRINT "CORRECT": PRINT
159 IF LEFT$(Q$,1)="N" THEN 149 ELSE 160
160 PRINT: PRINT "COMPARSED TO WOOD": PRINT
161 PRINT NS,"H"
162 IF NS="STOP" THEN 195 ELSE 163
163 IF NS=W$ THEN 165 ELSE 161
164 GOTO 161
165 RESTORE:M=H/R(L):IF US(L)<0 THEN V=INT(M+.5):GOTO166
166 V=INT(100*M)/100
167 CLS: PRINT: PRINT
169 PRINT "IS EQUIVALENT TO": PRINT
170 PRINT:US(L);" OF":
171 PRINTAS(L)
172 PRINT "FOR A TOTAL HEAT CONTENT":
173 PRINT H/100,"MILLION BTU":
174 PRINT AT 100% EFFICIENCY": PRINT
175 PRINT "ENTER <M> TO RETURN THE MENU": PRINT
176 PRINT "ENTER <C> FOR A NEW CALCULATION": PRINT
177 INPUT Q$ 
178 IF Q$="M" THEN 32 ELSE 179
179 IF Q$="C" THEN 144 ELSE 180
180 REM GENERATE CONVERSION NOTES
181 CLS: PRINT "THIS ROUTINE WILL MAKE A COMPARISON OF A CORD OF ANY TYPE OF WOOD IN MY DATA"
182 PRINT "TO ANY OF THE NON-WOOD HEAT SOURCES IN MY DATA": PRINT
183 PRINT "I WILL LIST ALL OF MY NON-WOOD DATA AND YOU CHOOSE THE WOOD YOU WANT TO KNOW ABOUT.
184 PRINT "THEN I WILL ASK WHICH WOOD YOU WANT TO COMPARE WITH": PRINT
185 INPUT "PRESS ENTER" TO CONTINUE":Q
186 CLS: PRINT "FOR EXAMPLE": PRINT
187 PRINT "SAY YOU WANT TO KNOW HOW MUCH ANTHRACITE COAL YOU CAN REPLACE WITH A CORD OF OAK."
188 PRINT "YOU SELECT ANTHRACITE COAL FROM THE LIST AND ENTER OAK AFTER THE PROMPT. I WILL THEN RETURN:
189 PRINT: PRINT "ONE CORD OF OAK IS EQUIVALENT TO"
190 PRINT "TON OF ANTHRACITE COAL": PRINT
191 PRINT: PRINT "PRESS ANY KEY": PRINT
192 Z$=INKEY$: IF Z$="" THEN 193
193 GOTO 144
194 RETURN
195 RETURN
196 PRINT "I DO NOT HAVE THAT WOOD DATA": PRINT
197 PRINT "TRY ONE FROM MY DATA DISPLAY": PRINT
198 PRINT "DO YOU WANT TO SEE IT (Y/N) ":Q
199 IF LEFT$(Q$,1)="Y" THEN 98 ELSE 99

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Program Operation

At the opening of the program, the supervisor must establish game parameters. The first determines the operations that the game will test. The menu offers you five choices: addition, subtraction, multiplication, division, and continue. When you press a number from one to four, the corresponding mathematic symbol appears below the menu. You can enter a single symbol or any combination of symbols. The more frequently you press a particular number, the more often that operation will be tested. Press 5 (continue) when you are ready to set further parameters.

The program then asks you to input the number of problems needed to complete a game and lets you choose the numeric range of the question: 1–9, 1–99, or 1–999. The program randomly generates the problems' X and Y values so that these values and the answer fall within the range you have chosen. The game speed you select—fast, moderate, or slow—influences the time allotted for a response and thus controls the speed of the invader. At the continue/redo prompt, press C to bring up the next prompt or R to change the parameters.

Press any key to begin the game. A problem appears at the top of the screen, and an invader descends toward the student's base at the bottom. (The base is always directly beneath the invader; no maneuvering is necessary.) If the student types in the correct answer and presses the enter key, the base fires, destroying the invader. If a wrong answer is given, the alien continues downward.

The student may attempt to answer the question again. If the problem has not been solved correctly by the time the invader gets to the base, the base explodes and the computer records the question as an incorrect response.

Students should be encouraged to type multiple digits slowly and accurately; there is ample time to answer each problem. The answers to questions are whole numbers, so students are not required to type fractions or decimals.

When the student has had the opportunity to answer the appropriate number of questions, the program displays a game-over message, a final score, and a rating of the student's performance. The ratings are designed to encourage students who have done poorly and reward students who have done well.

Address correspondence to Simon Clift, P.O. Box 787, Kincardine, Ontario, NOO 2GO, Canada.

System Requirements

16K RAM for cassette systems
32K RAM for disk systems
Extended Color Basic or Disk Extended Color Basic

November 1985 HOT CoCo 53
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Parallel processing is the hottest topic in computerland these days. With CPUs as cheap as a dollar or two, it is feasible to build a computer with 10 or even 1,000 processors operating in parallel. These parallel computers will vastly increase the speed of database searches and vector operations like spreadsheets and graphics. They may even achieve some of the goals of artificial intelligence, such as speech recognition and problem solving.

Multiple-processor computers have already been built at Cal Tech and Columbia University, while companies like DEC, IBM, and Cray Research are known to be working on similar technology. Japanese researchers are basing their Fifth Generation project on parallel computation. A recent meeting of university, government, and industrial computer scientists reported, “We are entering a new era in very high-performance computing that will be dominated by parallel-architected systems.” (Comm. ACM, August 1984, p. 747.) Parallel processing will first appear on large, expensive mainframe computers, but it might filter down to personal computers before long. The greatest obstacle confronting parallel processing is designing software to take advantage of parallel hardware. Effective parallel algorithms are only now being developed.

You and your CoCo can join the parallel-processing revolution now and experiment with parallel processing using Tandy’s Color Logo. Logo’s multiple turtles can operate simultaneously and communicate with each other like independent CPUs. Who knows—perhaps a CoCo owner will invent a new algorithm for the parallel hardware now being developed.

System Requirements

16K RAM
Color Basic
Tandy Color Logo

Parallel Processing with Color Logo

Synchronizing multiple turtles mimics parallel processing.

Programming Multiple Turtles

Programming multiple turtles is like organizing a group of people. Each turtle is assigned a job and taught to do it. That is, each turtle is given a program to follow. You don’t write a single program or a main routine with subroutines. Instead, you write a separate program for each turtle, including instructions for synchronizing with the other turtles. When the overall task is set in motion, the turtles communicate with each other to coordinate their processing.

In some parallel programs, the turtles talk to each other. Listing 1 contains a short example of this sort. On the command RACE N, N turtles race across the screen. More pre-
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sists of three pegs or towers placed upright and a small set of rings of graded sizes. The rings are initially placed on tower 1, with the largest on the bottom and the smallest on the top. The object of the puzzle is to move the rings to tower 3. You can only move one ring at a time, and you cannot place a ring on a smaller ring. When you are done, the rings should be stacked on tower 3, with the largest on the bottom and the smallest on the top.

Table 1 contains a solution to the puzzle for three rings. You can try this solution yourself. Draw three circles on a piece of paper; label them 1, 2, and 3; stack three different coins in circle 1. Now follow the instructions in Table 1 to move the coins to circle 3. Can you solve the puzzle for four coins? How many moves does it take? How many moves does it take with four towers instead of three?

Before discussing the details of this program, let's look at its underlying algorithm. Think of Table 2 as the directions for improving your ability to solve the puzzle. If you could move three rings from one tower to another, then Table 2 would show you how to move four rings. First, move the top three rings from the source tower to the extra tower (you already know how to move three rings). Then move the bottom ring from the source tower to the target tower (that involves moving one ring). Finally, move the top three rings from the extra tower to the target tower (you move three rings again).

Table 2 solves the puzzle completely. It solves the puzzle if there aren't any rings left (you don't do anything); it also extends the solution from any level to the next. So, it solves the puzzle for any number of rings.

The algorithm in Table 2 is called recursive because it calls itself. Recursion is one of the tricks of the Logo programmer. You can read more about it in the Color Logo manual. pp. 43–52. (See also pp. 28 and 116 on local variables.)

Logo Solution

The Logo solution to the Towers of Hanoi puzzle (Listing 2) uses a master turtle (turtle 0) and subordinate turtles. The subordinate turtles are tower turtles and ring turtles. The master turtle is controlled by the pro-

The Towers of Hanoi

The ancient Towers of Hanoi puzzle consists of three pegs or towers placed upright and a small set of rings of graded sizes. The rings are initially placed on tower 1, with the largest on the bottom and the smallest on the top (Fig. 1). The object of the puzzle is to move the rings to tower 3. You can only move one ring at a time, and you cannot place a ring on a smaller ring. When you are done, the rings should be stacked on tower 3, with the largest on the bottom and the smallest on the top.

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Logo Solution

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To move a stack of $N$ rings from tower $A$ to tower $B$:

1. If $N > 0$ then:
   a. $C = 6 - A - B$
   b. Move stack of $N - 1$ rings from tower $A$ to tower $C$
   c. Move ring $N$ to tower $B$
   d. Move stack of $N - 1$ rings from tower $C$ to tower $B$

Table 2. Solution to puzzle given as an algorithm for moving a stack of $N$ rings from tower $A$ to tower $B$. If $N = 0$, there are no rings to move, so nothing happens. If $A$ and $B$ are two tower numbers, then $C = 6 - A - B$ is the third tower number.

The following text is a continuation of the previous discussion about tower turtles and the Hanoi puzzle:

A tower turtle always occupies the lowest unused position on its tower, although they are not visible on the screen. Each tower turtle is controlled by the procedure TOWER. Tower turtles always occupy the lowest unused position on their tower, although they are not visible on the screen. When they receive the message $2$, in the mail, they move up one position: they move down one position when they receive a $1$. They tell the moving rings where to land at the end of a move. (You can make the tower turtles visible by removing the command HT from TOWER.)

Ring turtles, numbered $1, \ldots, N$, correspond to the rings on the towers. They look like rings turned on edge, they sit stacked on the towers, and on command from the master turtle, they move to another tower.

Each ring turtle is controlled by the procedure RING. This procedure first places the ring turtle at its starting position on tower $1$. Then it waits for a message from the master turtle. Upon receiving the message $2$ from the master turtle, RING moves the ring to tower $2$ and sends a confirmation message back to the master turtle.

As each ring moves, it sends a message $1$ to the tower it is leaving and a $2$ to the tower for which it is headed. This causes the tower turtles to correct their positions on their towers in preparation for receiving the next ring. The master turtle and its subordinate ring and tower turtles are alive and operating simultaneously.

Two questions remain to be answered. How can the ring and tower turtles follow just two procedures, RING and TOWER, and yet not all do the same thing? How can they operate simultaneously? An analogy might help answer the first question. An income-tax form is a procedure. Everyone fills out the same tax form according to the same rules, but because people have different incomes and deductions, they don’t fill it out the same way.

Similarly, several turtles can follow the same procedure in different ways. Each turtle has its own shape, its own name (ME), its own mail, and its own set of variables. For example, if ring turtles 1 and 2 are on different towers, they have different values in their variables: $T1$. Differences in their data lead different turtles to follow the same procedure in different ways.

There is, however, only one CPU in your CoCo. The Logo interpreter mimics parallel operation with a time-sharing trick. After an instruction for one turtle is executed, the interpreter cycles through all the turtles and then begins again with the next instruction for each one. If you observe the operation of Listing 1 closely, you can see that two turtles never move at exactly the same time.

I hope I’ve interested you in exploring parallel processing further. More information can be found in the Color Logo manual as well as in texts and articles on parallel processing and Ada. I’ve listed three classics and one up-to-date text in the bibliography (Table 3). Despite their forbidding titles, they are accessible to anyone who knows a little Pascal.
A Brief Introduction to Logo

Logo is a computer language widely used to introduce children to programming. But Logo is neither simple nor childish. It was designed to be a complete programming environment with special graphics features; anything you can do with Basic, you can do with Logo. Moreover, Logo is modular and readable. You can develop a Logo program as a series of procedures and use long variable and procedure names.

The key object in Logo is the turtle. If the metaphor for a Basic program is a list of instructions for a computer to follow, then a Logo program is a list of instructions for a turtle to follow. A Logo programmer is always directing a turtle on the screen. The turtle can receive key-strokes, print messages, and draw pictures with its pen by moving about the screen.

The turtle is always located on the screen headed in a specific direction. Table 4 lists commands that move the turtle or affect the pen.

Logo procedures can include variables. Variable names are strings preceded by a colon, like :N. To assign :N the value 3, execute "MAKE :N 3".

Program control is given by IF, ELSE, REPEAT, and WHILE (there are no GOTOs). Each control statement is followed by a block of instructions to execute; the block is delimited by parentheses. For example, to move forward eight steps :R times, use REPEAT :R (FD 8). The instruction block can contain more than one line.

The principle program unit in Logo is not the line but the procedure. Procedures begin with TO, and invoke each other. The main procedure can be started by invoking its name and any necessary parameters from the keyboard in run mode. For example, to run the Towers of Hanoi animation in Listing 2 for three rings, you type HANOI 3 from run mode. HANOI in turn invokes SETUP and MOVE, and RING invokes F.

Tandy’s Color Logo includes a multiple-turtle facility not found in other Logos. You always start with one turtle—turtle 0. You can create additional turtles numbered 1 through 254 with the command, HATCH. Each newly created turtle must be assigned a program. The command HATCH 101 TOWER :N creates Turtle 101, assigns it the program Tower, and passes the parameter :N to TOWER.

Turtles can exchange messages that are numbers between -32768 and 32767. To send a message m to turtle B, execute SEND B m. The message m can be a constant or a variable. Notice that you don’t have to specify which turtle is sending the message; the turtle executing the program in which the command appears is the one sending the message.

Messages are held until called for. To request mail sent by turtle T, a turtle executes the function MAIL T. The function MAIL 255 returns the oldest message waiting to be delivered to the turtle.

Table 4. Logo Commands

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD N</td>
<td>move forward N steps</td>
</tr>
<tr>
<td>LT N</td>
<td>turn left N degrees</td>
</tr>
<tr>
<td>RT N</td>
<td>turn right N degrees</td>
</tr>
<tr>
<td>HT</td>
<td>hide the turtle</td>
</tr>
<tr>
<td>ST</td>
<td>show the turtle</td>
</tr>
<tr>
<td>PU</td>
<td>lower the turtle's pen</td>
</tr>
<tr>
<td>PD</td>
<td>lift the turtle's pen</td>
</tr>
<tr>
<td>PC N</td>
<td>change the pen's color to N</td>
</tr>
<tr>
<td>SHAPE</td>
<td>change the shape of the turtle</td>
</tr>
</tbody>
</table>

FD N move forward N steps
LT N turn left N degrees
RT N turn right N degrees
HT hide the turtle
ST show the turtle
PU lift the turtle's pen
PD lower the turtle's pen
PC N change the pen's color to N
SHAPE change the shape of the turtle
1. Race N turtles across the screen.

NER TURTLE SELECTED AT RANDOM, AND RESUMES RUNNING ITSELF.

TO STOPANDGO :N
PU PRINT ME FD 8 PD
PC ME - 3*(ME/3)
WHILE 1
( IF NOT MAIL 255
( FD 5)
ELSE
( LT 90
WHILE RANDOM 61
SEND ((RANDOM :N) + 1) 1
RT 90
)
)
END

STOPANDGO DIRECTS RUNNER TURTLES. A TURTLE GOES UNTIL IT RECEIVES MAIL. THEN IT STOPS FOR A RANDOM LENGTH OF TIME, SENDS A MESSAGE TO STOP ANOTHER RUNNER TURTLE, AND RESUMES RUNNING ITSELF.

TO RACE :N
CLEAR HT NOWRAP
SX OS Y 16 SH 90
MAKE 1 I
REPEAT :N
WHILE RANDOM 61
SEND ((RANDOM :N) + 1) 1
RT 90
END

TO DISPLAY ANIMATED SOLUTION TO TOWERS OF HANOI PUZZLE WITH N RINGS. INVOKE "HANOI N".

THE PROGRAM USES THREE TOWERS OF HANOI

RACE CREATES N TURTLES THAT RACE ACROSS THE SCREEN. AT ANY TIME ONE TURTLE ISN'T MOVING. SEND COMMAND FREEZES A RANDOM TURTLE TO START.

SETUP ESTABLISHES THREE TOWERS WITH :N RINGS ON THE FIRST TOWER.

RINGNUM AND :HEIGHT ARE LOCAL VARIABLES.

DEFINITION AND USE OF RINGNUM, :HEIGHT AND :RINGNUM SHOULD BE CLEAR.

STOPANDGO DIRECTS RUNNER TURTLES. A TURTLE GOES UNTIL IT RECEIVES MAIL. THEN IT STOPS FOR A RANDOM LENGTH OF TIME, SENDS A MESSAGE TO STOP ANOTHER RUNNER TURTLE, AND RESUMES RUNNING ITSELF.

THE ROUTINE IS LIMITED BY MAKE ME TO 6 RINGS.

SEND COMMAND FREEZES A RANDOM TURTLE TO START.

TO STOPANDGO :N
PU PRINT ME FD 8 PD
PC ME - 3*(ME/3)
WHILE 1
( IF NOT MAIL 255
( FD 5)
ELSE
( LT 90
WHILE RANDOM 61
SEND ((RANDOM :N) + 1) 1
RT 90
)
)
END

TO SETUP :N :RINGNUM :HEIGHT
CLEAR PU HT
HATCH :I STOPANDGO :N
MAKE :I :I + 1
SEND ((RANDOM :NJ + 1) 1
VANISH
TO DISPLAY ANIMATED SOLUTION TO TOWERS OF HANOI PUZZLE WITH N RINGS. INVOKE "HANOI N".

THE PROGRAM USES THREE TOWERS OF HANOI

RACE CREATES N TURTLES THAT RACE ACROSS THE SCREEN. AT ANY TIME ONE TURTLE ISN'T MOVING. SEND COMMAND FREEZES A RANDOM TURTLE TO START.

SETUP ESTABLISHES THREE TOWERS WITH :N RINGS ON THE FIRST TOWER.

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MOVISTACK moves a stack of m rings from tower A to B. To move ring M to tower B, a message B is sent to ring turtle M (controlled by proc. ring). After issuing the order to move ring :M to tower :B, a message from tower :A to :B. To movestack :M :A :B :C move before continuing. :C is a local variable.

TO MOVESTACK :M :A :B :C
IF :M = 0 (STOP)
MAKE :C = A - B
MOVISTACK (:M - 1) :A :C
WHILE NOT MAIL :M (:)
MOVISTACK (:M - 1) :C :B
IF :M = 0 (STOP)
MAKE :C = A - B
END

RING CONTROLS RING TURTLES 1...N. H1 IS THE INITIAL HEIGHT OF THE RING TURTLE ON STACK 1 (FROM SETUP). H1, T1 STORE CURRENT HEIGHT AND TOWER NUMBER OF RING. UPON RECEIVING MESSAGE T2 (FROM MOVISTACK), RING MOVES RING TURTLE TO TOWER T2 AND RE- SETS (BY MAIL) THE AFFECTED TOWERS. T1, H2, T2 ARE LOCAL VARIABLES.

TO RING :H1 :T1 :H2 :T2
PU HT SH 0

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MAKE :T1 101
MAKE :T2 100
MAKE :H1 :H2
ST
WHILE 1
( MAKE :T2 MAIL 0
IF :T2 < > 0
MAKE :T2 100 + :T2
SEND :T2 100
SEND :T2 100
SEND :T2 0
SEND 01
MAKE :T1 :T2
MAKE :H1 :H2
)
END

F moves a turtle a distance :D, stopping periodically to show the turtle. This animates the movement.

TO F :D
REPEAT :D/8
( FD 8)
END

MAKEME GIVES SHAPE TO RING TURTLE N < = 6.

TO MAKEME
IF ME = 1
( SHAPE RUBBBDBBBBBBB
STOP)
IF ME = 2
( SHAPE RUBBBDBBBBBBBBBBBFUBBB
STOP)
IF ME = 3
( SHAPE RUBBBDBBBBBBBBBBBBBFUBBB
STOP)
IF ME = 4
( SHAPE RRUBBBDBBBBBBBBBBB
STOP)
IF ME = 5
( SHAPE RRUBBBDBBBBBBBBBBBBB
STOP)
IF ME = 6
( SHAPE RRUBBBDBBBBBBBBBBB
STOP)
END

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If you've ever struggled with maintaining a sorted list in arrays, Linksort is for you. (See Listing.) It demonstrates the use of linked lists in Basic and can be used in hobby and business applications.

What Are Linked Lists?

A linked list is a dynamic data structure used in languages like Pascal. The size of the list can increase or decrease as the number of elements changes. Arrays and other data structures stored in memory are static—their dimensions are declared early in the program with a DIM statement. When you want to insert or delete information and yet maintain data in alphabetical order, arrays can cause headaches. If the list is arranged contiguously (organized from top to bottom, as in Fig. 1), insertion or deletion requires shifting part of the array up or down by one place (Fig. 2). If the array is large, this process can take time.

In Pascal, linked lists provide a way of avoiding these problems. Figure 3 will help you understand the underlying concept. The variable, FIRST, points to the first cell. The left portion of each cell contains the name; the right segment contains the pointer that links the cell to the next element in the list. The exact location of each cell within the array is of no consequence.

Representing linked lists in arrays is powerful in languages such as Basic, Fortran, and Cobol, which don't have pointers and dynamic storage. Setting up the list is simple. Linksort uses four arrays: NAME$, which holds the names in the list; PTR, which provides the link to the next cell in the list; BALANCE, which holds the customer's balance; and AVAIL, which is used to delete names from the list and keep track of the positions of deleted cells. The number of names in the list is represented by the variable, NUMBER.

Figure 4 shows an example of a list containing 10 names that are linked in alphabetical order but arranged randomly. This can be confusing, but if you think in terms of the links—not the array—the concept should be easier to grasp. If you trace through the table you will see that the linking between cells places the names in alphabetical order. PTR(0) marks the first name in the list, NAME$(7)—Amy, in this case. PTR(7) contains 4, which means that the next name is NAME$(4), Bill. To check the remainder of the list, proceed in the same manner, looking in PTR for the subscript of the name in NAME$ and using that subscript to tell you what the next PTR value is. The zero in PTR(8) signifies that its corresponding element in NAME$ is the last name in the list.

System Requirements

16K RAM
Color Basic
Printer Optional

November 1985 HOT CoCo 63
Inserting Information

The real power of linked lists lies in inserting and deleting cells. Figure 5 shows how the name, Ben, would be inserted into the list. If you were not using a linked array, Ben would be placed between Amy and Bill by shifting Bill and the names that follow down one cell and inserting Ben in the empty cell (Fig. 2). With linked lists, you can simply insert additions into the next empty cell and change the appropriate pointers. To better understand this process, refer to lines 900-1010, the Search for Insert routine, and lines 1020-1220, the Insert Customer routine. The variable TEMP points to the current name in the list and BACK points to the name immediately preceding it. Trace through the code with the example for Ben, keeping track of the values of P. BACK, TEMP, and the procedure should become clear.

Problems with Deletion

Deleting names isn't quite as easy as inserting them: the structure of arrays can cause problems. After an entry is deleted, that cell still takes up space in the array, thus wasting memory. To overcome this difficulty, Linksort uses the array, AVAIL, and the variable, COUNT, to keep track of the number of cells available for insertion. A second variable, DCELL, keeps track of the next available cell in NAME$ (and its counterpart, PTR). AVAIL records the locations (subscripts) of deleted cells: as each cell is deleted, its position is stored in AVAIL, to be filled when the next insertion is made.

In Fig. 6, Ben has been deleted from the list. The name hasn't been removed from the array, but the pointers are set to move from Amy to Bill. DCELL contains the subscript of the next available cell—11 in this case.

To understand deletion, trace the Search and Delete routine (lines 1230-1380). The routine reads in the name to be deleted as DES$ and searches the list from the first element to the last, comparing each name to DES$. If a match is found, the program calls the Delete Customer routine (lines 1390-1470). The cell is deleted by changing the BACK pointer: the position of the deleted cell, 11, is stored in AVAIL and used for the next insert. If no match is found, an error message is printed because the name is not in the list.

The Search for Insert and Insert Customer routines check COUNT before adding a new name as the last element in the list. If its value is greater than zero, there are empty cells within the list. The routine inserts the new name in the cell to which DCELL points and changes BACK to point to it. If there are no available cells within the list, the name is inserted at the end of the list.

Using Linksort

After displaying preliminary prompts for cassette, disk drive, and printer, Linksort brings up a menu with six options:

1. Create File
2. Read File
3. Insert New Name
4. Delete Name
5. Print the List
6. Save and Exit
Each menu item corresponds to a subroutine within the program. I have documented the start of each block to simplify debugging and modification. (See Table 1 for a list of program variables.) If you need to restructure the program, you will only need to rearrange a few lines in the main loop.

Linksort should work in all versions of Basic. I used it on an IBM PC and it ran fine. The only limitation on creating additional records or increasing the number of customers is the amount of memory your computer has.

**BALANCE** holds the balance of the corresponding name in **NAME$**. See Table 1 for a list of all program variables. If you need to restructure the program, I have documented the corresponding name in **NAME$**. You can easily create large records by adding other parallel arrays, such as **ADDRESS** and **ACCTNO**(37) holds the balance for **NAME$(37)**. You can easily create large records by adding other parallel arrays, such as **ADDRESS** and **ACCTNO**(37) holds the balance for **NAME$(37)**.

Experiment with the program: you will learn to make a new file, you can enter the corresponding name in **NAME$**: e.g., **BALANCE** holds the balance of the corresponding name in **NAME$**. You can easily create large records by adding other parallel arrays, such as **ADDRESS** and **ACCTNO**. If you need to restructure the program, I have documented the corresponding name in **NAME$**. You can easily create large records by adding other parallel arrays, such as **ADDRESS** and **ACCTNO**. You can easily create large records by adding other parallel arrays, such as **ADDRESS** and **ACCTNO**.

### Table 1. Program Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NAME$</strong></td>
<td>Array to hold customer names.</td>
</tr>
<tr>
<td><strong>PTR</strong></td>
<td>Pointer array.</td>
</tr>
<tr>
<td><strong>BALANCE</strong></td>
<td>Array to hold customer balances.</td>
</tr>
<tr>
<td><strong>AVAIL</strong></td>
<td>Available (deleted) cell array.</td>
</tr>
<tr>
<td><strong>DEVICE</strong></td>
<td>Tape or disk identifier.</td>
</tr>
<tr>
<td><strong>HCS</strong></td>
<td>Send output to printer.</td>
</tr>
<tr>
<td><strong>CUS$</strong></td>
<td>Input customer name.</td>
</tr>
<tr>
<td><strong>AMT</strong></td>
<td>Input customer balance.</td>
</tr>
<tr>
<td><strong>NUMBER</strong></td>
<td>Number of customers in list.</td>
</tr>
<tr>
<td><strong>TEMP</strong></td>
<td>Link to next name in array <strong>NAME$</strong>.</td>
</tr>
<tr>
<td><strong>DCELL</strong></td>
<td>Position in <strong>NAME$</strong> of previously deleted cell.</td>
</tr>
<tr>
<td><strong>DES</strong></td>
<td>Input name of customer to delete.</td>
</tr>
<tr>
<td><strong>BACK</strong></td>
<td>Pointer to name preceding current name.</td>
</tr>
<tr>
<td><strong>COUNT</strong></td>
<td>Number of available (deleted) cells.</td>
</tr>
</tbody>
</table>

names in any order because they are alphabetized as you enter them. And you needn't confine the list to names: Linksort will alphabetize any character. Once you become comfortable with the concept and methods used, I'm sure you'll use them for all of your list-management programs.

Address correspondence to Bruce Bauder, 910 Meadow Ave., Tillamook, OR 97141.

---

**Program Listing. Linksort**

```basic
10 CLS: PMODE 0: PCLEAR 1: CLEAR 30
20 DIM NAMES(100), PTR(100), BALANCE(100), AVAIL(100)
30 PRINT@139, "-LINKSORT-": PRINT
40 PRINT@179, "A LINKED LIST"
50 PRINT@197, "FILE MANAGEMENT PROGRAM"
60 PRINT@233, "BY BRUCE BAUER"
70 PRINT@266, "MARCH 5, 1984"
80 SCREEN 0, 1
90 FOR T=1 TO 150: NEXT
100 CLS: INPUT "TAPE (T) OR DISK (D)
*: I0$"
110 IF I0$="T" THEN DEVICE=-1 ELSE
SE IF I0$="D" THEN DEVICE=1 ELSE
120 INPUT "OUTPUT LIST TO PRINTER (Y/N)"; HCS: IF HCS <> "Y" AND H
CS$ <> "N" THEN 120
```

---

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**FOUR STAR SOFTWARE**

66 HOT CoCo November 1985
869 RETURN
870 ' 
889 ' 
909 ' 
919 ' 
929 P=0
939 TEMP=PTR(P) 'GET LINK
949 IF P=0 THEN BACK=P 'FIRST
959 CELL IN LIST
969 IF (C USS < N AME S ( T EMP )) OR ( PTR (P)=0) THEN GOSUB 1319:RETURN 'IP FOUND THEN INSERT
979 BACK=PTR(P)
989 P=TEMP
999 GOTO 939

1009 ' 
1029 ' INSERT CUSTOMER ' 
1039 ' 
1049 IF COUNT > 0 THEN 1149 'A
VAILABLE CELLS
1059 NUMBER=NUMBER+1
1069 NAME$=NAME$+NAME$:
BALANCE(NUMBER)=AMT 'INSERT NAME AND
BALANCE
1079 IF PTR(P)=0 THEN 1119 'L
AST ELEMENT IN LIST
1089 PTR (NUMBER)=PTR(P)
OINT TO NEXT CELL
1099 PTR(P)=NUMBER 
OINT TO NEW CELL
1109 RETURN
1119 PTR(P)=NUMBER 'I 
INSERT END OF LIST
1129 PTR(NUMBER)=0
1139 RETURN
1149 DCELL=AVAIL(LIST)
1159 OINT TO NEW CELL
1169 RETURN
1179 TEMP=PTR(P) 'I 
SNERT END OF LIST
1189 PTR(NUMBER)=0 
OINT TO NEXT CELL
1199 OINT TO NEW CELL
1209 RETURN
1219 ' 
1229 ' 
1239 ' 
1249 ** SEARCH FOR DELETE 
1259 ' 
1269 CLS
1279 LINE INPUT "NAME TO DELETE? 
1289 " 
1299 ' 
1309 IF NUMBER < 1 THEN RETURN
1319 TEMP=PTR(P) 'GET LINK
1329 IF P=0 THEN BACK=P
1339 IF (PTR(T EMP)=0) AND (NAME$ (TEMP) <> DES) THEN PRINT "SEARC 
H FAILU RE. "DES NOT IN LIST":FOR 
R CT=1 TO 1000:NEXT:RETURN
1349 IF TEMP=0 THEN GOSUB 1399:RETURN 'DELETE NAME
1359 BACK=PTR(P)
1369 GOTO 1339 'SEARCH NEXT
T CELL
1379 ' 
1389 ' 
1399 ' 
1409 ** DELETE CUSTOMER 
1419 ' 
1429 PTR(BACK)=PTR(TEMP)
1439 POINT AROUND CELL
1449 IF PTR(TEMP)=0 THEN NUMBER=
NUMBER-1:RETURN 'LAST CELL
1459 RETURN
1469 ' 
1479 ' 
1489 ' 
1499 ' 
1509 ' PRINT LIST 
1519 CSL:J=0:CT=0:ST=0
1529 IF HCS="Y" THEN PRINT#-2,"N 
AME":** ,"BALANCE" 
1539 IF HCS="Y" THEN PRINT#-2,CH
R(11):PRINT#-2,="",**, 
** ,":PRINT#-2
1549 PRINT "NAME", "BALANCE":PRIN
T
1559 TEMP=PTR(J)
1569 IF TEMP=0 THEN 1639
1579 ST=BALANCE(TEMP)
1589 PRINT N AME$(TEMP),**:PRINT 
USING "$##### .###":BALANCE( 
TEMP),** ,**:PRINT#-2,USING 
"** ** **":BALANCE(T EMP )
1599 IF HCS="Y" THEN PRINT#-2,NA 
MES(TEMP),**,**:PRINT#-2,USING 
"** ** **":BALANCE(TEMP)
1609 IF TEMP=0 THEN 1659
1619 CT=CT+1:IT=IT+ST
1629 J=TEMP:GOTO 1559 'PRINT
NEXT CELL
1639 PRINT:PRINT "TOTAL CUSTOMER 
S:";CT;PRINT "TOTAL BALANCE:";:PR 
INT USING"$##### .###":ST 
1649 IF HCS="Y" THEN PRINT#-2,PR 
INTS(TEMP),"TOTAL CUSTOMERS:";CT;P 
RINT#-2, "TOTAL BALANCE:";
PRINT#-2
1659 PRINT:PRINT "PRESS ANY KEY 
TO CONTINUE" 
1669 IF HCS="Y" THEN FOR T=1 TO 
5:PRINT#-2:NEXT
1679 KS=INKEYS:IF KS="" THEN 1679 
1689 RETURN
1699 ' 
1709 ' 
1719 ' 
1729 ** SAVE LIST 
1739 ' 
1749 IF DEVICE=1 THEN 1789
1759 CLS:PRINT "PRESS PLAY AND R 
ECORD"
1769 PRINT "HIT ANY KEY WHEN REA 
DY" 
1779 GS=INKEYS:IF GS="" THEN 1779 
1789 J=0:OPEN 
1799 TEMP=PTR(J)
1809 IF TEMP=0 THEN 1849
1819 PRINT #DEVICE,NAMES(TEMP)
1829 PRINT #DEVICE,BALANCE(TEMP)
1839 J+TEMP:GOTO 1799
1849 CLOSE #DEVICE
1859 RETURN
1869 INPUT "CONFIRM EXIT (Y/N)"
:EX
1879 IF EXS="Y" THEN 1889 ELSE I 
F EXS="N" THEN 1869 ELSE 1869
1889 END

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November 1985 HOT CoCo 67
You have probably heard of machine-language programs that will disable the break key. Now you can be the first on your block to tame your CoCo's reset button.

Listing 1 is a short Assembly program that redirects the normal restart routines so that when you press the reset button, the program starts at any line number desired. To achieve a flexible start, the reset sequence (described on p. 208 of Going Ahead with Extended Color Basic) is modified.

Here's what the reset button does. First, it resets most of the CoCo's main circuits to a clear condition. This means that your CoCo gets amnesia. Second, it synchronizes the video chip (VDG) at random to the leading or trailing edge of the main clock's square wave. In short, the artifact colors of PMODE4 change. Third, the master chip (6809E) does a warm start (JMP $FFFF), which for the CoCo means start at $A027 in the Color Basic ROM. Fourth, either the text or extended Color Basic, the program assumes for the necessary changes. If you do not have extended Color Basic, you should replace the BASIC valiables LN and SC are converted into the machine-language variables LNNUM and FLAG2 since your Basic program must communicate with them.

Listing 1 works with the Color Basic 1.0 or 1.1. Extended Color Basic 1.0, and Disk Color Basic 1.0 ROMs. If the disk Basic 1.1 ROM, see the comment in line 460 for the necessary changes. If you do not have Extended Color Basic, the program assumes that you will not be using PMODE4 graphics. You can add a section of code at the indicated spot to directly set the SAM chip.

To keep the program as short as possible, undocumented ROM routines are used. I will describe what these routines do and include below the first few commands in each so you can find them in your version of ROM if they have been relocated:

Locations $72–73 are a warm-start reset vector CB $A0E8: EXCB $80C0: DCB $C0D4

The vector at $183 is called before each keyboard input = RTS.

$AAD03 converts the line number in register D to line location plus one in locations $47–48.

$95CF executes the SCREEN1.n command using the last value given. This is part of Extended Color Basic. You can set $FF22 and $FFC0–$FFD3 directly.

$AAD7 executes the line at the location in register X.

System Requirements

16K RAM
Color Basic (Without Graphics)
Extended Color Basic (With Graphics)
Editor/Assembler

Listing 1 is position independent so it can be located anywhere convenient. Note, however, that the vectors at $72 and $183 must be reset either manually with POKEs or by reassembling the listing. Further, you must keep track of the locations of variables LNNUM and FLAG2 since your Basic program must communicate with them.

Listing 2 is shown used with a tape system, but the machine-language routines can be LOADMed from disk or POKEd from data. Line 1 is a subroutine that loads the machine-language variables LNNUM and FLAG2. It should be called before a new start line is required. The Basic variables LN and SC are converted into the machine-language variables LNNUM and FLAG2. Thus, LN should be made equal to the line to which the reset button should branch. To obtain a text screen make SC = 0; to obtain a graphic screen make SC = 1. Listing 2 assumes the presence of Extended Color Basic. Those of you with only Color Basic should replace the graphics commands with something else.

A few precautions are advisable. Do not point LNNUM into a FOR...NEXT loop or toward a RETURN as Basic's stack has been reset and an error will result. Do not point into a graphics routine in progress unless you are sure of the results. Not only may the artifact colors change, but other problems occur as well. As an example, don't try to rePAINT something already painted the desired color. Be careful of mixed graphic modes as they can be canceled.

If the above has not stimulated your imagination, consider that only minor adjustments are needed for the following applications: auto-restart of programs at any line number: auto-restart after an error: implementation of anti-theft schemes: prevention or loss of the all-RAM (64K) mode.

Program Listing 1. Reset Button Tamer

```assembly
... (program listing continues) ...
```

Program Listing 2. Sample Basic Program. Note the LN and SC variables in lines 2, 10, and 15.

```basic
CLS: CLEAR28H,6H7F00H:CLOADM"RES ET";GOTO2
1 POKE&H7F00H,LN/256:POKE&H7F01H,LN/256*INT(LN/256):POKE&H7F02H,SC:RETURN
2 LN=4;SC=1:GOSUB1:CLS:PRINT"TUR N OFF TAPE RECORDER";PRINT"PUSH THE RESET BUTTON AT ANY TIME DURING THIS PROGRAM AND WATCH WHAT HAPPENS.";PRINT"PRINT HIT ANY KEY";
3 IPINKEYS="THEN3
4 PMODE4,1;PCLS1;SCREEN1,1;PMODE 3
5 COLOR2,1;LINE(128,99)-(130,100);PSET,0F
6 LN=7;SC=8;GOSUB1
7 PMODE4,1;CLS:PRINT@168,"IF RE D PUSH reset";PRINT@209,"IF BL US PUSH ENTER";
8 PORT=1T016H:NEXT;IPINKEYS=CHR$(13)THEN19
9 SCREEN1,1;PORT=1T016H:NEXT;SCR EEN1,1;IPINKEYS=CHR$(11)THEN19SELB
10 LN=11;SC=1:GOSUB1
11 PMODE4,1;PCLS1;SCREEN1,1;PMODE 3,1
12 CIRCLE(128,96),96,4,8:CIRCLE(99,78),9,4:CIRCLE(166,78),9,4
13 PAINT(128,96),2,4;PAINT(99,78),4,4;PAINT(166,78),4,4
14 CIRCLE(128,118),79,3,4,05,.
15 PMODE4,1;LN=16;SC=1;GOSUB1
16 IPINKEYS="THEN16
17 CLS:PRINT"PUSH THE RESET BUT T ON
```

---

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November 1985 HOT CoCo 69
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If you have several short educational programs that a student will run in succession, you can add a personal touch. Incorporate Listing 1 into the first program the student will use, placing it at the beginning of that program. The computer asks for the user's name and POKEs it into high memory, where it will be unaffected by other programs that are loaded from tape or disk. Place Listing 2 at the beginning of subsequent programs. Before each new program begins, it welcomes the student by bringing his name back from protected storage.

The program is written for a 32K machine and will run under Color Basic or Extended Color Basic. To use it with 16K machines, change all occurrences of 32700 in Listings 1 and 2 to 16316. If any of the programs you run contains a machine-language subroutine that is stored above memory location 32700, adjust the storage area for the Listings. Line 10 in Listing 1 clears 200 bytes; increase this value if you need more storage space.

True/False Test Generator

How often have you wanted to create a true/false test quickly? Have you ever wished you could streamline the order of the questions to make cheating more difficult for students with roving eyes? If you have a 16K CoCo with Extended Color Basic and an 80-column printer, True/False Generator (Listing 3) can help you. Unfortunately, you still have to come up with the questions.

The program stores your questions in a bank of DATA lines. The generator types out as many different arrangements of the test as you need, prevents the printer from splitting a word at the end of the line, and even lets you print answer keys. You can have the computer print a test using all the questions or create a test with fewer questions. The program shuffles the questions and ensures that each question appears only once per test.

Modifying the program to suit your grade level and subject is easy. As you add DATA lines, increase the value of string space cleared (200) in line 10. If you do not add adequate space, an OS error occurs. Set the variable NN (also in line 10) to equal the number of test questions plus one. If you have 25 questions, for example, NN should equal 26. The program installs your questions in the

**System Requirements**

16K Extended Color Basic

**CHEMISTRY '85**

1) Two elements combine to form a compound, the symbol for the element which is oxidized is always placed on the left in the compound's formula.

2) Sodium's symbol is Na.

3) Ozone is triatomic oxygen.

4) The nonmetals are located on the left side of the periodic table of the elements.

5) There are two oxygen atoms in a hydroxide ion.

6) A solution with a pH of 3 is basic.

7) The oxidation number for sulfate is -2.

8) Kinetic energy is energy due to an object's motion.

9) Ferrous is the iron ion with an oxidation number of +2.

10) The symbol for gold is G.

**Fig. 1. Student's Chemistry Test**

<table>
<thead>
<tr>
<th>Line Number</th>
<th>DATA Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Two elements combine to form a compound, the symbol for the element which is oxidized is always placed on the left in the compound's formula.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sodium's symbol is Na.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Ozone is triatomic oxygen.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>The nonmetals are located on the left side of the periodic table of the elements.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>There are two oxygen atoms in a hydroxide ion.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A solution with a pH of 3 is basic.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>The oxidation number for sulfate is -2.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Kinetic energy is energy due to an object's motion.</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Ferrous is the iron ion with an oxidation number of +2.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>The symbol for gold is G.</td>
<td></td>
</tr>
</tbody>
</table>

**CHEMISTRY ‘85**

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10) The symbol for gold is G.

**Fig. 2. Teacher's Chemistry Test and Answer Key**

DATA statements numbered from 1010 up to 10000. The proper format is:

Line Number DATA Question, Answer

State each question as a sentence and include a period. Use a comma between the question and the answer, which will be either T or F. Be sure that the last DATA line reads:

Line Number DATA END.E

Figures 1 and 2 show printouts of student and teacher versions of a chemistry test. Can you imagine making a test that neat with a typewriter or creating different arrangements of the questions using that dreaded machine?

Address correspondence to James Wood at 424 N. Missouri, Box 507, Atwood, IL 61913.
Program Listing 1. Name Program that resides in High Memory

10 CLEAR280,32700
20 CLS: INPUT "WHAT IS YOUR NAME"; NA$
30 L=LEN(NA$): IF L>67 THEN PRINT "NEED A SHORTER NAME"; GOTO280
40 POKE32700,L
50 FOR A=1 TO L
60 B=ASC(MID$(NA$,A,1))
70 POKE A+32700,B; NEXTA
80 REMARK PROGRAM STARTS HERE

Program Listing 2. Welcome-Back Program

10 CLS: L=PEEK(32700)
20 PRINT "WELCOME BACK,"
30 FOR A=1 TO L
40 IF NA$(A)=NA$(A-1) THEN NEXTA
50 NEXTA
60 REMARK FOLLOWING PROGRAMS START HERE

Program Listing 3. True/False Test Generator

10 CLEAR280; PEEK(32700); N=1
20 CLS: PRINT "TRUE-FALSE TEST GENERATOR"
30 INPUT "TITLE";T$
40 DIM Q$(N),A$(N),JW(N),IS(N)
50 REMARK PROGRAM STARTS HERE

Program Listing 4. TOGETHER

199 DATA THE SYMBOL FOR GOLD IS 7
200 DATA WATER HAS THREE EQUATIONS.
201 DATA THERE ARE TWO OXYGEN ATOMS IN A HYDROXIDE ION.
202 DATA TWO ELEMENTS COMBINE TO FORM A COMPOUND.
203 DATA OZONE IS TRIATOMIC OXYGEN.
204 DATA PAPER IS BLUE IN A BASIC SOLUTION.
205 DATA A SOLUTION WITH A PH OF 3 IS BASIC.
206 DATA FERROUS IS THE IRON ION WITH AN OXIDATION NUMBER OF +2.
207 DATA THE NONMETALS ARE LOCATED ON THE LEFT SIDE OF THE PERIODIC TABLE OF THE ELEMENTS.
208 DATA SODIUM'S SYMBOL IS NA.
209 DATA END,E

---

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November 1985 HOT CoCo 71
Software Influences Hardware

Your choice of software greatly affects the hardware you need. There are a number of options, the most inexpensive of which is to write your own programs. If you have the talent for writing machine-language, you can write a driver program to control the serial port through modifications to Basic and stand-alone subroutines. Or you can purchase a driver, like Remoterm from Star-Kits Inc. or 232 Remote Plus from EDC Inc. In either case, you will need to write the remaining program or programs in Basic. The advantage to this approach is obvious: Because you design the system, your hardware choices are not restricted.

Purchased software offers different advantages. One commercial package, Colorama, is thoroughly supported by the manufacturer, Ceratec. You get quick and courteous help if you have problems. Purchased software is well worth the price, especially if you have limited programming time or talent. However, you still need a working knowledge of Basic to run a commercial BBS because you must be able to make program modifications and system adjustments to set up your board.

Knowledge of RS-232 protocols is also important. You need a special cable to accommodate the additional RS-232 lines missing on the CoCo. Colorama uses the standard I/O, cassette, and joystick ports on the back of the CoCo to deal with 1,200-baud detection, carrier-detect, and smart-modem features. A CoCo drives, controller, and autoanswering modem are the basic requirements for a Colorama system—you won't need an RS-232 port or Multi-Pak Interface. The system will handle up to three double-sided drives but can be run on one single-sided drive, as well.

The middle ground between purchased and original software is public-domain software. The cost is low, but you must be willing to debug and modify the programs. Even if you make a donation, you do not get the same support you receive when you buy a commercial package.

One such program, COBBS, written by Richard Duncan, can be downloaded from CompuServe or another BBS. At present, COBBS supports up to three single-sided drives and requires Tandy's Deluxe RS-232 Program Pak (catalog no. 26-2226). You must therefore use a Multi-Pak Interface (catalog no. 26-3124) or a Y cable, but your serial I/O port is free for a printer or another peripheral. In addition, using a fully configured RS-232 port gives you greater control over your modem and its control lines.

Since the CoCo lacks a standard RS-232 port, you cannot reliably send data at speeds above 1,200 baud using the existing port. With the advent of 2,400 baud, you might want to consider adding an RS-232 port. Of course, this requires that you purchase a Multi-Pak Interface to simultaneously handle your drive and controller. You might buy Tandy equipment or purchase a bus-expansion board from PBJ Inc.

A BBS Ties Up Equipment

An early decision you must make is whether to have an additional phone line installed. If your board will be on line 24 hours a day, consider dedicating a separate phone line for your BBS. BBS numbers get passed on and often the information regarding hours of operation is omitted. You might find people calling you at all hours, thinking it is a 24-hour-a-day board.

Equally important is balancing your personal computing and BBS needs. You might not be able to get by if you have only one CoCo with a drive controller and two disk drives. When your BBS is running, your CoCo will be tied up just as if someone else were at the keyboard. Setting up a separate system is expensive. Adding a printer might prove invaluable in printing membership lists and tracking caller activity while you are away from the terminal, but it will increase costs, too.

Then there's OS-9. Perhaps you can use it to time-share and multitask in order to accommodate your personal and BBS needs. But while it is possible to run a system on OS-9, only one person can access the disk system at a time. OS-9 is still worth considering, though, because you might be able to serve two callers at once using a dual RS-232 port from PBJ Inc.

Another important piece of BBS equipment is a modem. If you don't own an autoanswering modem, you will need one for your BBS. Even if you do, you must choose between tying it up with the BBS or buying a second one. Of course, if you telecommunicate only occasionally, you might not need two modems.

Other Considerations

Storage capacity is the heart of any BBS and represents the largest overall cost. You need disk space for all files and storage space for the disks. Uploading and downloading also consume space. In fact, most download and information files are stored in ASCII, which uses more space than tokenized Basic. A program that uses 5 granules in Basic might use 6–8 granules in ASCII.

Protecting files from spikes and surges must be figured in total costs. With a BBS it is best to protect the telephone lines in addition to the system power lines.

There are many odds and ends that also add up. Paper and printer ribbons are two of the little things that you'll need more of once your BBS goes on line. It's clear that there are many factors to consider and many places to spend money, but you are the controlling factor. What you want from the BBS and how it is run are up to you.
INKEYS Improvement

The article, "Those Amazing POKEs" (HOT CoCo, March 1985, p. 28) was very interesting, but I needed something more. My one-liner combines the best qualities of INKEYS and EXEC44539:

```
0 X$ = "" ;POKE VARPTR(X$) + 2.0 ;POKE VARPTR(X$) + 3.8H187
```

After a program executes this line, X$ will contain the value of the last key pressed after any use of INKEYS$ or EXEC44539.

Because this line changes the string pointer for X$ to the last-key-pressed memory location in the Basic communications area, you should not use X$ for another value or you might write over important data. If you are already using X$ as a variable, substitute another single-character variable, making sure that both POKEs use the correct VARPTRs.

Geoffery H. Frizzell
Edmonton, Alberta

---

Pseudo PRINT USING

If you’re using an MC-10 or a CoCo without Extended Color Basic (or even an Apple II or Commodore), you can’t take advantage of Basic’s PRINT USING statement. This command is particularly useful when you are working with numbers or money amounts because it lets you round off numbers or display figures in columns with the decimal points aligned. For example, the statement, PRINT USING "####.##"; STR$(N) will print the number as 7634.73.

While you can’t change your computer’s command vocabulary, you can use my short utility as a substitute for PRINT USING. Lines 10-240 and 360 are included for demonstration purposes; they show how the numbers can be printed. Lines 210-350 contain the pseudo PRINT USING subroutine. Before the main program branches to it, you need to assign the number of places before the decimal (NA), the number of places after the decimal (NB), and the number that you want to print the number as.

```
10 PRINT NS : NEXT X: RESTORE
110 FOR X=1 TO 10: READ Y: PRINT Y: NEXT X: RESTORE
```

```
20 PRIN T @8 ," PR OGRAM TO SIM ULATE
30 INPUT " <E NTER> FOR DEMO NSTRAT ION*:A S
40 CL S :PR IN T "THE NUMBERS - AS TH EY ORIGINAL Y WERE "
50 FOR X=l TO 10: READ Y:PRINT Y : NEXT X: RESTORE
60 INPUT "<ENTER>*;A S
70 " CL S :PR IN T "IN A COLUMN - ROUN D ED TO NEAR EST INTEGER (C OLMU N W I DTH 7)
80 PRINT "LIKE PRINT USING "CHR$(3 4) "####.##" ;CHR$(3 4) "", N'
90 NA=0 , NB=7 'S ET 7 PLACES BEFORE THE DECIM AL, 0 PLACES AFTER DECIM AL
110 FOR X=1 TO 10: READ Y : N = Y : G O S
120 PRINT NS : NEX T X: RE STOR E
130 INPUT "<ENTER>*; A S
```

```
140 PRINT "LIKE PRINT USING "CHR$(3 4) "####.##" ;CHR$(3 4) "", N'
150 NA=2 , NB=6 'S ET 6 PLACES BEFORE THE DECIM AL, 2 PLACES AFTER DECIM AL
170 NA=2 : NB=6 'S ET 6 PLACES BEFORE THE DECIM AL, 2 PLACES AFTER DECIM AL
180 FOR X=1 TO 10: READ Y : N = Y : G O S
190 PRINT NS : NEX T X
```

```
200 END
210 PRINT "###.##", N$ 'J UST IN CASE THE NUMBER WAS TOO LONG
230 IF N>999999999 OR N<-999999
99 THEN PRINT "OUT OF RANGE" ;NS $=STR$(N) ;RETURN "JUST IN CASE THE NUMBER IS TOO BIG
250 N=( IN T ( "####.##") + "####.##") /"####.##/
260 NS$=STR$(N)
270 FOR NC =1 TO NT: NS$=NT
280 IF MID$(NS$,NL)=". " THEN GO TO 340
290 NEXT NL
300 IF NA>0 THEN NS$=NS$* "":FOR NC =1 TO NA: NS$=NS$+CHR$(48):NEXT NC
310 IF LEN(NS$)>NT+1 THEN NT=LEN(NS$) 'JUST IN CASE THE NUMBER WAS TOO LONG
320 FOR NC=1 TO NT: NS$=CHR$(3 2)+N$: NEXT NC
330 IF NS$="RIGHTS(NS,NT):RETURN
340 IF NA>0 THEN NC=1 TO NA:
350 IF NS$=CHR$(48):NEXT NC
350 IF NS$="LEFTS(NS,NL+NA):GOTO310
360 DATA 1298.799,234.3218,54999
9,34.2,6547.4321,8.8093,654.987 ,
1.765,54.654,345421.553
```

```
```

Anna M. Reeves
Espanola, WA

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November 1985 HOT CoCo 73
The Nondestructive Cursor

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 assemblers will also work, but the programs may require some additional modification. The documentation that comes with your software should provide the commands you need.

Last month's program, Destructive Cursor, let you use the arrow keys to move the cursor around the screen, wiping out whatever letters were printed under the new cursor location. Actually, the cursor is printed on the screen. POLCAT writes a blank ($60) at the cursor address; hence, when the cursor moves again, a blank remains where the cursor had been.

To manipulate text, you also need the option of a nondestructive cursor—one that you can move without destroying existing characters.

The cursor is inherently destructive: you cannot prevent the computer from writing the cursor ($60) at the address in $88 when POLCAT is used in a program. You don't want to completely abandon POLCAT, but you do want a way to save the character that the cursor would otherwise destroy. To do this, you must restore the character to its original position after the cursor moves, so you must also store the address for the character saved.

However, you don't always want to restore the original character. If POLCAT is called to write a new character at the cursor's location, the new character should take the place of the old. On the other hand, if you're just moving the cursor through a screen address, you'll want the original character restored.

The whole thing sounds complicated. The hard part about writing more complex programs is figuring out what the program must do and how it should accomplish that task. Break the problem down into single parts; then write code to perform each part. We'll leave the lecture on flowcharting and pseudo-codes to more advanced Assembly-language classes, but you should get the logic down before you fire up the editor and begin writing code.

The following steps will give you a nondestructive cursor:

1. Go to POLCAT. Is the next key pressed an arrow key or a regular ASCII character?

2. If it is an ASCII character, print it. Update register X, save the character at the new X, and update the cursor.

3. If the key pressed is an arrow key, determine where the cursor will go (use the updated address in X). Check to see if the address is still on the screen (i.e., greater than $400 and less than $5FF). Save the character at the location to which the cursor is moving; restore the saved character that was at the cursor's original location; and move the cursor to the new location.

4. Return to POLCAT.

There are lots of ways to set up a temporary storage location for characters you want to save. Both Macro-80C and EDTASM have a pseudo-operating instruction for creating storage location in RAM: The acronym is RMB. Reserve Memory Byte. The number of bytes of memory to be reserved for this use follows RMB. For example, CHAR RMB 1 sets up a 1-byte storage location for the character.

The assembler automatically assigns the memory location to CHAR.

The Program Listing, Nondestructive Cursor, displays the longer GO routine which now has the following four routines:

1. Jump to the POLCAT subroutine to scan the keyboard, and jump to DONE if the break key was pressed.

2. Branch to the subroutines if one of the arrow keys was pressed.

3. Display the character and update the cursor.

4. Save the character at the next position.

If you're using EDTASM +, change line 0007 to ORG $1200. Delete line 0008, and move the START instruction down to line 0009. Change line 0058 to DONE SWI.

The SAVE routine is new. After X is incremented, the new address is stored in the cursor pointer and is also used to save the character at X. Although B holds the ASCII value, the program also stores B in the CHAR location in RAM. The program then loops back to GO to scan the keyboard again. If POLCAT picks up another ASCII character, the character is written to X and the content of CHAR is ignored.

Restoring the Old Character

If POLCAT's keyboard scan finds that an arrow key was pressed, it is best to use the old X address (before it is altered in the arrow-key subroutine) to restore the character that the cursor displaced. The@store subroutine moves the contents of CHAR into A. A is then stored or printed at X. Note that each of the arrow-key subroutines begins with a JSR (Jump to Subroutine) RSTORE. Note also that JSR subroutines must end with an RTN (Return to Subroutine) which concludes the subroutine and returns control to the calling routine. Now the X address and CURSOR can be updated to reflect the arrow key that the original subroutine called.

But you're not done yet. Before you can include a branch back to GO, which will print the cursor at the new position, the character in the new location needs to be stored in CHAR. You can use the arrow keys to run the cursor of the screen, so the program must check the cursor location to see if X is between $400 and $5FF. If the address is OFFTOP or OFFBOT, the program will place the cursor at the first or last position on the screen. However, as before, you must store the character occupying that first or last spot for later use. But that's easy: Use the SAVE subroutine again, and then BRA GO.

System Requirements

16K
Color Basic
Editor/Assembler

Program Listing, Nondestructive Cursor

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tr>
<td>000100</td>
<td>000204</td>
<td>0003A181</td>
<td>0004A10A</td>
<td>00050088</td>
</tr>
<tr>
<td>CHAR RMB</td>
<td>VDIRAM EQU $0400</td>
<td>POLCAT EQU SA181</td>
<td>PRINT EQU SA30A</td>
<td>CURSOR EQU $088</td>
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<td></td>
<td>00069E98</td>
<td>0007A027</td>
<td>00C8 $493E</td>
<td>C15 EQU $9A18</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>START N0NCUR</td>
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<td>000A0B92</td>
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<td></td>
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<td>ROM ADDR FOR BASIC</td>
<td>WRITE SCREEN</td>
<td>C15 CURSOR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
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<td>08A88</td>
</tr>
</tbody>
</table>

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Hot CoCo—May 1985

Assembly 101: by James and Victor Perotti

---

**End of Document**
CoCo Simulations

Market Place

Market Place is designed for use within a social-studies curriculum and teaches economic concepts. It contains four simulations that increase in difficulty. An excellent course manual accompanies this software as do several reproducible student handouts and question sheets. Learning objectives are clearly stated for the teacher's benefit. A section of text suggests possible uses in the classroom, including preparation and follow-up activities.

Sell Apples is the simplest simulation. The student becomes the apple seller and has to determine the best price at which to sell apples. Each time the program is run, a new best price is randomly set.

Sell Plants adds the concept of expenses and advertising to the selling situation. The student sells 1,000 tomato plants that the class has grown at a fixed expense of $30. Opportunities to purchase advertising at 25 cents a sign help the student to increase exposure and sales. Results demonstrate the relationship between selling price, advertising, and profit.

Sell Lemonade lets the student set up a lemonade-stand business. The student decides the quantity of lemonade to be produced, the price, and the number of advertising signs to purchase. Random events, such as changes in weather, street repair, and a parent's decision to stop providing free sugar, affect sales and profit.

Sell Bicycles is the most complicated of the Market Place simulations. Students manage two bicycle companies and learn how sales are affected by their business decisions.

Competition exists between the companies: each begins with $5,000 in cash and an inventory of 100 bicycles. The simulation continues until one company has earned $32,000 in assets or gone bankrupt. Students make decisions each quarter about production level, advertising budget, and selling price. Outcomes are affected by the other company's decisions and, eventually, by random events, such as fire, transportation and production strikes, wage-price freezes, and burglary.

Outdoor Biology

This simulation contains two programs to be used as part of a science curriculum (grades 2-9). Odell Lake simulates the feeding conditions for five kinds of fish in a North American lake; Odell Woods simulates the food chain that exists in North America's forests. Reproducible materials and course objectives are included in the package.

In Odell Lake, the student assumes the role of a specific kind of fish. The fish meets other kinds of fish and plant life in its natural environment. The survival of the fish depends on the student's decisions in each situation. Through experimentation (and often death), the student gains insight into food-chain relationships and ecological systems.

Odell Woods provides similar experiences, but the student assumes the role of an animal in the woods and makes survival decisions as that animal. In order to survive, the animal must eat enough to maintain its energy level and successfully live through a maximum of nine random encounters with unpredictable outcomes. Student teams are suggested as the best use of this simulation because decisions can be discussed and agreed upon.

Congress

Congress is a social-studies simulation in which you become the president of the United States. You build your program of five bills and then attempt to pass them through Congress within a two-year period. Congress might or might not have a majority of members of your chosen party affiliation. All bills begin in the House of Representatives. You must decide where to place your 20 lobbyists to effect the greatest good for your platform.

Flowcharts show the steps of a bill going through Congress. If the bill passes, you decide whether to veto the bill, sign it into law, or ignore it and let it become law. The number of amendments added to each bill during passage affects your point score: the simulation is different each time it is played. Again, student teams or pairs would work well with this program.

Andrew Jackson

Also a social-studies simulation, this program allows you to become President Andrew Jackson. Your challenge is to make the same decisions he did in each of several situations, such as the Indian removal from the South or the Eaton Scandal. To achieve this, you read a newspaper article displayed on the screen to obtain background information. In addition, you choose to reflect upon the past, view the overall effect of the problem, or ask advice from others—friends or cabinet members. These options can be used more than once before a decision must be made.

After you make your decision, it is compared to Jackson's. The final outcome and historical effects of Jackson's decisions are explained. Finally, at the end of the simulation, your progress is rated with points and your effectiveness as Andrew Jackson stated.

In Conclusion

All these simulations have value in the classroom. Where they fit into your curriculum depends on you and the equipment and time available to you. Simulations such as these make it easy to set up a class project or competition. There is much to be learned by the practical application of knowledge or concepts: using simulations will no doubt add an element of interest and suspense to the learning process.

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.

Manufacturers and Products

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Polygon’s Flight Check, D.P. Johnson’s CCRD, Four Star’s PenPal, OS9 Calligrapher, New Mark Data Games, the Latest from Dorsett, 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.

Specialized or Unusual

Polygon Industries is one of several companies that offers job-specific programs. Flight Check is an airplane-operation program that computes the best altitude and power settings for a given flight. It also computes weight, balance, and reserve fuel at destination. Barrett Leib of Polygon noted that the program was “field” tested for 12 years in his airplane dealership business. Flight Check sells for $49. Polygon also offers F & I Master, a program designed to allow automobile dealers to work monthly payment terms on screen and print out 13 kinds of sales forms. It lets salesmen quickly discover the best financing for each customer. F & I Master sells for $2,000 but comes with extensive on-sale support, including customization for each dealer. These programs require 64K and at least one disk drive.

West Bay Company has released a new program called Medic, which it calls “one of the new generation of ‘expert’ programs.” Medic appears to offer lay medical advice on common physical ailments—not what you might term expertise. It requires 16K, Extended Color Basic, and a disk drive. It sells for $20.

If you think specialized software is the latest rage, you haven’t seen some of the unusual stuff being dreamed up out in CoCo land. Before Sports, the only exercises your computer offered were finger calisthenics or getting up to stretch your legs. Computhon could be on the verge of a new breakthrough in computer exercise. The Computhon Sports is a giant coiled-spring-loaded joystick with a foot-operated fire button (see photo). You stand on it and move its handlebar with your body while watching and reacting to a game on your TV or monitor. The company markets the device as an exercise alternative and has tested the product for medical safety. The Sports plugs into one of the CoCo’s joystick ports without modification. It sells for $150.

Advances

D.P. Johnson has a block buster of a new-product announcement this month. The company has released a 512K RAM-disk cartridge called CCRD (for Color Computer RAM disk). The CCRD plugs into a multiple ROM-pack interface and runs with OS-9. (The company also provides OS-9 drivers for customers who do not own OS-9.) The CCRD cartridge is a half-megabyte RAM disk that can be used by any program just like a disk drive. RAM disks can access software several times faster than mechanical disk drives because data is stored in RAM. RAM disks are especially useful for speeding up the compiling of C or Pascal programs. For larger memory, two CCRDs can be configured in one system to provide a megabyte of storage. The CCRD requires a multiple ROM-pack interface and OS-9 or OS-9 drivers you purchase separately from D.P. Johnson for $20. The cartridge sells for $298.

Four Star Software, makers of CoCo Paint and other fine programs, is being secretive about its new integrated business package dubbed PenPal. The product grew out of an idea for a flexible, creative database system, which Product News reported on in May. PenPal is sure to include a word processor, spreadsheet, and database. The company intends to release the new product before the end of the year. We’ll just have to wait and see.

Soistmann Enterprises can’t resist saying “help has arrived.” The company offers a new DOS called S.O.S. (for small operating system). S.O.S. requires a 64K Color Computer and is designed for machine-language programs. It does not support Basic. The DOS was designed to provide a larger work space and several improvements for program developers. Its format, backup, and copy utilities are designed to work with 35-, 40-, or 80-track single- or double-sided disk drives. The new DOS offers a long list of intriguing options and features. This might be just what you are looking for. Contact the company for more information. S.O.S. sells for $49.95.

News Bits

PBJ of World-Pak fame has a new address and phone number: P.O. Box 813, 5725 Kennedy Blvd., N. Bergen, N.J. 07047, 201-861-0126. The company is working on a new version of the OS-9 driver for World-Pak that will enhance the product’s use with other products, such as Computer Systems Center’s Dynamic Calc for OS-9 being marketed by Tandy. PBJ is also quickly becoming the de facto standard in multifunction add-on boards for the Tandy 1000. New 1000 boards in the works from PBJ include a 2-megabyte board, a high-resolution board, and the “Super Charger,” which contains the 80126 chip (the same one used in the Tandy 2000).

The CoCo Calligrapher from Sugar Software has been released in a new version for OS-9 called OS9 Calligrapher. The program is a special-purpose text processor that reads an input file containing both text and format...
ting directions. Text is output to a dot-matrix printer or redirected to a file in one of many available print styles. OS9 Calligrapher supports Epson, Gemini, Tandy, Okidata, Leading Edge Banana, and C. Itoh Prowriter dot-matrix printers and their compatibles. It sells for $39.95 plus $1.50 for shipping. Sugar Software headed south a few months back. They now have a new phone number to go along with their new Hollywood, FL address: 305-981-1241.

Games and Education

**Shock Trooper** and **The Vortex Factor** are two new games from Mark Data Products. Shock Trooper is an arcade game with a theme resembling the movie V, in which scheming reptilian creatures descend to earth and plot to take over. The Vortex Factor is the sixth in Mark Data's series of graphics adventures and is about time travel. Both programs require 32K and come on cassette for $24.95 or disk for $27.95 plus $2 for shipping.

Dorsett Educational Systems is working on disk versions of some of its popular educational series. Its latest conversion is **Disk Algebra**. The company is also releasing two new series: **Principles of Electricity** and **Lower Math**. The latter is designed for kindergarten through fourth-grade learners. Dorsett's educational series contain 16 lessons, require 16K, and sell for $59.95.

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**Tandy Color Computer** requires Extended Basic. 32K Disk - $29.95

**Tandy Model III/IV/4P** 32K Disk - $29.95

The letter bothered me. There's something sad about a system that makes 9-year-olds feel like criminals. And yet, there's no denying that the uncontrolled copying and swapping of software hurts everyone — manufacturers and users alike. It's an issue unlike any society has ever faced, because we have never before possessed a technology that allows such easy duplication of a valuable information product. If it were as easy and inexpensive to duplicate a book as it is to duplicate a piece of software, how many books do you think would be sold? With books, it's far more economical to buy your own copy.

It's unfair, really. My letter writer wasn't trying to rip off anyone, merely help out his friends and save himself a few dollars. I wonder, though, why no adult ever explained to him what program swapping really means. It may not be true in every market for every computer, but when it comes to the Color Computer, unauthorized copying really hurts. Even though it may not be as out-of-control as some people think, the problem is large enough to discourage some software makers from producing new CoCo products. The end result is fewer programs plus a trend toward copy-protection, a real pain for users.

**EOS Notes**

Thanks for your numerous letters about using Tandy's Express Order System. If there is any consensus to be drawn, it is that EOS is a good idea with great potential and a few serious bugs.

Most everyone trying the system says that, while it works and the software they've ordered eventually arrives, they are not sure they'll use the system again. First, too many Tandy store personnel still don't seem to know or care a great deal about EOS. But more important is the lack of demonstration copies or even a descriptive catalog of the programs available. If you're going to order sight unseen anyway, there's slight advantage in ordering through EOS. The delivery time doesn't time appear to be significantly faster than a good mail-order vendor.

Demo copies and a good catalog could make EOS take off like a rocket.

As always, your letters are welcome at:

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