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THE COLOR COMPUTER MONTHLY MAGAZINE

October 1990 Vol. X No. 3

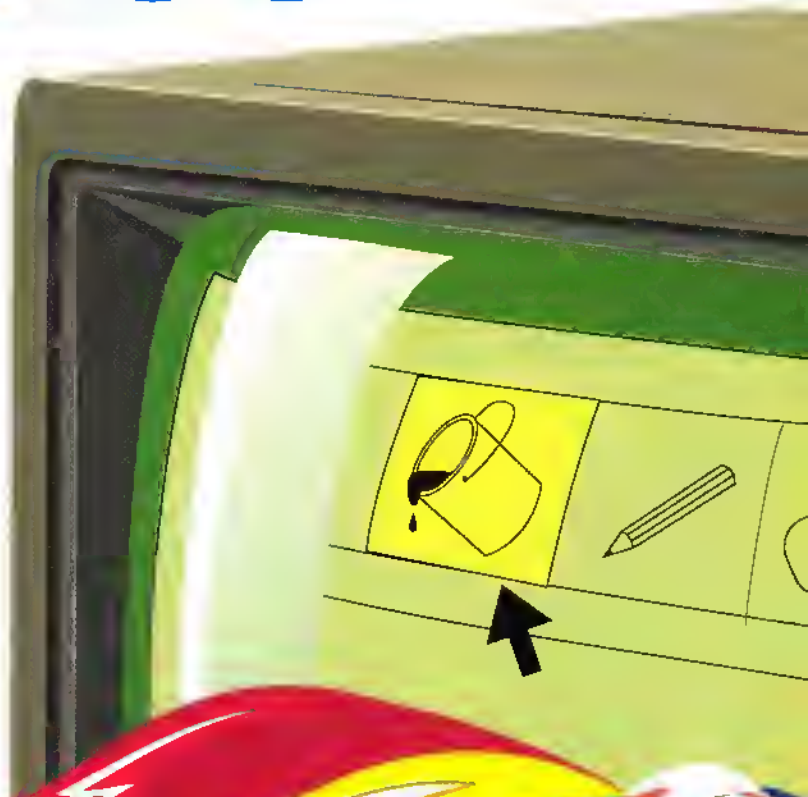
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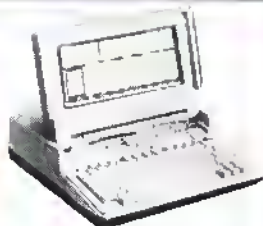
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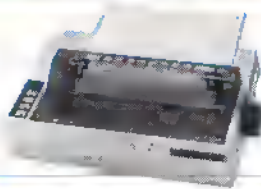
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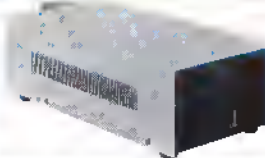
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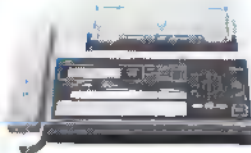
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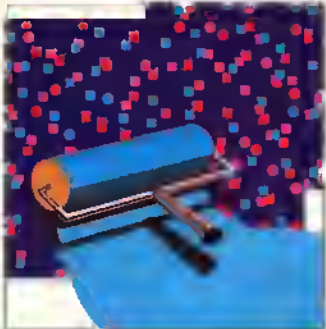
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For RAINBOW Advertising and
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see Page 95

Letters to the RAINBOW

Protecting THE RAINBOW

Editor:

I enjoy THE RAINBOW very much, and you have my continued support. However, I do have a problem. I like the new binding because I can fold the magazine to enter listings, but my copy gets ripped before it even gets to my home. The magazine used to come in a plastic bag. Could you start doing this again?

Scott Lukens
Osceola Mills, Pennsylvania

Editor:

When the August 1990 issue came, there was no plastic bag around it and my copy was mutilated. I was very disturbed that you no longer protect our magazines from the abuse they get in the postal system. I like to keep all my RAINBOWs for reference, and all of them are in good condition — except the last one.

Robert F. Long
Walkersville, Maryland

After receiving many similar requests, we have decided to return to the plastic polybags you used to find protecting your monthly copies of THE RAINBOW. Its an investment worth preserving.

Barden to the Rescue

Editor:

I received my August 1990 issue of THE RAINBOW today, and I'm finding it very interesting — there is more information on how to use my CoCo, as well as new products for it. My primary interests are in how to use the computer as a tool. I am an "operator" rather than a programmer.

If THE RAINBOW had come just two days later, I would have purchased an MS-DOS system. But I changed my mind after reading "Barden's Buffer" (Page 60). It was a difficult decision, but the CoCo has served me well. In fact, using TX-80, a word processor by Fred Kolesar, I have found many uses for my CoCo.

A.J. Cryder
St. James City, Florida

Why Upgrade to the 68K?

Editor:

In recent issues, I have seen several ads for the so-called "CoCo 4." From what I can tell, it is just a CoCo 3 that can be upgraded to use the 68000 microprocessor.

I see no point in upgrading to a 68000. After all, what do we end users need with a more powerful microprocessor and OSK?

We have what we need in a computer. If anything, a new machine should be a portable version of the CoCo 3 with minor enhancements like a full-screen editor, or perhaps ADOS or OS-9 built-in. This is what I would be looking for — not a dedicated OSK system.

Matthew Bramnigan
Rockville, Maryland

While the CoCo 3 allows access to 512K (and more) of memory, the 68B09E is limited to a 64K address space. This limitation continues to get in the way of programmers wanting to write sophisticated applications. The CoCo has served us well over the years, but we won't say no to an upgrade option offering more power to those users who want it — especially when the upgrade is a direct ascension from the 68xx family. Until now, "upgrading" has meant moving to an MS-DOS system, or an Atari or Amiga, and leaving behind all that is CoCo.

... and a Different View

Editor:

Being one who fell into the InterTan "trap," I believed the CoCo was dead. So I sold my entire collection of CoCos and purchased an MS-DOS machine. I like my new machine, but I am thinking of entering the CoCo market once again.

I have seen the ads for the new Tomcat and MM/1 machines and I am excited. It is great to see the CoCo evolve. I can remember others telling me the CoCo would never last. Now we are gaining access to the 68000 world and OSK.

I am glad to see the Tomcat is designed to maintain CoCo compatibility. Those of us who left the CoCo and are considering coming back will like this. It feels great to be returning to the CoCo.

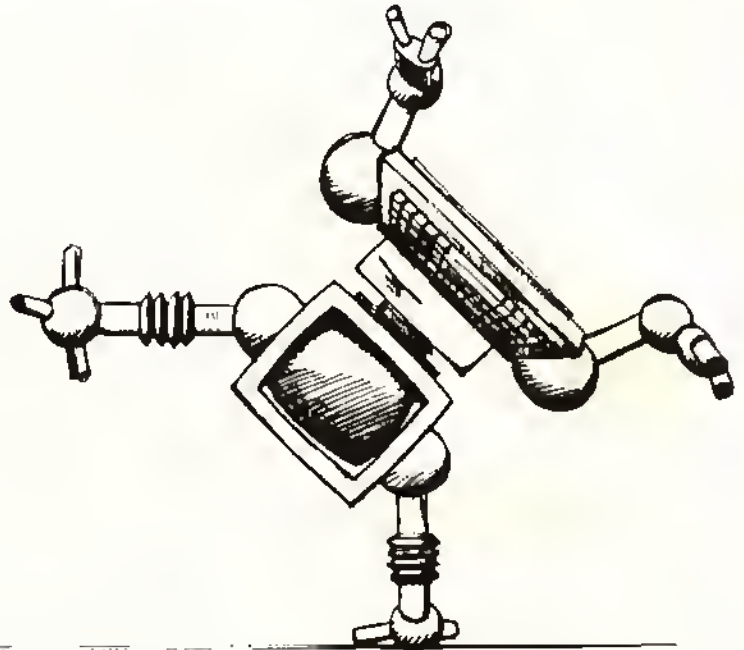
Basil V. Fitz
Abotsford, British Columbia

The Price of Progress

Editor:

Lately I've noticed when you print a listing of assembly-language programs, you no longer print the object code to the left of the line numbers. Many of us don't have access to EDTASM+, so we write BASIC programs to poke the object code into mem-

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ory. Without this information, we have no easy means of doing this. You have published many machine-language programs that I would like to use. But without the object code, I am out of luck. Will you start listing these codes again?

Steven Martin Bump
Muscle Shoals, Alabama

Before THE RAINBOW was produced via desktop publishing (DTP), it was easy to provide the object code in assembly listings. After all, EDTASM+ provided this information in its "list on assembly" mode. But EDTASM+ doesn't allow us to "list on assembly" to a disk file, and that is what we need if we are to publish the object code with DTP. Where possible, we provide BASIC programs to poke the machine-language code into memory. Also, EDTASM+ is still available through Radio Shack's Express Order Software system.

Looking for 512K

Editor:

I want to upgrade my CoCo 3 to 512K and I wonder if I need any other accessories along with the upgrade board. I also wonder if you could recommend any upgrades that are easy to install and are not too expensive.

Dwayne Acker
P.O. Box 923
Shelburne, NS B0T 1W0
Canada

You shouldn't need any accessories beyond the items included when you buy your 512K upgrade. For more information, check Marry Goodman's article "Upgrading the Color Computer's Memory" (March 1989, Page 34).

A Friendly Situation

Editor:

As a result of your publishing my previous letter in the August issue I have now received seven responses, each from a different state — all were helpful. I answered the letters and suggested that the effectiveness of THE RAINBOW as a means of data exchange is (to me) a proven plus.

One caller, previously unknown to me, is a CoCo veteran who lives just a couple of miles away. We have met, swapped shop talk, and plan to continue this association. In view of this, accept my thanks for your assistance.

Robert Willard
Carriere, Mississippi

We're glad we could help.

Redefining OS-9 Control Keys

Editor:

One common use for the OS-9 xmode command is to change the printer baud rate. Less often does one hear of its use in altering the configuration of the CoCo keyboard. Personally, I have always found CTRL-A (used to repeat a command line) and CTRL-W (to pause the screen) to be both awkward and unwieldy. A simple remedy is to use xmode to redefine other keys for these functions.

Since SHIFT-left arrow deletes the current line, let's redefine SHIFT-right arrow to recall the last line typed. Using the "OS-9 Keyboard Codes" table (Level II manual, "OS-9 Commands," Page C-1) as a guide, you see the code for SHIFT-right arrow is \$19. Simply change the dup character from its default (\$01) to \$19 using xmode. In a similar fashion you can change the psc character from \$17 to \$60 to change the pause-screen key from CTRL-W to SHIFT-@ (just like Disk BASIC). If you add the line:

```
xmode /term dup=19 psc=60
```

to the startup file, the changes will be in place after booting OS-9. You can take this even farther by adding the pause and pag characters to give you control over all the windows you use. Replace /term with /wx, where x is the number of the window in question.

Gerry Gerhart
Huntsville, Ontario

Pirate Notice

Editor:

Thank you for running my request for pen-pals. In the June issue, you stated "Only those parties who have signed our non-piracy agreement form appear in the listings of Intercom". I never received such a form before my request was printed. I also noticed the statement doesn't appear in the August issue. Does this mean you don't require the agreement any more? The agreement is a very good idea and should be continued. We programmers spend a lot of time working on our programs and anything to reduce the chance of piracy is welcomed.

Also, my address has been changed and I'm still interested in pen-pals. Thank you for bringing me closer to those who share my interest in the CoCo.

Tika Carr
199 Rossmore Street
Rochester, NY 14606

Pen-pals seem to be self-governing as far as piracy is concerned. However, please

inform us if you do receive an invitation from a pirate.

What's in a C Compiler?

Editor:

I'm a beginning C programmer, and I purchased the C compiler from Tandy. Upon booting the software I found that the module cc2 is missing. cc2 is designed to take advantage of Level II's enhanced memory management. I called Tandy and the person I talked with has no idea what I'm talking about. So I then called Microware. It turns out they know what I'm talking about, but Microware isn't supporting the 6809 anymore.

Also, I am interested in locating patches to allow me to put the compiler and the library on one 40-track disk. I would be grateful for any help.

Ernest Bazzinotti, Jr.
93 Aueckland Street, Apt #2
Dorchester, MA 02125

The difference between the Level I and Level II versions of the C compiler is that both passes are performed by the c.comp modules in the Level II version. Tandy licensed only the Level I version from Microware. However, you can find versions of cc1 that take advantage of Level II features on Delphi, CompuServe and many bulletin boards.

A Vote of Confidence

Editor:

I am writing to commend you on your excellent August issue of THE RAINBOW. I am encouraged that you are giving more coverage to OS-9, and I hope this will continue. I am also looking forward to articles on the new machines and OS-9/68K.

Frank Pittenger
Raleigh, North Carolina

Can CoCo Tell Time?

Editor:

I recently built an expansion-relay board that was advertised in THE RAINBOW. Having just bought a new house, I want to secure my home with a CoCo 3 alarm system.

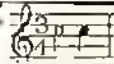
I am an experienced BASIC programmer, and I understand 6809 machine language at an intermediate level. I am looking for a real-time clock program with output that can be displayed on the 40- or 80-column screen while the computer is executing a BASIC program to scan windows, doors and

Continued on Page 88

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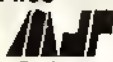
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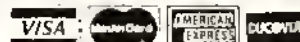


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Graphically Speaking



As I was discussing the theme for this month's issue of *THE RAINBOW*, it occurred to me that most of the major advances in the CoCo over the years have been graphics-oriented.

Ask any of the older (in terms of years of involvement, not necessarily age) members of the CoCo Community and they will probably tell you about the wonder they felt the first time they saw a real, "live," space invader crawl across the top of their screen.

In an early issue of a small magazine called *Color Computer News*, Tom Rosenbaum of Spectral Associates in Tacoma, Washington, demonstrated how to create a space-invader type game in machine language and how to animate it.

I know that sounds pretty crude today. But back then, when all we had were some not-so-exciting ROM Paks from Radio Shack, the Spectral invader was quite a marvel. Naturally, it did not do anything except move across the screen. To actually *play* the game, you had to buy the program from Spectral. And there it was, in living color.

Tom Rosenbaum's invader game was probably the third most spectacular sight I have ever seen on my CoCo. The Number 1 ranking, interestingly, belongs not to a graphics program at all but, yet, one which

was more of a graphics program than anything else.

Early on, when Howard Cohen wrote *Telewriter* for his company, Cognitec of Del Mar, California, he set out to write a word processing program and immediately ran into a problem that bugged everyone who was working with the Color Computer — a text screen only 32 characters wide.

Howard solved this problem — and fathered an entire new age in the CoCo world — by drawing letters on the graphics screen and providing 64- and 85-column displays. I heard that members of the Greater Cincinnati TRS-80 User's Group actually applauded when Dick White demonstrated *Telewriter* for the first time.

So graphics is as graphics does, I guess. Today, of course, we have even more fine screen definitions, and many people are doing all sorts of things with the CoCo: word processing, desktop publishing, sign-making and the like. Graphics have taken over the world of games as well, and that is as it should be, since games are an important part of the computer world.

Tandy, as you are aware, originally conceived the Color Computer as a machine on which people could play games — throwing in the "computer" as a sort of bonus. It was originally marketed as competition for the home game devices of its day and happened to perform spectacularly. Of course, what happened to be "thrown in" — the computer — became CoCo's mainstay. It still is.

What has always been interesting to me is to see the programmers in the Color Computer world expand their horizons. In the last couple of years that has happened more so in the graphics area. I suspect graphics and graphics capabilities will always be a prime factor in the world of Color Computing.

What is most interesting to me, though, is the role graphics plays in non-graphic areas. Sure, we "celebrate" graphic inven-

tiveness with such features here as our "CoCo Gallery," but the truth is that graphics are employed in almost all commercial products on the CoCo today.

Cohen opened up a whole world of applications and a way to "get around" the 32-column display. That idea was and is used by everything from database programs to desktop publishers. Quite a legacy, Howard.

Before you ask and I end up with a thousand letters to answer, the Number 2 gee-whiz, to me anyway, was the concept of *Motion Picture Programming* developed by a gentleman named Arnold Pouch. I still do not totally understand how it works, and Arnold passed away about a year after he developed the concept (although there are some tutorials in some older issues of *THE RAINBOW*).

Without needing to draw true animated screens, *Motion Picture Programming* animates the CoCo screen. I thought Arnold's neatest venture was a craps game in which a hand actually shook the dice and then rolled them onto a table.

Because mighty oaks do indeed grow from small acorns, I have wondered from time to time what advances Arnold and those who would have used his technology would have brought about. It is a shame we will never know.

Now that you've had a month to cogitate on the matter, I'll give you the answers to last month's little geography quiz. The Allegheny and Monongahela rivers meet at Pittsburgh, Pennsylvania, and form the Ohio River, and this area is called the Golden Triangle.

— Lonnie Falk

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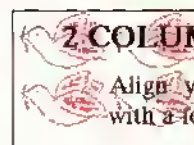
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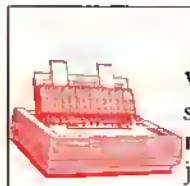
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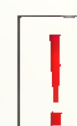
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Picture This!

by Tom George

*Feature-packed
graphics with
the CoCo 3*

I am the first to admit I lack great artistic ability. Although I like the graphics programs available for the Color Computer 3, I've never purchased one because, with my minimal talent, I could not justify spending the money. I also did not need a program that could use 100 fonts and 40 brushes, but I did want to create simple graphic icons and print text with graphics.

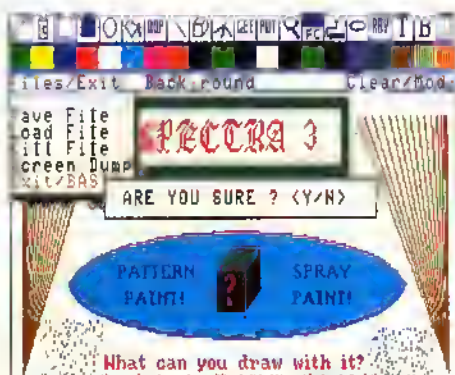
CoCoDraw, by Darin Herr, is just such a program for the CoCo 2; however, it is not easily modified because it is built around the PCOPY command, which cannot be used with the CoCo 3 Hi-Res screen. Inspired by *CoCoDraw*, I wrote *Spectra 3* to take advantage of the CoCo 3.

Spectra 3 requires 512K with one disk drive, an RGB monitor and a self-centering joystick. The Hi Resolution Joystick Interface needed on some commercial drawing packages is not necessary, thanks to a modification by John G. Williams. *Spectra 3* is ideally suited for beginning artists and persons with simple graphics needs.

Although it's easy to use, *Spectra 3* is a program powerhouse with features such as rays, cubes and ellipses. It paints in vertical patterns and has fast machine language screen refresh, disk save/load and memory management.

Tom George has a PhD in organic chemistry and is a specialist in clinical chemistry with a hospital in the Philadelphia area. His Color Computer interests include machine-language programming and working with the OS-9 operating system.

You draw by pointing on the main menu and pressing the fire button to initiate a command. This menu can be turned on or off to allow drawing with the full screen in view, unlike other programs that draw on only part of the screen or require you to scroll to the hidden areas.



Two pull-down menus are also provided. The Files/Exit menu lets you save and load pictures and exit to BASIC. The Clear/Mode menu lets you set the Get/Put mode, which clears the screen and sets the colors. You can select a palette of 16 colors from the 64 colors available. The colors are saved to disk with the picture and restored when the picture is loaded.

In addition to using it as a drawing program, *Spectra 3* can also be used as a simple desktop publisher. You can write with the standard HPRINT font or use Bold or Old English. To get started, using a freshly formatted disk, enter and save listings 1 and 2, then RUN "MAKESPEC". A machine-language file (SPECTRA3/BIN) is created and saved. Be sure to make a backup

copy of this disk. It can hold up to four picture files. Enter RUN "SPECTRA" and you are ready to draw.

Main Menu

On startup the main menu appears at the top of the screen. It contains twenty icons representing drawing tools. Below it are 16 palette colors and four patterns. The menu can be turned off by moving the pointer to the top left corner and pressing the fire button. To restore the menu, move to the top right corner and press the button. Below the palette are three boxes. Pressing the button in the Files/Exit box activates a pull-down menu that automatically enters the Load File option. If the disk contains picture files, the files are listed. Use the joystick to scroll to the desired file and press the button to load the picture.

To use the other options in Files/Exit, hold the button down when entering the menu. Use the joystick to scroll to the desired option, then release the button to activate the selection. When entering text remember that lowercase is used unless you hold down the SHIFT key. Use the left arrow key to backspace and erase text if necessary.

Although *Spectra 3* does not have a graphics-screen dump, space has been left in the menu if you want to add one to

fghfghfghfghfghfg

Line 5240. If your dump is written in machine language, place it between \$7D00 and the top of RAM (\$7FFF) to avoid overwriting the BASIC program.

Since the BREAK key is disabled, there are only two ways to exit the program without turning off the computer. The Exit/BASIC option leaves the program in memory; you can continue by typing RUN. You can also exit by pressing the Reset button, which restarts the computer and erases program memory but not video memory. Any pictures not saved before exiting can still be partially recovered using the Oop icon to restore the picture. The areas under the menus cannot be recovered.

You can save or edit HSCREEN2 pictures from other programs the same way; however, you must use the Palette option to manually restore the colors. Pictures are lost if the computer is turned off, and you cannot save screens from OS-9 programs.

The Background box sets the background color. On startup the background is white. To change it, position the pointer anywhere in the box and press the button. You can then select any of the 16 colors by moving the pointer to a color and pressing the button. The Clear Screen option in the Clear/Mode menu erases the entire screen to the background color. This color is the border at which painting stops when using Paint. When using the Enlarge command, the background color appears when a pixel is turned off. The background color is also used to erase the HPRINT text by backspacing. Finally, background color is used for pull-down menus. You cannot use a pattern as a background color.

The Clear/Mode box opens another pull-down menu similar to Files/Exit. Hold the button down and scroll to the desired Put mode option or Clear Screen. If you clear the screen accidentally, use Oop to restore. Selecting Palette presents 16 colored boxes. Change the palette with the right and left arrow keys and select the color with the F1 and F2 keys. Starting from Number 63 (white), F1 decreases the color number and F2 increases the color number. Remember that Palette 8 (black) is the pointer color, and changing it may make the pointer difficult to see.

Commands

To select a command, move the arrow to a command icon and press the fire button. The icon border changes color, and you can use the tool on the screen directly below the menu or underneath by turning the menu off. The command remains active until you select another or use the Oop command. The commands are, from left to right:

Digitized Pen: After selecting this com-

mand, move the pointer to the desired location and press the button. The pointer disappears. You can then draw lines by pressing one of eight keys. W moves up, E up and right, D right, C down and right, X down, Z down and left, A left and Q up and left.

Line	Module /Subroutine
10 - 60	Initialization
100 - 170	Main Menu
200 - 330	Main Loop
1000 - 5820	Subroutines
1000 - 1150	Pen
1400 - 1410	Box
1600 - 1610	Box Fill
1800 - 1810	Circle
2000 - 2020	Paint
2200 - 2200	Oop
2400 - 2410	Line
2600 - 2620	Cube
2800 - 2810	Point kRay
3000 - 3020	Get
3200 - 3290	Put
3400 - 3510	Enlarge
3600 - 3640	Foreground Color
3800 - 3810	Roller Brush
4000 - 4010	Ellipse
4200 - 4210	Ray
4400 - 4410	Text
4600 - 4630	Bold Text
4800 - 4830	Old Text
5000 - 5270	Files/Exit
5300 - 5320	Background
5400 - 5480	Clear/Mode
5500 - 5610	Palette
5620 - 5670	Joystick routine
6000 - 7880	Font Data

Table 1: Modules and Subroutines

The keys are arranged in their order of movement on the keyboard, and repeat automatically if held down. Try holding down a key and simultaneously pressing a second key for some interesting angles and pixel spacing. To increase line size press 2; to decrease press 1. Toggle the pen up and down by pressing 3. A blinking pixel shows the draw position. Press ENTER to end and restore the pointer.

I have never been able to master free-hand drawing with a joystick, but those who want to draw freehand can add this by deleting lines 1000 through 1150 and adding the following two lines. Press and release the button to start and end.

```
1000 GOSUB5780:FORJ=1TO1000:NEXT
:HLINEX,Y)-(X,Y),PSET:REM * PEN
1010 GOSUB5650:HLINEX,Y),PSET:
IFFB=0THEN1010ELSERETURN
```

Spray Can: Sprays paint in a rectangular box. Move the pointer to the upper left corner of the area to be sprayed and hold the fire button down. Move the box down and

to the right, then release the button. Paint is sprayed in the box until the button is pressed. Note that while you can position the box upward from the starting point or down and to the left, no paint is sprayed.

Box: Draws a rectangular box. Position the pointer and hold the button while moving the box to the desired position.

Box Fill: Same as the box command except the box is filled.

Circle: Hold the button and move the joystick forward and left to decrease the circle or backward and right to increase it.

Paint: The object to be painted must be completely enclosed by the background color, or the entire screen will be painted. If this happens, move the pointer to the upper right corner and press the button to restore the menu, then select the Oop command to restore the picture. You cannot use a pattern as a border color, and you cannot paint over a pattern made up of a border color.

Oop: Cancels the previous command. Restores the Hi-Res picture in memory on startup.

Line: Draws a line of any length in the specified direction.

Cube: Move the joystick right to project the cube right and change size. Move left to project the cube left and change size. Move the joystick forward to increase the depth of the cube and backward to decrease it. When the cube hits the borders of the screen it breaks up.

Point Ray: Draws lines to a central point. Position the pointer and press the button. You can either hold the button to position the line or position the pointer and press the button to draw the line. Note that when using Point Ray with the menu off, you must double-click the button to restore the main menu.

Get: You can pickup or "get" a portion of the screen, up to a maximum of 62-by-62 points. Position the pointer at the upper left corner, hold the button and move the pointer to highlight the image. Releasing the button picks up the image.

Put: Pressing the button quickly Puts down the image from Get so it can be positioned by moving the joystick. The way the image is Put depends on the mode setting in the Clear/Mode menu. Press the button again to set the image. Move the joystick to the top of the screen to restore the pointer.

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Enlarge: Hold the button down and move the rectangle over the area you want to enlarge. A 22-by-22 enlarged grid appears, and you may edit any pixel to any color. To change color move the pointer over a color on the palette at the right and press the button. Then move the pointer over a background pixel. Pressing the button changes the color of that pixel. Pressing the button again resets the color to the background color set in the main menu. You can change an entire row or column by holding the button down and slowly moving the pointer up or down, left or right. You cannot use Enlarge with the foreground color set to a pattern.

Foreground Color: The drawing color for all commands. After selecting this command, move the pointer over any color or pattern and press the button.

Roller Brush: Allows you to paint with a 5-by-5 pixel brush by holding the button and moving the joystick. Note that you can also use the brush as an eraser by setting the foreground color to the background color.

Ellipse: While pressing the button, moving the joystick up and left elongates and shortens the ellipse top-to-bottom. Moving down and right flattens and lengthens the ellipse left-to-right. Adjust the joystick slowly since small movements can sometimes produce large changes.

Ray: Hold the button down and move the joystick in any direction to produce rays.

T (Text): Position the pointer where you want to print text and press the button. Enter up to 40 characters of text. Hold down the SHIFT key for capital letters. You can use the left arrow to backspace over mistakes if the background color is the same as the background on which you are entering text. Press ENTER when finished.

Hint . . .

Recently I have been encountering I/O errors with Drive 0 under OS-9. This frustrating problem was causing me grief to the point where I was ready to take the drive back to Radio Shack for repairs. However, being the inquisitive type, I decided to poke around inside the drive to see if I could solve the great and mysterious I/O problem.

Using a small program on the OS-9 Level II Boot/Config disk I checked the

Addresses/Variabtes	
SM -	Save menu (ML)
RM -	Restore menu (ML)
SUM -	Save Under menu (ML)
RUM -	Restore Under menu (ML)
SS -	Save Screen (ML)
RS -	Restore Screen (ML)
FB -	Firebutton status
F -	Foreground Color
B -	Background Color
CP -	Put mode status
S -	Command number
M -	Main Menu status
X,Y -	Present screen location
XX, YY -	Last screen location
L -	Length of input string
R -	Palette register
C -	Palette color
P -	Pattern/Pen color
R -	Pen radius

Strings	
A\$ -	General input
C\$ -	Cube length/Disk input
E\$ -	Cube depth/Disk input
P\$ -	Up arrow character
Q\$ -	*Text input
D\$ -	Disk picture files

Arrays	
DP -	Non-linear pointer data
B -	Bold text data
O -	Old text data

Table 2: *Spectra 3* Variables

B (Bold) and O (Old English): The same as Text except backspacing over mistakes is not allowed.

Spectra 3 is modular in construction. There are five main program modules. Initialization sets palettes and buffers, defines the machine-language execution addresses, draws the pointer and sets up the non-linear joystick array. You can define your own palette on startup by changing or adding PALETTE commands to Line 40; you

can set the foreground and background colors by changing F and B in Line 30.

The Main Menu module draws the main menu without displaying it and saves it to memory. The first two pokes in Line 170 disable the BREAK key and the next poke restarts the computer when the reset button is pressed.

Main Loop takes input from the joystick and branches to the appropriate command or menu. The high-speed poke is used in Line 30 and 5220 and remains on except during disk access.

The Subroutines module is divided into subroutine functions, all marked by REM comments. Table 1 lists major program lines for these modules and subroutines, and Table 2 lists program variables. This information should help if you want to modify any function to suit your particular needs.

Font Data is a list of strings for the Bold and Old English fonts. You can modify these strings to change any character or write a whole new font. A detailed explanation of the machine language portion of *Spectra 3* would require a separate article, but if enough readers express an interest, I would be happy to write a tutorial. □

512K CoCo 3 Disk

✓

110 37
140 128
END 101

Listing 1: MAKESPEC

```

0 COPYRIGHT 1990 FALSOFT, INC.
10 CLEAR 400,31999
20 CLS:L=110:P=4000
30 READ A$,CS:S=0
40 PRINT@0,"WORKING ON LINE":L

```

Continued on Page 20

drive speed. In almost all cases, the drive speed was too slow. With the case removed, I began to move the door and noticed the drive would spin at normal speed with the door opened slightly. After repeated trials, I confirmed the door was indeed the problem, but how to adjust it?

I found a broken piece on the lower side of the door causing it to close too far, thereby placing extra pressure on the ro-

tating disk. I managed to eliminate the problem by gluing a small piece of wood to the bottom of the door. (A Popsicle stick works just fine!) Not only did I fix the problem, I saved myself the cost of getting the drive fixed at Radio Shack.

*Terry Alexander
St. Johns, Newfoundland*

For this hint, the author has been sent copies of *The Fourth Rainbow Book of Adventures* and tape.

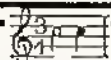
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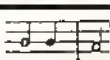
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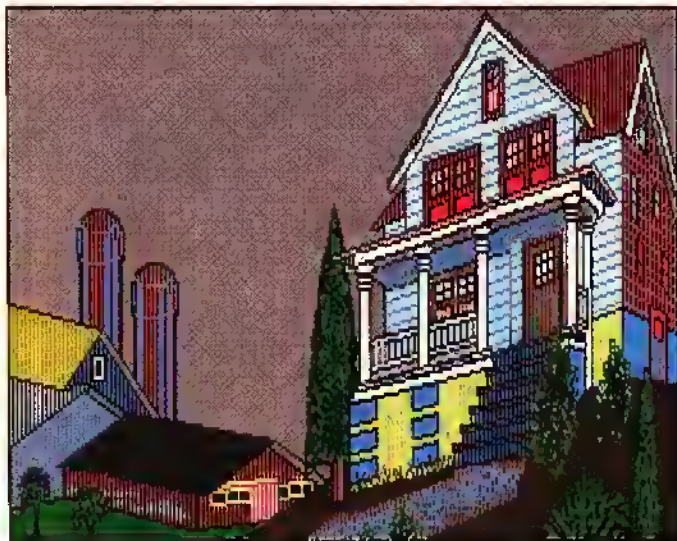
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CoCo Gallery

1st Place

Farmnite
John Murvine



John, of Ebensburg, Pennsylvania, used *CoCo Max III* to create this picture. To see more of John's work, reference your back issues of "CoCo Gallery."

3rd Place

The Farm
Kathy Rumpel



Kathy, of Arcadia, Wisconsin, has lived on a dairy farm all her life. She designed this *CoCo Max III* picture to show what a typical summer day on the farm looks like.



SHOWCASE YOUR BEST!

You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community! Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also please include a few facts about yourself.

Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere. A digitized copy of a picture that appears in a book or magazine is not an original work.

We will award one first prize of \$25, one second prize of \$15 and one third prize of \$10.

Please send your entry on either tape or disk to the CoCo Gallery, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. Remember, this is a contest and your entry will not be returned.

— Tony Olive, Curator

2nd Place

Red Sun
Dorothea Clement



Dorothea, of Amityville, New York, is a senior in a three generation CoCo family. This graphics image was developed with *CoCo Max III*.



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```

50 FOR X=0 TO 63
60 V=VAL("&H"+MID$(AS,X*2+1,2))
70 POKE P,V:S=S+V:P=P+1:NEXT
80 IF CS<S THEN PRINT "DATA ERR
90 L=L+10:IF P<4320 THEN 30
100 SAVEM"SPECTRA3",4000,4320,40
00:PRINT"SPECTRA3/BIN SAVED":END
110 DATA "1A50CC302FFDFFA48D68CC
3C3DFFFA4391A50CC302BFDFFA48D5A

```

```

CC312CFDFFA48D52CC322DFDFFA48D4A
CC332EF0FFA48042CC292AFDFFA48D3A
20CD1A50CC", 8946
120 OATA "2830FDFFA48D2ECC2C31FD
FFA48D26CC2D32FDFFA48D1ECC2E33FD
FFA48D16CC2A29FOFFA4800E20A11AS0
00EC81EDA1", 8452
130 DATA "8CA00026F7398E8000108E
A000EC81EDA18C99A026F7391A50CC30
29FDFFA48DE516FF661A50CC2930FDF
A48DD816FF598D0FDD8D10448601976F

```

```

8EFF80A680", 8364
140 OATA "AD9FA0028CFFC026FS8E80
008D41A680D4FAD9FA0028CF80025F1
0F6F398EFF80C6108601976F8DA176A7
80SA26F8E800008D2D0D702609BDA176
8D12A78020", 7602
150 OATA "100000000000000000000000
00000000000000000000000000000000
BD0FB13934061A50CC3031FDFFA4CC32
33FDFFA635863406CC3C3DFDFFA4CC3E
3FFDFFA63586FF000000000000000000
000000FFFF", 7739
160 REM * END OF LISTING

```

50	.....	54	3480	.....	254	5680	.....	103	7120	.....	236
120	.....	192	3510	.....	211	5750	.....	39	7220	.....	253
150	.....	72	3810	.....	55	6000	.....	63	7300	.....	9
220	.....	104	4620	.....	29	6110	.....	249	7370	.....	27
300	.....	224	5010	.....	249	6210	.....	77	7430	.....	53
1020	.....	125	5080	.....	219	6300	.....	135	7480	.....	56
1090	.....	187	5130	.....	51	6390	.....	106	7530	.....	217
1220	.....	4	5200	.....	215	6470	.....	52	7590	.....	182
2010	.....	76	5270	.....	90	6550	.....	145	7660	.....	203
2620	.....	121	5410	.....	103	6640	.....	245	7730	.....	171
3020	.....	244	5470	.....	226	6730	.....	146	7810	.....	243
3270	.....	51	5530	.....	131	6810	.....	115	END	.....	56
3440	.....	22	5600	.....	30	7040	.....	225			

Listing 2: SPECTRA

```

0 *COPYRIGHT 1990 FALSOFT, INC.
10 REM * INITIALIZATION
20 PCLEAR1: CLEAR700: SM=4000: RM=4
105: SUM=4151: RUM=4164: SS=4017: RS
=4061: RGB: LOAOM"SPECTRA3": EXECUSU
M: EXECSS:HSCREEN2:HSCREEN0
30 WIDTH40: PRINT"INITIALIZING..."
:F=2: B=4: POKE230,2: POKE282,0: POK
ES9078,18: POKE59079,18: POKE65497
,0:HCLS8:HCOLOR8
40 PALETTE9,17: PALETTE10,7: PALET
TE11,49: PALETTE12,34: PALETTE13,S
0: PALETTE14,32: PALETTE15,15
50 HBUFF1,15:HBUFF2,15:HBUFF3,39
20:HBUFF4,3920: HDRAW"BM0,0R3G3U3
F4": HGET(0,0)-(4,4),1:HCLS8:HCOL
ORF: EXECSSUM
60 DIMOP(63),B$(90),O$(90): FORJ=
0T063: N=J-31: DP(J)-INT(.S+(ABS(N
)*N/50)): NEXT: M=1: CP=1: P$=CHR$(9
4): GOSUB8010
100 REM * THE MAIN MENU
110 HDRAW"BM0,0R319D16L319NU16OR
319BD12L319DR319BD10L80NU10L159N
U10L80": FORJ=0T0304STEP16: HLINE(
J,0)-(J,16): PSET: NEXT
120 HDRAW"BM12,2G9D2GE2DRE6L2UR3
HLBM21,5D9R6U3L3U3R3D2U5L6E3DRF8
M35,3R10D10L10U10BM70,4R3F3D3G3L
3H3U3E3BM87,20SEF3U2RF5HU4G5H5E
4BM100,5BM99,5D6R2U6L2BR4D6R2U6L
2BR4N06R2D3L2BM115,3F10BM131,13U
6NR6E4R6NG4D6G4NL6U6
130 HDRAW"BM153,8M156,3BM153,8F5
H5M151,14BM153,8M146,11BM165,5L2
D6R2U2B4R6K4L2D3R2E2D3R2B300LR2
BM179,8R2U3L2D6BR4BU6D6R2U6BR2R2
LD6BM198,2G3D2F3R5F3DH3L3L2BU5
E2U2H3NL3DL4G2D2F2R4E2U2H2BM212,
10NR3D2NR2D2BR8L2HU2ER2BM209,6R1
5

```

```

140 HDRAW"BM238,12L1002R10UL12U4
R7U3LU4R2D4": HCIRCLE(248,8),6,,,
6: HDRAW"BM259,11U6R2D3LDFDBR2U6R
2D3LRD3BR3U3LU3BR2O3BM276,SU2R70
2HL5R2D8GR3HU78M292,3R6ND9FD3GNL
3FD3GL4NU9L2EU88M309,3ND9R5FNL50
8GNU8LSHNR6U8
150 HLINE(S1,3)-(61,13),PSET,8F:
HLINE(208,1)-(224,8),PSET,8F: HPR
INT(0,4),"Files/Exit Background
": HPRINT(30,4),"Clear/Mode"
160 FORJ=0T015: HCOLORJ:HLINE(J*1
6,18)-(J*16+16,28),PSET,8F: NEXT:
FORP=2T04: GOSUBS690:HLINE(P*16+2
24,18)-(P*16+240,28),PSET,8F: NEX
T: P=22: GOSUBS690:HLINE(304,18)-(
319,28),PSET,8F: GOSUBS700: HCOLOR
F,B: EXECSSM: HSCREEN2: POKES9078,14
1: POKES9079,16
170 POKE41598,255: POKE41599,2SS:
POKE113,0: ONERR GOTOS680
199 REM * MAIN LOOP
200 FORJ=1T0200: NEXT: IFS=6THEN21
0ELSEGOSUB5620
210 IFX=0ANDY=0ANDM=1THENEXECRUM
: M=0: GOT0200
220 IFX=319ANDY=0ANDM=0THENEXECS
UM: EXECRUM: GOSUB8330: M=1: IFS=6THE
N300ELSE200
230 IFM=0THEN300ELSEIFY>30ANDY<4
1ANDX<80THENGOSUBS000
240 IFY>30ANDY<41ANDX<80ANDX<239
THENGOSUBS700: HCOLOR3:HLINE(80,3
0)-(239,40),PSET,B: IFF<15THENGOS
UB5300ELSEGOSUB5690: GOSUB5300
250 IFY>30ANDY<41ANDX>239THENGOS
UB5400
260 IFY>40THEN300
270 IFY<16THENS=INT(X/16)+1: EXEC
RUM: PLAY"O3T8C"
280 IFF<16THENGOSUB320ELSEGOSUB3

```

```

30
290 IFS=70RS=14THEN300ELSEIFS=6T
HENEXECS: ELSE200
300 XX=X: YY=Y: ONS GOSUB1000,1200
,1400,1600,1800,2000,2200,2400,2
600,2800,3000,3200,3400,3600,380
0,4000,4200,4400,4600,4800
310 IFM=0THENEXECSUM: GOT0200ELSE
IFS=100RS=14THEN210ELSE200
320 IFS=0THENRETURNELSEHCOLOR3:H
LINE((S-1)*16,0)-(S*16,16),PSET,
8: IFF<16THENHCOLORF: RETURNELSERE
TURN
330 IFF>15THENGOSUBS700: GOSUB320
: GOSUBS690: RETURNELSEGOSUB320: RE
TURN
999 REM * SUBROUTINES
1000 GOSUBS780: R=0: P=F: REM * PEN
1010 AS=INKEY$: IFA$=CHR$(13)THEN
RETURNELSE1FBUTTON(0)THEN1010
1020 IFPEEK(343)-2S4THENY=Y-1: IF
Y<41ANDM=1THENY=41ELSEIFY=-1THEN
Y=0ELSEX=X+1: IFX=320THENX=319: Y
=Y+1
1030 IFPEEK(342)-254THENX=X+1: IF
X=320THENX=319
1040 IFPEEK(341)-254THENX=X+1: IF
X=320THENX=319ELSEY=Y+1: IFY=192T
HENY=191: X=X-1
1050 IFPEEK(338)-247THENY=Y+1: IF
Y=192THENY=191
1060 IFPEEK(340)-247THENY=Y+1: IF
Y=192THENY=191ELSEX=X-1: IFX=-1TH
ENX=0: Y=Y-1
1070 IFPEEK(339)-254THENX=X-1: IF
X=-1THENX=0
1080 IFPEEK(339)-2S1THENY=Y-1: IF
Y<41ANDM=1THENY=41ELSEIFY=-1THEN
Y=0ELSEX=X-1: IFX=-1THENX=0: Y=Y+1
1090 IFPEEK(34S)-2S1THENY=Y-1: IF
Y<41ANOM=1THENY=41ELSEIFY=-1THEN
Y=0
1100 IFPEEK(340)-239THENR=R+1: IF
R>10THENR=10
1110 IFPEEK(339)-239THENR=R-1: IF
R=-1THENR=0
1120 IFPEEK(341)-239THENIFP=F TH
ENP=B ELSEP=F
1130 IFR<>0THENHCIRCLE(X,Y),R,P:
GOT011S0
1140 HSET(X,Y,P)
1150 IFP=B THENHSET(X,Y,F): FORJ=
1T0100: NEXT: HSET(X,Y,B): GOT01020
ELSEGOTO1010
1200 GOSUB5780: REM * SPRAY
1210 HLINE(XX,YY)-(X,YY),PSET,8: G
OSUBS790: IFFB=1THEN1210
1220 J=XX+RND(X-XX): K=YY+RND(Y-Y
Y): HSET(J,K): IFBUTTON(0)=0THEN12
20ELSERETURN
1400 GOSUB5780: REM * BOX

```

```

1410 GOSUB5790:HLINE(XX,YY):(X,Y
),PSET,B:IFFB=1THEN1410ELSERETUR
N
1600 GOSUB5780:REM * BOX FILL
1610 GOSUB5790:HLINE(XX,YY)-(X,Y
),PSET,B:IFFB=1THEN1610ELSERETU
RN
1800 GOSUB5780:REM * CIRCLE
1810 GOSUB5790:HLINE(XX,YY),(X
+Y)/4:IFFB=1THEN1810ELSERETURN
2000 REM * PAINT
2010 GOSUB5620:IF(Y<41ANDM=1)OR(
X=319ANDY=0ANDM=0)THENRETURNELSE
EXECSS:HPAINT(X,Y),B:IFM=0THENE
XECSSUM
2020 GOTO2010
2200 EXECRS:EXECRM:S=0:RETURN:RE
M * OOP
2400 GOSUB5780:REM * LINE
2410 GOSUB5790:HLINE(XX,YY)-(X,Y
),PSET:IFFB=1THEN2410ELSERETURN
2600 GOSUB5780:REM * CUBE
2610 GOSUB5790:1FX<XX THEN2620EL
SEC$=STR$(ABS(XX-X)):E$=STR$(INT
(ABS(XX-X)/((INT(Y/10)+2)/5)):H
DRAW"BM"+STR$(XX)+" "+STR$(YY)+"
R"+C$+"D"+C$+"L"+C$+"U"+C$+"E"+E
$+"R"+C$+"NG"+E$+"D"+C$+"G"+E$:1
FFB=1THEN2610ELSERETURN
2620 GOSUB5790:IFX>XX THEN2610EL
SEC$=STR$(ABS(XX-X)):E$=STR$(INT
(ABS(XX-X)/((INT(Y/10)+2)/5)):H
ORAW"BM"+STR$(XX)+" "+STR$(YY)+"
L"+C$+"O"+C$+"R"+C$+"U"+C$+"H"+E
$+"L"+C$+"NF"+E$+"D"+C$+"F"+E$:I
FFB=1THEN2620ELSERETURN

```

```

2800 GOSUB5780:REM * POINT RAY
2810 GOSUB5790:HLINE(XX,YY)-(X,Y
),PSET:IFFB=1THEN2810ELSEP9=XX:R
9=YY:GOSUB5620:IF(Y<40ANOM=1)OR(
X=319ANDY=0ANOM=0)THENRETURNELSE
XX=P9:YY=R9:EXECSS:GOTO2810
3000 GOSUB5780:XX=X:YY=Y:REM * G
ET
3010 X=JOYSTK(0)-1:Y=JOYSTK(1)-1
:IFXX>X>318THENX=318:XX ELSEIFY
+Y>191THENY=191:YY ELSEIFINT(X/2
)<>X/2THENX=X+1
3020 HLINE(XX,YY)-(XX+X,YY+Y),PR
ESET,B:HLINE-(XX,YY),PSET,B:EXEC
RS:1FBUTTON(0)THEN3010ELSEHGET(X
X,YY):(XX+X,YY+Y),3:FORJ=1TO8:HP
UT(XX,YY):(XX+X,YY+Y),3,NOT:NEXT
:PX=X:PY=Y:X=XX:Y=YY:RETURN
3200 GOSUB5780:REM * PUT
3210 GOSUB5650:IFY<1THENRETURNEL
SEIFX+PX>318THENX=318:PX
3220 IFY+PY>191THENY=191:PY ELSE
IFINT(X/2)<>X/2THENX=X+1
3230 HGET(X,Y)-(X+PX,Y+PY),4:ONC
P GOSUB3250,3260,3270,3280,3290:
IFFB<>1THENHPUT(X,Y):(X+PX,Y+PY)
,4,PSET
3240 GOTO3210
3250 HPUT(X,Y):(X+PX,Y+PY),3,PSE
T:RETURN
3260 HPUT(X,Y):(X+PX,Y+PY),3,PRE
SET:RETURN
3270 HPUT(X,Y):(X+PX,Y+PY),3,AND
:RETURN
3280 HPUT(X,Y):(X+PX,Y+PY),3,OR:
RETURN

```

```

3290 HPUT(X,Y)-(X+PX,Y+PY),3,NOT
:RETURN
3400 IFF>15THENRETURNELSEGOSUB57
80:IFB=3THENHCOLOR4,BELSEHCOLOR3
,B:REM * ENLARGE
3410 GOSUB5650:IFX>298THENX=298
3420 1FX/2<>INT(X/2)THENX=X+1:1F
Y>170THENY=170ELSEIFY>170THENY=1
70
3430 HLINE(X,Y)-(X+21,Y+21),PRES
ET,B:HLINE-(X,Y),PSET,B:EXECRS:I
FBUTTON(0)=0THENHGET(X,Y):(X+21,
Y+21),3:ELSE3410
3440 XM=X:YM=Y:HSCREEN2:HLINE(5,
5):(187,187),PSET,B:HLINE(4,4)-(
188,188),PSET,B:HLINE(204,171)-(
258,188),PSET,B:HLINE(260,171)-(
314,188),PSET,B:HLINE(205,25)-(2
28,48),PSET,B:HLINE(205,81)-(228
,104),PSET,B
3450 HCOLOR5:HPRINT(27,1),"ENLAR
GE":HPRINT(30,4),"Cut":HPRINT(30
,11),"Paste":HPRINT(30,18),"Colo
r":HPRINT(27,22),"Done Undo"
3460 FORJ=0TO15:HOLORJ:HLINE(29
9,J*10):(319,J*10+10),PSET,BF:NE
XT
3470 HPUT(206,26):(227,47),3,PSE
T:HPUT(206,82):(227,103),3,PSET:
HCOLORF:HLINE(205,137)-(229,158)
,PSET,BF:FORJ=26TO47:YY=(J-26)*8
+9:FORK=206TO227:XX=(K-206)*8+9:
MC=HPOINT(K,J):HCOLORMC:HLINE(XX
,YY):(XX+6,YY+6),PSET,BF:NEXTK,J
:HCOLORF:MC=F
3480 GOSUB5620:IFX>298ANDY<160TH

```

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```

ENMC=INT(Y/10):HCOLORMC:HLINE(20
5,137)-(229,158),PSET,BF:GOTO348
0
3490 IFY<185ANDX<185ANDY>8ANOX>8
THENX=INT((X-9)/8):Y=INT((Y-9)/8
):XX=X*8+9:YY=Y*8+9:1FHPOINT(XX,
YY)-B THEN3510ELSEHCOLORB:GOTO35
10
3500 IFX>259ANDX<315ANDY<189ANDY
>170THENHGET(206,26)-(227,47):3:
HPUT(206,82)-(227,103),3,PSET:GO
T03470ELSEIFX>203ANOX<259ANOY<18
9ANDY>170THENHGET(206,82)-(227,1
03),3:EXECRS:HPUT(XM,YM)-(XM+21,
YM+21),3,PSET:HCOLORF,8:RETURNEL
SE3480
3510 HLINE(XX,YY)-(XX+6,YY+6),PS
ET,BF:HSET(X+206,Y+82):X=XX+1:Y=
YY+1:HCOLORMC:GOTO3480
3600 REM * FOREGROUND COLOR
3610 GOSUB5620:GOSUB5700:IFY>320
RY<16THENEXECRM:RETURNELSEF=INT(
X/16):PLAY"03T8C":IFF<16THENEXEC
RM:HCOLORF:HLINE(209,1)-(223,8),
PSET,BF:EXECMSM:RETURN
3620 IFF=16THENP=2:GOSUB5690ELSE
IFF=17THENP=3:GOSUB5690
3630 IFF=18THENP=4:GOSUB5690ELSE
IFF=19THENP=22:GOSUB5690
3640 EXECRM:HLINE(209,1)-(223,8)
,PSET,BF:EXECMSM:RETURN
3800 GOSUB5780:REM * ROLLER BRUS
H
3810 GOSUB5650:HLINE(X,Y)-(X+5,Y
+5),PRESET,BF:HLINE(X,Y)-(X+5,Y+
5),PSET,BF:IFFB=1THEN3810ELSERET
URN
4000 GOSUB5780:REM * ELLIPSE
4010 GOSUB5790:HCIRCLE(XX,YY),(X
*4+Y)/5,,13.9-SQR(Y):IFFB=1THEN4
010ELSERETURN
4200 GOSUB5780:REM * RAY
4210 GOSUB5650:HLINE(XX,YY)-(X,Y
),PSET:1FFB=1THEN4210ELSERETURN
4400 GOSUB5780:REM * HPRINT TEXT
4410 I=INT(XX/8):K=INT(YY/8):L=4
0:GOSUB5710:RETURN
4600 GOSUB5780:REM * BOLD TEXT
4610 HORAW"BM"+STR$(X)+", "+STR$(
Y)
4620 A$=INKEY$:IFA$=""THEN4620EL
SEIFA$=CHR$(13)THENRETURNELSEIFA
SC(A$)<31THEN4620
4630 HDRAWB$(ASC(A$)-32):GOTO462
0
4800 GOSUB5780:REM * OLD TEXT
4810 HORAW"BM"+STR$(X)+", "+STR$(
Y)
4820 A$=INKEY$:IFA$=""THEN4820EL
SEIFA$=CHR$(13)THENRETURNELSEIFA
SC(A$)<31THEN4820
4830 HDRAWO$(ASC(A$)-32):GOTO482
0
5000 REM * FILE/EXIT
5010 GOSUB5B10:EXECSS:D=0:L=8:I=
2:K=39:HDRAW"BM89,41049L89R20R88
U48R049L89":HLINE(0,41)-(88,89),
PRESET,8F:HPRINT(0,6),"Save File
":HPRINT(0,7),"Load File":HPRINT
(0,8),"Kill File":HPRINT(0,9),"S
creen Oump":HPRINT(0,10),"Exit/B
ASIC"
5020 HGET(1,K+I*8)-(87,K+8+I*8),
4:HPUT(1,K+I*8)-(87,K+8+I*8),4,N
OT

```

```

5030 XX=JOYSTK(0):YY=JOYSTK(1):F
ORJ=1T0250:NEXT:IFBUTTON(0)=0THE
NONI GOTO5080,5090,5200,5230,526
0ELSEIF(YY>22ANDYY<42)THEN5030
5040 HPUT(I,K+I*8)-(87,K+8+I*8),
4,PSET
5050 IFYY<23THENI=1-1:IFI<1THENI
=1
5060 IFYY>41THENI=I+1:IFI>5THENI
=5
5070 GOTO5020
5080 GOSUB5770:1FFREE(0)<14THENH
PRINT(7,9),"DISK FULL. USE NEW 0
ISK":FORJ=1T04000:NEXT:EXECRS:GO
T05220ELSEHPRINT(7,9),"SAVE FILE
NAME":GOSUB5710:POKE65496,0:OPE
N"0",1,0$+"/PIC":EXEC4177:CLOSE:
GOTO5220
5090 D=0:I=1:K=63:HLINE(51,64)-(
172,116),PSET,B:HLINE(52,65)-(17
1,115),PRESET,BF:POKE65496,0:DSK
I$0,17,3,C$,E$:FORJ=1T012BSTEP32
:GOSUB5100:NEXT:C$=E$:FORJ=1T012
BSTEP32:GOSUB5100:NEXT:GOTO5130
5100 Q$=MIO$(C$,J,14):IFLEFT$(Q$
,1)-CHR$(0)THENRETURN
5110 IFASC(Q$)>127THENRETURN
5120 IFMID$(Q$,9,3)<>"PIC"THENRE
TURNELSEO=D+1:O$(D)=LEFT$(Q$,8)+
"/"+"PIC":RETURN
5130 IFD=0THENHPRINT(7,9),"NO FI
LES SAVED":FORJ=1T03000:NEXT:GOT
05220ELSEFORX=ITOD:HPRINT(7,8+X)
,D$(X):NEXT:HPRINT(7,8+X),"Exit
to Menu"
5140 HGET(53,K+I*8)-(170,K+8+I*8
),4:HPUT(53,K+I*8)-(170,K+8+I*8)
,4,NOT
5150 FB=BUTTON(0):XX=JOYSTK(0):Y
Y=JOYSTK(1):1FFB=1ANOI=D+1THENG0
T05220ELSEIFFB=1THENHCLSB:OPEN"I
",1,0$(I):EXEC4222:CLOSE:GOTO522
0ELSEIFYY>22ANDYY<42THEN5150
5160 HPUT(53,K+I*8)-(170,K+8+I*8
),4,PSET
5170 IFYY<23THENI=1-1:IFI<1THENI
=1
5180 IFYY>41THENI=I+1:IFI>D+1THE
NI=0+1
5190 GOTO5140
5200 GOSUB5770:HPRINT(7,9),"KILL
FILENAME":GOSUB5710:GOSUB5800
5210 A$=INKEY$:IFA$=""THEN5210EL
SEIFA$="Y"ORAS="Y"THENK1LL0$+"/P
IC"ELSEIFA$="N"ORAS="n"THEN5220E
LSE5210
5220 EXECRS:POKE65497,0:F=F9:RET
URN
5230 EXECRS:EXECRM:REM * SCREEN
DUMP
5240 REM * ADD YOUR SCREEN DUMP
HERE
5250 GOTO5220
5260 GOSUB5800
5270 A$=INKEY$:IFA$=""THEN5270EL
SEIFA$="Y"ORAS="y"THENPDKE65496,
0:POKE282,255:RGB:STOPELSEIFA$="
N"ORAS="n"THEN5220ELSE5270
5300 REM * BACKGROUND
5310 GOSUB5620:GOSUB5700:BG=8:IF
Y>320RY<16THENEXECRM:RETURNELSE8
=INT(X/16):IFB<16THENEXECRM:HCOL
DR,B:HLINE(185,32)-(225,38),PRE
SET,8F:EXECMSM:RETURN
5320 IFB>15THENEXECRM:B=BG:RETUR

```

```

N
5400 REM * CLEAR/MOGE
5410 GOSUB5B10:EXECSS:I=3:K=39:H
ORAW"BM222,41074R97L20L96U73L074
R97":HLINE(223,41)-(319,114),PRE
SET,BF:HPRINT(28,6),"Palette":HP
RINT(28,7),"Clear Screen":HPRINT
(28,8),"PUT Mode":HPRINT(31,9),"
Set":HPRINT(31,10),"Reset"
5420 HPRINT(31,11),"And":HPRINT(
31,12),"Or":HPRINT(31,13),"Not":
HPRINT(29,CP+8),">"
5430 HGET(224,K+I*8)-(319,K+8+I*
8),4:HPUT(224,K+I*8)-(319,K+8+I*
8),4,NOT
5440 XX=JOYSTK(0):YY=JOYSTK(1):F
ORJ=1T0250:NEXT:IFBUTTON(0)=0THE
NONI GOTO5500,5590,5600,5610,561
0,5610,5610ELSEIFYY>22ANDYY
<42THEN5440
5450 HPUT(224,K+I*8)-(319,K+8+I*
8),4,PSET
5460 IFYY<23THENI=1-1:IFI<1THENI
=1
5470 IFYY>41THENI=I+1:IFI>BTHENI
=8
5480 GOTO5430
5500 R=8:C=63:REM * PALETTE
5510 HCOLORF,B:HSCREEN2:HPRINT(1
0,1),"PALETTE COLOR CHANGER":HPR
INT(2,3),"Left & Right Keys -> S
elect Palette":HPRINT(5,5),"F1 &
F2 Keys -> Select Color"
5520 FORJ=0T015:HCOLORJ:HLINE(J*
16+2B,60)-(J*16+44,100),PSET,BF:
NEXT:HPRINT(R*2+4,13),P$:HPRINT(
7,18),"Press Fire Button when do
ne"
5530 AS=INKEY$:IFA$=CHR$(8)THENR
=R-1:IFR=-1THENR=0ELSEHCOLORB:HP
RINT(R*2+6,13),P$:HCOLORF:HPRINT
(R*2+4,13),P$
5540 IFA$=CHR$(9)THENR=R+1:IFR=I
6THENR=15ELSEHCOLORB:HPRINT(R*2+
2,13),P$:HCOLORF:HPRINT(R*2+4,13
),P$
5550 IFA$=CHR$(103)THENC=C-1:IFC
=-1THENC=63:PALETTER,C ELSEPALET
TER,C
5560 IFA$=CHR$(4)THENC=C+1:IFC=6
4THENC=0:PALETTER,C ELSEPALETTER
,C
5570 IFBUTTON(0)THENEXECRS:F=F9:
RETURN
5580 GOTO5530
5590 HCLSB:EXECMSM:EXECRM:F=F9:R
ETURN
5600 EXECRS:F=F9:RETURN
5610 CP=I-3:EXECRS:F=F9:RETURN
5620 GOSUB5650:GOTO5640:REM * JO
YSTICK
5630 HGET(X,Y)-(X+4,Y+4),2:HPUT(
X,Y)-(X+4,Y+4),1:GOSUB5650:HPUT(
XX,YY)-(XX+4,YY+4),2:IFFB=1THENR
ETURN
5640 XX=X:YY=Y:GOTO5630
5650 X=X+DP(JOYSTK(0)):Y=Y+DP(JO
YSTK(1)):FB=BUTTON(0):IFX<0THENX
=0ELSEIFX>319THENX=319
5660 IFY<0THENY=0ELSEIFY>191THEN
Y=191ELSERETURN
5670 RETURN
5680 EXECRS:F=F9:GOTO280:REM * E
RROR ROUTINE
5690 POKE59291,196:POKE59292,P:R

```

```

ETURN:REM * PATTERN ENABLE
5700 PDKE59291,212:PDKE59292,181
:RETURN:REM * RESTORE CODE
5710 Q$=STRINGS(L,""):FORJ=0TDL
-1:REM * HPRINT INPUT
5720 A$=INKEY$:IFA$=""THEN5720EL
SEIFA$=CHR$(I3)THEN5760
5730 IFA$=CHR$(8)THENJ=J-1:IFJ>
1THENAS$="":MID$(Q$,J+1,1)="":H
LINE((I+J)*8,K*8)-((I+J)*8+8,K*8
+7),PRESET,BF:J=J-1:GOTO5750
5740 IFJ<0THEN5750ELSEIFASC(A$)<
32THENJ=J-1ELSEMID$(Q$,J+1,1)=A$
:HPRINT(I+J,K),A$
5750 NEXT
5760 Q$=LEFT$(Q$,J):RETURN
5770 I=22:K=9:L=8:HLINE(52,64)-(
245,87),PSET,8:HLINE(53,65)-(244
,86),PRESET,BF:RETURN
5780 GOSUB5620:EXECSS:RETURN
5790 EXECRS:GOSUB5650:RETURN
5800 HLINE(67,B2)-(260,101),PSET
,B:HLINE(68,83)-(259,100),PRESET
,BF:HPRINT(10,11),"ARE YOU SURE
? <Y/N>":RETURN
5810 F9=F:IFF>15THENGOSUB5700:F=
15
5820 IFB=8THENHCOLOR0:RETURNELSE
HCDLDR8:RETURN
5999 REM * FDNT DATA
6000 REM * BOLD TEXT
6010 B$(0)="-BR7""SPACE
6020 B$(1)="-BRD4RU4BD6LBR4BU6""1
6030 B$(2)="-DRUBR2DRUBR2""
6040 B$(3)="-BRD6RU6BR2D6RU6BRBD2
L6BD2R6BU4BR3""#
6050 B$(4)="-BR2RFL4GRDR3DRG2LEL
3BR8BU5""$
6060 B$(5)="-BDDRUBR5G5LE5BD4DRUB
U5BR3""%
6070 B$(6)="-BR4FGU2L2DLF5LH4DGRG
RDR2BU6BR5""&
6080 B$(7)="-BRDGREUBR2""'
6090 B$(8)="-BR3G2D2F2LH2U2E2BR3"
'('
6100 B$(9)="-F2D2G2RE2U2H2BR5""')
6110 B$(10)="-BRBDF4RH4D2L2R7LHG3
LE4RBU2BR3""*
6120 B$(11)="-BR2BDD4RU2NL3NR2U2B
UBR4""+
6130 B$(12)="-BD5BRD2NLEUBR2BU5""
.
6140 B$(13)="-BD3R5BU3BR2""-
6150 B$(14)="-BD5DRUBR2BU5""'
6160 B$(15)="-BR6G6RE6BR2""/
6170 B$(16)="-BRD6R3U6L3GD4NE3RE4
D4BU5BR2""0
6180 B$(17)="-BR2NGD6L2R3NR2U6BR4
""1
6190 B$(18)="-BDRUR3DRDL2G2DNE2
R5HRBU5BR2""2
6200 B$(19)="-BDRUR3FDGNL2FDG6NU5L
3ULBU5BR7""3
6210 B$(20)="-BD3E3RG4R4NU3DGR3HE
LU4BR3""4
6220 B$(21)="-BD5RDR3NU3EU2HL4ELU
R5BR2""5
6230 B$(22)="-BD2D3FNU2R3U2FUHL3U
2RUR2BR3""6
6240 B$(23)="-DRUR3D2G2D2RU2E2U2B
R2""7
6250 B$(24)="-BRGDFGDFNU5R3NU5EUH
NL2EUHL2BR5""8
6260 B$(25)="-BRGDFNU2R4G3LR2E2U3
GU2L2BR5""9

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6270 B$(26)="-BD5DRUBU3LURBR2BU5""
:
6280 B$(27)="-BRB05DGREUBU3LURBUB
R2"";
6290 B$(28)="-BR3G3F3RH3E3BR2""<
6300 B$(29)="-BD2R5BD3L5BU5BR7""=
6310 B$(30)="-F3G3RE3H3BR5"">
6320 B$(31)="-BDR4G3BD2RBU2E2UHLN
L2BR3""?
6330 B$(32)="-BR5L4GD4FNU5R4BU2L2
UR3UL3RERHBR3""@
6340 B$(33)="-BR3D2HD3NR2HD3HDBR7
UGU3GU3GU2BR5""A
6350 B$(34)="-R5FDGNL2FDG6NU5L5ENU
4RU5BR6""B
6360 B$(35)="-BR3LDLGD2FNU3RDR3UR
BU4LHRBR3""C
6370 B$(36)="-RD5GR2U6RF2D2G2RE2U
2H2BR4""D
6380 B$(37)="-RNR4D3NR3D2GR2NU6R4
ULBU4RUBR2""E
6390 B$(38)="-RD5GR3HU2NR2U3R3DRU
BR2""F
6400 B$(39)="-BR2DLND3GD2F2UFR2U2
HR2ND2BU2LUL2BR5""G
6410 B$(40)="-D6RU3NR2U3BR3D6RU6B
R2""H
6420 B$(41)="-R2D6L2R5LHU5R2BR2""I
6430 B$(42)="-BD4DED2R3NU5EU5L3BR
5""J
6440 B$(43)="-RD5GR2NU6BR4UGU2LHR
URU2FUBR3""K
6450 B$(44)="-RD5GR6ULBL3U5BR5""L
6460 B$(45)="-D6RU5F2DHR2UED5RU6B
R2""M
6470 B$(46)="-D6RU6NF3DF4NU5DRU6B
R2""N
6480 B$(47)="-BR3LDLND3GD2FRDR2UR
NU3EU2HLUBR4""O
6490 B$(48)="-RD5GR3HU2NU3R3EUGU2
L2BR5""P
6500 B$(49)="-BR3LDLND3GD2FRDR2UF
2LU5RND2HLUBR4""Q
6510 B$(50)="-RD5GR2U3NU3RF3RH3RE
LELUL2BR6""R
6520 B$(51)="-BD5RDR3URUL2EL3EL2E
LER3DRHBR3""S
6530 B$(52)="-DERD5GR3HU5RFUBR2""T
6540 B$(53)="-ND5RD6R3NU6EU5BR2""U
6550 B$(54)="-DED3ED3ED2RU2FU3FU3
FUBR2""V
6560 B$(55)="-ND6RD6EURUFDFNU6RU6
BR2""W
6570 B$(56)="-F6RH6BR5G6RE6BR2""X
6580 B$(57)="-DED2RDRD2GR3HU2RURU
2FUBR2""Y
6590 B$(58)="-DRUR5G6R6ULGLHE4UBR
2""Z
6600 B$(59)="-BD2BRR3FD2FLHGL2HER
3UBU3BR4""a
6610 B$(60)="-RD5U2R2ERND3FD2GL3U
6BR6""b
6620 B$(61)="-BD3BR5LUL3ND3GD2FR3
URBU5BR2""c
6630 B$(62)="-BR3RD5GL2NU3HU2ERF4
LU6BR3""d
6640 B$(63)="-BD2BRR3DRDL4ULD2DRR
3BU6BR3""e
6650 B$(64)="-BRBDDGRD2GR3HUEL3UR
2DRHBR3""f
6660 B$(65)="-BD7RDR3URULUL3ULURU

```

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R2FDRU2RBR2BU2" 'g
6670 B\$(72)="-RD5GR2U6D3RERND4FD3
BU6BR2" 'h
6680 B\$(73)="-BD2RD3GR3HU3BU2LBR4
" 'j
6690 B\$(74)="-BD6RDR3NU5EU4BU2LBR
3" 'j
6700 B\$(75)="-RD5GR2U3F3RH2E2LG3U
5BR6" 'k
6710 B\$(76)="-RD5GR3HU5BR3" '1
6720 B\$(77)="-BD2D4RU4F2EURD4RU3B
R2BU3" 'm
6730 B\$(78)="-BD2D4RU4R3D4RU3BU3B
R2" 'n
6740 B\$(79)="-BD3D2RU3R3ND3FD2GL3
BE6" 'o
6750 B\$(80)="-BD2RD4GR3HU3ER2DRDL
DL2BE5" 'p
6760 B\$(81)="-BR6BD2GD3FL2U5L3D2H
DFR2BE5" 'q
6770 B\$(82)="-BD2RD3GR3HU3FERFDLU
BE3" 'r
6780 B\$(83)="-BD6R4URHL3HRUR4BE2"
's
6790 B\$(84)="-BD2ED4FNU6REBU3LRBE
2" 't
6800 B\$(85)="-BD2D3FNU4R2EU3RD4RB
U6BR2" 'u
6810 B\$(86)="-BD2D2FNU3RDEDENU3EU
2BE2" 'v
6820 B\$(87)="-BD2ND2RD4RUEUDFDRU4
RND2BE2" 'w
6830 B\$(88)="-BR5BD2G4LE2H2RF4RH2
E2BE2" 'x
6840 B\$(89)="-BD2ND2RD3R2G2LR2E2N
U3EU2BE2" 'y
6850 B\$(90)="-BD3UR4NG4RG4R4UBU5B
R2" 'z
7000 REM * DLD TEXT
7010 O\$(0)="-BR12" 'SPACE
7020 O\$(1)="-BDFND5LD7BD3D2ED3BU1
6BR3" '1
7030 O\$(2)="-BD2D3ED4BR3U4GU3UBBR
4" '1
7040 O\$(3)="-BD3BFR8GL8BD3BR8GL8
BR2BD3U12ED12BR3DU12ED12BU12BR6"
'#
7050 D\$(4)="-BR4ND14DG3DF2U5FR2EG
2BD4ND4F2DG2L3UHDLGBU13BR12" '\$
7060 O\$(5)="-BRBDGFEBR6DRL2G6LFE7
BD7GFEBU11BR5" '%
7070 O\$(6)="-BR2BDG2DF2G2DFNU2FRE
3D3FNE2U3ENRGH2LNFHNH2E2UHN2HBU
BR9" '&
7080 O\$(7)="-BD02ED2GBU5BR4" '1
7090 O\$(8)="-BR3NR2G3D9F3R2LH3U9E
3BR3" '(
7100 D\$(9)="-R2F3D9G3NL2UE2U9H2BU
BR6" ')
7110 O\$(10)="-BRBD3NF3RF4NL5NR4NF
4NG4DG3LHBR8BDH3U3NE2RE2FBU4BR3"
'*
7120 O\$(11)="-BR5BD2D9GU5NU4NL4NR
5BU7BR9" '+
7130 O\$(12)="-BD9D2ED2GBU13BR4" '1
7140 O\$(13)="-BD7R9DL9BU8BR12" '1
7150 O\$(14)="-BD14NR2DR2BU15BR2"
'1
7160 O\$(15)="-BR10G10DE10BUBR3" '1
7170 O\$(16)="-BR3G3D8NF3NERNF3RF3
E3UBGU2GU2LDBUBR7" '0
7180 O\$(17)="-BR3NG3D14NEHNHU11BU
2BR5" '1
7190 O\$(18)="-BR3G2DE3NRDR2ND4FD3
NG6L66ND3FURFK3URURBU12BR3" '2
7200 D\$(19)="-BR3NG3RNG2DRF2ND3LD
3GNL2FND3RD3G3ULNH3BU11BR11" '3
7210 D\$(20)="-BR6ND12G6DR7NF6D24N
R2NFNU11BU2BR6" '4
7220 O\$(21)="-BR5GL4D7RE2R2ND5FD
4G3LEL2ULHBU11BR10" '5
7230 D\$(22)="-BR4F2NEL2ULG3D7F3RE
2NU5EU4H2L2GLD5F2RBU13BR6" '6
7240 D\$(23)="-BRNR7GR7D2G3ND7GD7B
U14BR8" '7
7250 O\$(24)="-BR2G2D2NF6RF6D2G2L3
HNU3HU2E3RE2NU3EU2H2L3BR9" 'B
7260 D\$(25)="-BR3G3D3NFRF2E3ND5U2
H2LURF3D7G4U2GULGBU13BR10" '9
7270 D\$(26)="-BRBD2GR2GBD5GR2GBU1
1BR4" '1
7280 O\$(27)="-BD2DRDBD6HDFGBU12BR
5" '1
7290 D\$(28)="-BR6G6F6UH5E5BUBR3"
'<
7300 D\$(29)="-BD4R8BD5LBBU9BR12"
'=
7310 D\$(30)="-F6G6UE5H5BUBR9" '>
7320 O\$(31)="-BR2NG2R2DRND2FDNG4D
G4BD3D2ED2BU14BR6" '?
7330 O\$(32)="-BR5BDR5F3ND2UHD4G3U
4LD2ND2G3NU3HU2E2NRBL5E3NRG3ND5G
D4F2UF2R5EREBU11BR4" '@
7340 D\$(33)="-BR4G4D3F2R2NG5E2NE3
U2LGBD4NR5BD2NL2GR2GR3GLBR6ELNU1
4LHRU11LEL6NG3UR4BR7" 'A
7350 D\$(34)="-BR4NG4R5GNL4G4NDBGD
6NG3DFNR4FR3E4NU2LNG2U3LU2G5ENU4
EU4E4D4EU3BUBR3" 'B
7360 D\$(35)="-BR5G4ND7GD6F2U2FD2F
NU10NR5ER5E2BU10GLDLUGU2GU2G2NG2
DBBU11BR10" 'C
7370 O\$(36)="-BR4NG4RNG2R7ND12GNL
6GRD11G2L2UGUGU2GULUNG3NU7EU7E4B
R7" 'D
7380 O\$(37)="-BR5NG5RNG3R4GNL3G5N
D5GD6NG2R6D2R2ENL6E2BL8NU5EUUNU4E
RNR4E6G3U3FL2U2ENG5BUBR6" 'E
7390 O\$(38)="-BR6G3ERE2R4GNL3G4D8
EU7BR2D8G4UH2LG2ER3FERE3U2E2NFG2
U6E4F2HD2DFBU4BR4" 'F
7400 O\$(39)="-BR4G3ND8GD7F4NR5UNU
10RE5ENU4EU4L7ND4NU5E7GL2DL2GU2N
G4BR8" 'G
7410 O\$(40)="-BR4NG4RNG2R4GNL3G4D
4GU5BD7LNG2R2DED2ENR2DR3BR3NU10E
U10L6G2D2U5RD4U5E5BR4" 'H
7420 O\$(41)="-BR3NG3RNG2R4GNL3G3N
D6GD6BD2LNG2RNF2R2DRNU9EU9E4BR"
'I
7430 O\$(42)="-BR5NG3RNG2R4GNL3G3N
D6GD6GHR3D5BD3H3LNF3LNGF3R2E3NU
7EU7E4BR" 'J
7440 O\$(43)="-BR3NG3RNG2R4GNL3G3N
D6GD6BD2LNG2NR3RFNE2NR3FR3BR3NE2
UELE2HNL3E4LENL3HL2G3D2U5LND6E5
D2EDR2EUBU" 'K
7450 O\$(44)="-BR3NG3RNG2R4GNL3G3N
D6GD6BD2NG2R3NU8NR3DR6GNL2E2BU2B
L6U7E4D2ED2EDE2BU" 'L
7460 O\$(45)="-BR3NG3RNG2RGR3EG4ND
7GD7NG3DR2GNR4FR3E2LNU12LU5LGERN
U7RE2BD8BRFNU14E2LU12HG3BU3BR7"
'M
7470 O\$(46)="-BR2NG2DED12NG3DRGNR
3FRLBU13D2RD2RD2RD2RD2FU15GR2
UFGNR2FRE2BU" 'N
7480 O\$(47)="-BR4G3ND8GD7FED2ED2N
R6FNU11R5E3NU7EU7NH4LNH4LH4DLG3E
2ND9B02BR11" 'O
7490 O\$(48)="-BR4G2RD2L2GER2D3L2G
ER2D7GLHBR4BUNU12F2REBU7BL4NF2UF
3E2NU6EU5HL2G3BU3BR9" 'P
7500 D\$(49)="-BR4G3NDBGD7FED2ED2N
R6FNU11R5E2H2LGER2F3RE2BL4NU7EU7
NH4LNH4LH4DLG3E2ND9BU2BR11" 'Q
7510 D\$(50)="-BR3NG3RNG2R4GNL3G3N
D6GD6BD2LNG2R2DR3FNR3U2EU7NE5RD
6BD4BR4NU4ENU2EUH3DHLRE3NU5RNG2U
5HBR4" 'R
7520 D\$(51)="-BR13G3NL4GL2U2NL2UL
G3FBUH7GF7DG7UF6D2NL4DL2UHNL3HL
2G2DFRE2BU14BR10" 'S
7530 D\$(52)="-BR3NG3RNG2R5GL2NL2G
3ND7GD6FED2ED2FR5E3G2L6U3NU6RUBN
G2E2RGNR3FR2E2BUBR2" 'T
7540 O\$(53)="-BR4ND11G2RD2GLGEFED
7G2ER3GR3FNL3EFNU14E2LU12HNG2BR5
'U
7550 D\$(54)="-BR4ND11G2RD3L2GEFRD
6NG3DR2GR2GRE4NU10EU9HNG2BR4" 'V
7560 O\$(55)="-BR4ND11G2RD3L2GEFRD
6G2ER3GRDE2RU13NG2FD13ED2E3NU11E
U10HNG2BR4" 'W
7570 D\$(56)="-BR2NF11DF11LNG2H11G
BD5BR2R10BD7BL12E2R3GR3GLBU2BL3E
11GL3EL3ERBR7" 'X
7580 O\$(57)="-BR3ND7G2RD3L2GEFRD2
G2ER3GR3GLR6D3GL5EL3GBR10BU2UHU1
0HND10NG2BR5" 'Y
7590 D\$(58)="-BR3NG2R3GR3DNL2R4EG
5NR3NL4G9ERE2R5FNL6GLR4GLR2E2BU1
3BR3" 'Z
7600 D\$(59)="-R5G5NU4BD2E7F7G7H7B
D2D5R5NH4BR4R5U5NG4BU4U5L5NF4BL2
BD3G4F4E4H4BD3GFEBU7BR6"
7610 O\$(60)="-R15D15L15U14BR2BDR1
1D11L11U10BR2DR7D7L7U6BR2BDR3D3
L3U2BU7BR10"
7620 O\$(61)="-BR3G2NUDL05NF7EDF6N
E6RE6NHU5LU2LNL3HL2G2NRNH2DH3DLB
UBR11"
7630 O\$(62)="-BRBD4NR3GDF3HGND5GD
4FERENU8F2EGHU9NL2EBR4BU4" 'a
7640 O\$(63)="-BR3GND13GHFD11LF2E2
RNU6EU5HG2BU8BR6" 'b
7650 D\$(64)="-BR2BD4ND10R2F2GUHL3
GRD7F2URE2BU12BR3" 'c
7660 O\$(65)="-F7RH7RF6EGD6GN5UG2
U2GH2RNU6FU7EUBU5BR8" 'd
7670 O\$(66)="-BR3BD4G3RD6LF2UNU8N
E3U4RERURELUNL4HL2BU5BR7" 'e
7680 O\$(67)="-BR7GLULGND13GD2NL2N
R3D9LF2E2BU13BR5" 'f
7690 O\$(68)="-BD4BR2ND9G2RD6GRFR2
NE5NG5R3FD2G2L4HR5EU12HND9NG3BR6
BU4" 'g
7700 O\$(69)="-BR3GND12GHFD10LF2EB
R2DFHUNU7EU6HG2BU7BR6" 'h
7710 O\$(70)="-BR2DLDBD4EFLND8GLFD
5LF2EUBU14BR3" 'i
7720 O\$(71)="-BR4DLDBD4NENR2NGD5R
NU4DRDG2LNH2URBU14BR5" 'j
7730 O\$(72)="-BR3GND13GHFD11LF2EB
U7E2ND4FD3G2LRFND2RD3E2BU13BR3"
'k
7740 D\$(73)="-BR3GND13GHFD11LF2EB
U14BR3" 'l
7750 O\$(74)="-BR2BD4G2RD7LF2ELU9F
E2D10FELU9FE2D10FNE2U10EBR4BU4"
'm
7760 O\$(75)="-BR2BD4G2RD7LF2ELU9F
E2D10FNE2U10FBU6BR4" 'n
7770 O\$(76)="-BR4BD4G2ND7GD6LF2RE
2NG6RUG2R6U5BR5" 'o

```

7780 D$(80)="--BR3BD5G2RD6NG2D6GE2
FHU4NU8RFENU8EFHU7HNG28U5BR5"p
7790 D$(81)="--8R2BD6ND8G2RD5LF2RE
2NU6D5GE2FHU9EGHLULBU6BR7"q
7800 D$(82)="--BR4BD13G2NU10H2RU7L
E2FDENRURF2GBR48U7"r
7810 D$(83)="--8R3BD4GND3GD2FR6ND3
FD2NG3LG2GUGU2GUL2GE9GL3ENL3HL8U
4BR8"s
7820 D$(84)="--8R4G2D2L2R2D9LF2NE2
U11R2L2U2UEBR4"t
7830 D$(85)="--8R2BD4ND10G2RD7LF2E
3NU7D2R2GU11G28U6BR6"u
7840 D$(86)="--8R2BD3G2DEDND9RD9E2
RNU7EU6RHUG2BU6BR6"v
7850 D$(87)="--8R2BD3G2DED9LDR2UNU
7E2ND3U7F2LD7RE2ND3U7F2LD7RBU14B
R3"w
7860 D$(88)="--BD5F10UH9G9F8L9U3RD
2E9D3LU3BU58R4"x
7870 D$(89)="--8R2BD5ND9G2RD6LF2E3
NU5D2FD3L5GER2DR2E2U2HU8RHG28U78
R6"y
7880 D$(90)="--BR3BD4NG3RNG2RFNL2D
R2EG4N13NR3G5ER2DNR3FR2NE3UEBU13
BR5"z
7890 RETURN
7900 REM * END DF LISTING

```

Listing 3: SPECTRA3

00100	ORG	&4000	00410	BSR	SBLDCK
00110	SM	ORCC	#80	LDD	#\$2D32
00120	LDD	#\$302F	00420	STD	#\$FAA
00130	STD	\$\$FA4	00430	BSR	SBLDCK
00140	BSR	SBLOCK	00440	LDD	#\$2E33
00150	DUT	LDD	00450	STD	\$\$FA4
00160	STD	\$\$FA4	00460	BSR	SBLDCK
00170	RTS		00470	LDD	#\$2A29
00180	SS	ORCC	00480	STD	\$\$FA4
00190	LDD	#\$302B	00490	BSR	SBLOCK
00200	STD	\$\$FA4	00500	BRA	OUT
00210	BSR	SBLDCK	00510	ORCC	#80
00220	LDD	#\$312C	00520	LDD	#\$2F30
00230	STD	\$\$FA4	00530	STD	\$\$FA4
00240	BSR	SBLDCK	00540	BSR	SBLOCK
00250	LDD	#\$322D	00550	BRA	DUT
00260	STD	\$\$FA4	00560	LDX	#32768
00270	BSR	SBLDCK	00570	LDY	#40960
00280	LDD	#\$332E	00580	LDD	,X++
00290	STD	\$\$FA4	00590	STD	,Y++
00300	BSR	SBLOCK	00600	CMPX	#40960
00310	LDD	#\$292A	00610	BNE	MENU1
00320	STD	\$\$FA4	00620	RTS	
00330	BSR	SBLDCK	00630	LDX	#32768
00340	BRA	DUT	00640	LDY	#40960
00350	RS	DRCC	00650	LDD	,X++
00360	LDD	#\$2B30	00660	STD	,Y++
00370	STD	\$\$FA4	00670	CMPX	#39328
00380	BSR	SBLDCK	00680	BNE	MENU2
00390	LDD	#\$2C31	00690	RTS	
00400	STD	\$\$FA4	00700	DRCC	#80
			00710	SUM	

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00720	LDD	#\$3029	
00730	STD	\$FFA4	
00740	BSR	MBLDCK	
00750	LBRA	OUT	
00760	RUM	DRCC	#80
00770	LDD	#\$2930	
00780	STD	\$FFA4	
00790	BSR	MBLOCK	
00800	LBRA	OUT	
00810	SAVE	JSR	RS
00820	JSR	RUM	
00830	LDA	#1	
00840	STA	\$6F	
00850	LDX	#\$65456	
00860	MENU3	LDA	, X+
00870	JSR	[\$A002]	
00880	CMPX	#\$65472	
00890	BNE	MENU3	
00900	LDX	#\$32768	
00910	MENU4	BSR	GRAPH
00920	LDA	, X+	
00930	BSR	BASIC	
00940	JSR	[\$A002]	
00950	CMPX	#\$634BB	
00960	BLO	MENU4	
00970	CLR	\$6F	
00980	RTS		
00990	LOAD	LDX	#\$65456
01000	LDB	#16	
01010	LDA	#1	
01020	STA	\$6F	
01030	MENU5	JSR	\$A176
01040	STA	, X+	
01050	DECB		
01060	BNE	MENU5	
01070	LDX	#\$32768	
01080	MENU6	BSR	BASIC
01090	TST	\$70	
01100	BNE	END	
01110	JSR	\$A176	
01120	BSR	GRAPH	
01130	STA	, X+	
01140	BRA	MENU6	
01150	END	CLR	\$6F
01160	CLR	\$70	
01170	JSR	SUM	
01180	JSR	RM	
01190	JSR	SS	
01200	RTS		
01210	GRAPH	PSHS	D
01220	DRCC	#80	
01230	LDD	#\$3031	
01240	STD	\$FFA4	
01250	LDD	#\$3233	
01260	STD	\$FFA6	
01270	PULS	D, PC	
01280	BASIC	PSHS	D
01290	LDD	#\$3C3D	
01300	STD	\$FFA4	
01310	LDD	#\$3E3F	
01320	STD	\$FFA6	
01330	PULS	D, PC	
01340	END		

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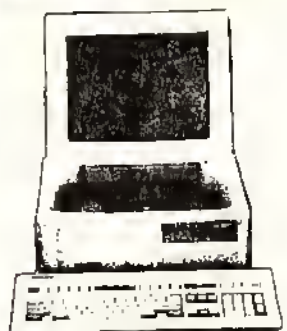
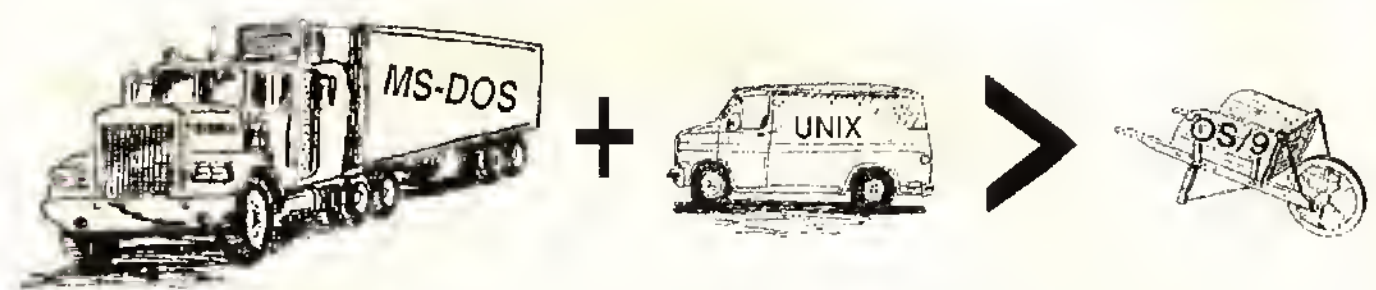
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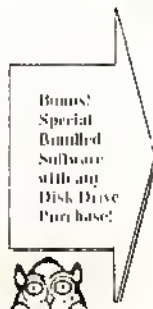
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Easy Access

by Greg Law
Technical Editor

Developing your own programs to manipulate files may quickly lead you to discover a minor nuisance. BASIC09 does not allow you to open a file that does not exist. Nor does it allow you to create a file that already exists. This may not be much of a nuisance except that in BASIC09, like many dialects of BASIC, error detection and correction require work-arounds by the programmer. Unlike BASIC on the CoCo 1 and 2, however, BASIC09 does offer some assistance.

Open Sesame

If you are quick on your feet, you may see an advantage to this method of opening and creating files. Because the `OPEN` command doesn't automatically create the file, you can't accidentally create an empty file. By the same token, you can't overwrite an existing file without explicitly deleting the existing file first.

Let's study some examples to determine the ramifications of all this. Assume we need to open a file, but we do not know in advance if the file exists. Our first option is to open the file and abort with an error if the file is not found. As you might guess, this is usually not an acceptable solution. An alternative is shown in Listing 1.

Immediately before attempting to open the file, we use `ON ERROR GOTO 10` to branch to Line 10 if the file cannot be opened. The first statement in Line 10 is `ON ERROR`. This tells BASIC09 to abort the program if it detects an error. The reason is that if BASIC09 cannot open or create the file, it is probably caused by a hardware error such

In addition to being OS-9 Online SIGop, Greg Law enjoys programming on all types of computers and has worked on systems ranging from the CoCo to the Burroughs B6700 super mainframe. He lives in Louisville, Kentucky.

as a defective disk or an invalid filename. In either of these cases there is nothing we can do about it. Finally, the file is created and control passes to the regular logic of the program.

Because the `OPEN` command doesn't automatically create the file, you can't accidentally create an empty file.

If the file is successfully opened, the error-correction logic is skipped by branching to Line 20. Enter the program and run it twice to verify it works as advertised. When run the first time, the program prints a line to inform you that it created the file. The second time the program prints a line to inform you that it opened the file — unless you deleted the `test.dat` file or swapped disks.

Now let's assume we need to create a file that does not have any information stored in it. If the file already exists, it should be deleted. One solution is shown in Listing 2, which is similar to the first, except we attempt to create the file first. If an error is detected, we use the `DELETE` command to delete the file and create it again. In this case, we can make the program shorter by attempting to delete the file first. Examine Listing 3 to see how this is done. Notice that Listing 3 continues into the main logic of the program regardless of

whether or not the file is deleted. Here `ON ERROR GOTO 10` is used to continue program execution if the file does not exist, instead of trapping an error.

Random Length Files

A common problem you may run into is the need to read a file that contains an arbitrary number of records. For example, in Listing 4 we use `RND(100)` to store a random number of records into a file. The actual number of records stored in the file is between one and 100, depending on the outcome of `RND(100)`, and it is different each time the program is run.

How can we determine the number of records stored in the file? Perhaps the simplest solution is to read each record sequentially until an error is detected. This solution, however, is impractical for most applications. A better solution is to use the `EOF` command, which returns `TRUE` if the end of the file has been reached. As shown in Listing 5, we use `WHILE NOT(EOF(#Path)) DO` to read each record sequentially until end-of-file is reached. Enter listings 4 and 5, and run both several times.

Although we are using a direct access file, this technique works very well and is the preferred solution with sequential access files. But why read direct access files sequentially? Sure, we could read all of the records until we reach the end of the file and count the number of records, but that's time-consuming and a waste of effort. As you recall, all records in a direct access file are the same size. Doesn't it seem logical that the file size could be used to tell us how many records are stored in the file? Sure it does! Once we know the file size, we can divide it by the size of each record to obtain the number of records stored in the file. This technique, based on the `SS.Size Get Status` call, is shown in Listing 6.

First we define the registers structure needed by the `SysCall` module and the

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structure of the records used in the data file. According to the description of the SS.Size Get Status call, Register A should be assigned the path number, and Register B should be assigned the value of SS.Size (S02). Next we assign the value of I\$GetStt (S8D) to CallCode and run SysCall. On return, Register X contains the most significant 16-bits of the file size, and

Register U contains the least significant 16-bits. Therefore we multiply Regs.X by 65536 (2^{16}) and add Regs.U to get the actual file size. To get the number of records stored in the file, divide the file size by the size of each record using the SIZE command. You can use these results to validate each record number requested from the file.

Another common technique is to use the

first record in the file as a configuration record. Instead of storing data, it is used to store the number of records in the file and other needed information. In our listings, Rec.Number can be used to store the number of records in the file, and Rec.Name can be blank (not used) or used to store some other piece of information such as a user password. □

OS-9

Listing 1: Open_Test

```
PROCEDURE Open_Test
0000 DIM Path:BYTE
0007
0008 DN ERRDR GDTD I0
000E OPEN #Path,"test.dat":UPDATE
0021 PRINT "File opened."
0031 GDTD 20
0035
0036 I0 (* Trap any possible errors from above. *)
0063 DN ERRDR
0066 CREATE #Path,"test.dat":UPDATE
0079 PRINT "File created."
008A
0088 20 (* Continue with the regular logic of the program. *)
00C3 CLDSE #Path
00C9 END
```

```
0017 DIM Rec:Record
0020 DIM Path:BYTE
0027 DIM Count:INTEGER
002E DIM High:INTEGER
0035
0036 ON ERRDR GDTD I0
003C DELETE "test.dat"
0048 PRINT "File deleted."
0059
005A I0 ON ERRDR
0060 CREATE #Path,"test.dat":UPDATE
0073 Rec.Name:="Record #"
0086 High:~RND(100)
0090 PRINT "Adding "; High; " records."
00AB
00AC FDR Count:~1 TO High
00BD Rec.Number:=Count
00C9 PUT #Path,Rec
00D3 NEXT Count
00DE
```

Listing 2: Create_Test

```
PROCEDURE Create_Test
0000 DIM Path:BYTE
0007
0008 ON ERROR GOTO I0
000E CREATE #Path,"test.dat":UPDATE
0021 PRINT "File created."
0032 GDTD 20
0036
0037 I0 (* Trap any possible errors from above. *)
0064 ON ERROR
0067 DELETE "test.dat"
0073 CREATE #Path,"test.dat":UPDATE
0086 PRINT "File deleted and created."
00A3
00A4 20 (* Continue with the regular logic of the program. *)
00DC CLDSE #Path
00E2 END
```

Listing 5: Read_File

```
PROCEDURE Read_File
0000 TYPE Record=Name:STRING[15]; Number:INTEGER
0016
0017 DIM Rec:Record
0020 DIM Path:BYTE
0027
0028 OPEN #Path,"test.dat":UPDATE
0038
003C WHILE NOT(EDF(#Path)) DO
0047 GET #Path,Rec
0051 ENDWHILE
0055
0056 PRINT Rec.Number; " records read."
006F CLDSE #Path
0075 END
```

Listing 3: Delete_Test

```
PROCEDURE Delete_Test
0000 DIM Path:BYTE
0007
0008 ON ERROR GOTO I0
000E DELETE "test.dat"
001A PRINT "File deleted."
0028
002C I0 DN ERRDR
0032
0033 CREATE #Path,"test.dat":UPDATE
0046 PRINT "File created."
0057 CLDSE #Path
005D END
```

Listing 6: Records

```
PROCEDURE Records
0000 TYPE Registers=CC,A,B,DP:BYTE; X,Y,U:INTEGER
0025 TYPE Record=Name:STRING[15]; Number:INTEGER
0038
003C DIM Regs:Registers
0045 DIM Rec:Record
004E DIM Path:BYTE
0055 DIM CallCode:BYTE
005C DIM NumRecs:INTEGER
0063 DIM FileSize:REAL
006A
006B DPEN #Path,"test.dat":UPDATE
007E
007F Regs.A:=Path
008B Regs.B:~$02 \(* SS.Size *)
00A4 CallCode:~$0D \(* I$GetStt *)
00BA RUN SysCall(CallCode,Regs)
00C9
00CA FileSize:=Regs.X*65536.+Regs.U
00E5 NumRecs:=FileSize/SIZE(Rec)
00FS PRINT "The file contains "; FileSize; " bytes and
"; NumRecs; " records."
012D CLOSE #Path
0133 END
```

Listing 4: Create_File

```
PROCEDURE Create_File
0000 TYPE Record=Name:STRING[15]; Number:INTEGER
0016
```

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Between Numbers

by Fred B. Scerbo
Contributing Editor

If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. Remember, keep your ideas specific, and don't forget this is BASIC. All programs resulting from your wishes are for your use, but remain the property of the author.

A few months ago I presented *In-Between*, a program designed to help youngsters determine how to put letters in alphabetical order. This month I drop the other shoe by offering you *In-Between 2*, a program to help a preschooler or early elementary student learn number placement with numbers from one to 10.

As with all recent early childhood programs I have written, *In-Between 2* is designed to work with a minimum of input from the keyboard, using only the space bar and ENTER key. I have found this method to be most successful with very young children because it lets the child concentrate on the material being presented on the screen rather than having them toil over the location of the correct answer on the keyboard. This may not seem like a big thing, but it can make a very big difference in the speed and the ease with which children under the age of six use the program. I like to think the program is kid friendly.

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

The Shell

Without going into great detail as to the format this program uses, you may recognize it has the BASIC shell introduced in the program *Opposites*. Although the shell has undergone some modifications in recent issues, the concept still remains the same.

The main objective is to teach number relationships by having the user select a number that goes in-between a set of given numbers.

Only the graphics, which can be time-consuming to create, differ from program to program.

One good point is that you don't have to create the graphics; I've done that for you. You only need to type in the program as listed or load it from a RAINBOW ON TAPE OR RAINBOW ON DISK.

The main objective of *In-Between 2* is to teach number relationships by having the user select a number that goes in-between a set of given numbers. While I could go into some interesting possibilities with other

number sets, for the present I deal with only the numbers one through 10.

While using *In-Between 2*, the student sees a graphics portrayal of each number in a large, chunky style. These are not just stick numbers but nice thick drawings that a young child can visually understand.

The review section of the program lets the student count through the numbers shown on the screen by pressing ENTER. This section is chosen by selecting A from the menu.

Sections B and C quiz the student on the material. The difference between the two choices is that one lets you match the number, while the other lets you match the blank.

The student advances to the correct choice by pressing the space bar until the correct picture is surrounded by the flashing cursor. There is no need to worry if the student passes the right answer. By pressing the space bar several times, the right answer can be selected again. When the student has the desired answer, he must press ENTER to record the answer. The screen clears and the correct match is shown again. Pressing ENTER brings up the next screen.

As always, pressing @ brings up the scorecard early. Pressing C on the scorecard lets the student continue. A new try can be run by pressing Y.

Conclusion

Judging from reader mail, this format still seems to be one of the best ways to convey new material to young users. If you stop to think about it, the possibilities for educational material are almost unlimited. (Just think, we've done music, numbers, letters, opposite concepts, etc.)

If you have an idea for this format, drop me a line. I am always looking for new ways to use this concept.

Next month we'll use graphics as an aid in learning the 50 states. □



✓ 25	9
55	14
80	6
130	59
180	212
245	219
295	138
335	132
370	142
395	8
415	178
435	69
455	223
475	158
END	37

The Listing: BETWEEN2

```
1 REM*****
2 REM*      IN-BETWEEN VOL.2 *
```

```
3 REM*      COPYRIGHT (C) 1990 *
4 REM*      BY FRED B. SCERBO *
5 REM*      60 HAROING AVENUE *
6 REM*      NORTH ADAMS, MA 01247 *
7 REM*****
10 CLEAR3000
15 CLS0:PRINTSTRING$(32,188);STR
ING$(32,204);:FORI=1TO160:READA:
PRINTCHR$(A+144);:NEXT
20 PRINTSTRING$(32,195);STRING$(
32,179);
25 OATA93,88,93,80,93,88,16,45,4
4,44,34,45,44,45,37,44,45,44,45,
37,40,,45,36,46,45,36,46,45,37,3
2,37
30 OATA85,,85,89,85,,,37...42,37
..33,36,,37,,36,37...37,,42,33,,
42,33,37,41,37
35 DATA85,,85,80,93,,28,37,44,44
,34,37,44,45,,,37,,,37,,34,37,,4
6,45,,46,45,37,32,45
40 DATA85,,85,,85,,,37...42,37,,
32,,,37,,,37,,42,37,,42,32,,42,,
37,,37
45 DATA87,82,87,82,87,82,,39,35,
34,40,39,35,39,,39,34,,37,35,43
,39,33,43,39,33,43,39,37,,37
50 PRINT@358," AN INTROOUCION T
O ";:PRINT@390," SEQUENCE IN NU
MBERS ";
55 PRINT@422," BY FREQ B.SCERBO
";:PRINT@454," COPYRIGHT (C)
1990 ";
60 X$=INKEY$:IFX$<>CHR$(13)THEN6
0
65 DIM P$(10,2),A$(6),B$(10),C$(
10),A(10),N(10),B(4),C(4),O(4),E
(4),F(4),AO(10)
70 FORI=1TO3:READ C(I),O(I),E(I)
,F(I):NEXT:FORI=1TO6:READA$(I):N
EXT:FORI=1TO10:READP$(1,1),P$(I,
2):NEXT
75 COLOR1,0
80 CLS:PRINT:PRINTSTRING$(32,"="
);:PRINT@102,"AN INTRODUCTION TO
":PRINT@134,"SEQUENCE IN NUMBERS
```

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(313) 481-DAVE (3283)

```

":PRINT@199,"A) REVIEW NUMBERS":
PRINT@263,"B) QUIZ SPACES":PRINT
@327,"C) QUIZ NUMBERS"
85 PRINT@388,"<<<SELECT YDUR CHD
ICE>>>"
90 PRINT:PRINTSTRING$(32,"=");
95 X$=INKEY$:X=RND(-TIMER):1FX$=
"A"THEN350ELSEIFX$="B"THEN100ELS
EIFX$="C"THEN480ELSE95
100 CLS0:PMODE0,1:PCLS1
105 LINE(0,0)-(254,170),PRESET,B
110 LINE(6,4)-(122,82),PRESET,BF
115 LINE(128,4)-(248,82),PRESET,
B
120 LINE(6,86)-(122,164),PRESET,
B
125 LINE(128,86)-(248,164),PRESE
T,B
130 DRAW"8M26,188C0NU10R10NU10BR
6R10U6L10U4R10BR6NR10D4NR10D6R10
8R12BU6NE4D2F4BR6R10U6L10U4R10BR
6ND10R10D4NL10BR6NR10D6U10R10D10
BR6NR10U10R10BR6NR10D4NR10D6R10B
R10U10NL4R10D4NL10D6NL14BR6U10R1
0D4NL10D6BR6U10R10D4L10R4F6BR6E4
U2H4"
135 DATA130,6,246,80,6,86,120,16
2,130,86,246,162
140 PAINT(2,2),0,0:PCOPYITD3
145 PMDDE0,4:PCLS1
150 LINE(0,0)-(254,170),PRESET,B
F
155 LINE(8,6)-(120,80),PSET,8F
160 PCOPY4T02:PMDDE0,1:SCREEN1,1
165 DATA"S48M2,8C1","S4BM130,8C0
","S48M2,90C0","S4BM130,90C0","S
48M2,48C0","S48M130,48C0"
170 FDR1=1TD10
175 A(I)=RND(10):IFN(A(I))=1THEN
175
180 N(A(I))=1:NEXT1:FDRY=1T010:C
DLOR1,0
185 FDR1=2T04
190 B(1)=RND(3)+1:IFN(B(1))=0THE
N190
195 N(B(1))=0:NEXT1:FDR1=1TD4:N(I
I)=1:NEXT
200 B=RND(10):IFB=A((Y))THEN200
205 C=RND(10):1FC=B OR C=A((Y))T
HEN205
210 DRAW A$(1):DRAWP$(A(Y),1)
215 DRAW A$(B(2)):DRAWP$(B,2)
220 DRAW A$(B(3)):DRAWP$(C,2)
225 DRAW A$(B(4)):DRAWP$(A(Y),2)
230 COLOR1,0
235 Z=0
240 PMODE0,4
245 DRAW A$(1)+"C0":DRAWP$(A(Y),
1)
250 DRAW A$(B(2))+"C1":DRAWP$(B,
2)
255 DRAW A$(B(3))+"C1":DRAWP$(C,
2)
260 DRAW A$(B(4))+"C1":DRAWP$(A(
Y),2)
265 PMODE0,1:SCREEN1,1
270 LINE(8,6)-(120,80),PSET,B
275 X$=INKEY$:1FX$=" "THEN285ELS
E1FX$="@ "THEN490
280 COLOR1,0:LINE(8,6)-(120,80),
PRESET,B:GOTO270
285 Z=Z+1:1FZ=4THENZ=1
290 COLOR1,0:LINE(C(Z),D(Z))-(E(

```

```

Z),F(Z)),PSET,B
295 X$=INKEY$:1FX$=" "THEN285ELS
E1FX$=CHR$(13)THEN305ELSE1FX$="@
"THEN490
300 CDLDR1,0:LINE(C(Z),D(Z))-(E(
Z),F(Z)),PRESET,B:GOTO290
305 1FZ+1=8(4)THEN315
310 NW=NW+1:FDRK=1TD5:PMODE0,4:S
CREEN1,1:SOUND10,3:PMODE0,1:SCRE
EN1,1:SDUND1,3:NEXTK:GOTO290
320 DRAW A$(5):DRAWP$(A(Y),1)
325 DRAW A$(6):DRAWP$(A(Y),2)
330 SCREEN1,1
335 X$=INKEY$:1FX$<>CHR$(13)THEN
335
340 PMDDE0,1
345 PCOPY3T01:SCREEN1,1:PCOPY2TD
4:NEXTY:GOTO490
350 PMDDE0,2:PCLS1:SCREEN1,1:LIN
E(0,40)-(256,126),PRESET,B:LINE(
6,44)-(124,122),PRESET,B:LINE(13
0,44)-(248,122),PRESET,B:PAINT(2
,42),0,0
355 FDR1=1T010:DRAW A$(5):DRAWP$
(I,1)
360 DRAW A$(6):DRAWP$(1,2)
365 X$=INKEY$:1FX$<>CHR$(13)THEN
365
370 CDLDR1,0:LINE(8,46)-(122,120
),PSET,BF:LINE(132,46)-(246,120)
,PSET,BF:NEXT1
375 RUN
380 DATA"8R56BD44R16U6L4U26L8G8D
2R6D16L4D6BD10B10D10R10U10N10B
R6ND10F10NU10BR6NR6U6NR6U4R6"
385 DATA"8R22BD50H4U24E4R20F4D24
G4NL20BH6U18L8D18R8BG6BR10R4BR4R
4BR4R4BR4R4BR6R28U12L6D4L14U4E4R
10E4U8H4L18G4D4R62R8F2D2L10G8D1
2"
390 DATA"BR48BD44R28U12L6D4L14U4
E4R10E4U8H4L18G4D4R6E2R8F2D2L10G
8D12BD12BL6NL6NR6D10BR12NU10R6NU
10R6U10BR6R10D10L10U10"
395 DATA"BR22BD50R16U6L4U26L8G8D
2R6D16L4D6BR24R4BR4R4BR4R4BR4R4B
R26BU16E4U8H4L18G4D4R6E2R8F2D4L1
0G4F4R10D4G2L8H2L6D4F4R18E4U8H2"
400 DATA"BR70BD28E4U8H4L18G4D4R6
E2R8F2D4L10G4F4R10D4G2L8H2L6D4F4
R18E4U8H2BL48BD24R6ND10R6BR6D10U
6R10U4D10BR6U10R10D4L10R4F6BR6NR
10U6NR10U4R10BR6NR10D4NR10D6R10"
405 DATA"BR18BD50R28U12L6D4L14U4
E4R10E4U8H4L18G4D4R6E2R8F2D2L10G
8D14BR34R4BR4R4BR4R4BR4R4BR16BU1
8NR8U14L8D14L10U14L8D22R18D10R8U
10R8U8"
410 DATA"BR74BD28NR8U14LBD14L10U
14L8D22R18D8R8U8R8U8BD24BL48NR10
D4NR10D6BR16U10R10D10NL10BR6NU10
R10NU10BR6U10R10D4L10R4F6"
415 DATA"BR38BD34E4U8H4L18G4D4R6
E2R8F2D4L10G4F4R10D4G2L8H2L6D4F4
R18E4U8H2BD14BR4R4BR4R4BR4R4BR4R
4BR4BU32R30D6L22D8R18F4D10G4L24H
2U4R20U6L20U18"
420 DATA"BR46BD14R30D8L22D6R18F4

```

```

D8G4L24H2U4R20U4L20U18BD36BL12NR
10D4NR10D6BR16NU10BR12H4U6BR8D6G
4BR12NR10U6NR10U4R10"
425 DATA"8R38BD32NR8U14L8D14L10U
14L8D22R18D10R8U10R8NU8BD10B14R4
BR4R4BR4R4BR4R4BR68U32R30D8L22D8
R18F4D8G4L24H2U4R20U4R14U4L14
D4"
430 DATA"8R46BD14R30D8L22D6R18F4
D8G4L24H2U4R20U6E4BR4R14U4L14D4BD1
4BL12NR10D4R10D6NL10R8NU10BR8E6
NH4NE4F6"
435 DATA"8R168D18R30D6L22D8R18F4
D10G4L24H2U4R20U6L20U188D308R32R
4BR4R4BR4R4BR4R4R4U32R30D8M-12,+2
4L12M+12,-24L20U8"
440 DATA"8R46BD14R30D8M-12,+22L1
2M+12,-22L20U8B03BBL8L10D4R10D6N
L10BR6NR10U6NR10U4R10BR6D6F4E4U6
8R6NR10D4NR10D6R10BR6U10F10U10"
445 DATA"BR168D18R30D8L22D8R18F4
D8G4L24H2U4R20U6E4BR4R14U4L14D4BD6
BR16R4BR4R4BR4R4BR4R4BR68U32R26F
4D8G4F4D8G4L26H4U8E4H4U8E4BD6BR4
R18D6L18U6BD14R18D6L18U6"
450 DATA"BR50BD14R26F4D6G4F4D8G4
L26H4U8E4H4U8E4BD48R4R18D6L18U6B
D14R18D6L18U68D20BL24NR10D4NR10D
6R10BR6U10BR6NR10D10R10U6NL68R6N
U4ND6R10D6U10BR6R6ND10R6"
455 DATA"BR148D18R30D8M-12,+24L1
2M+12,-24L20U8BD32BR32NL4BR4R4BR
4R4BR4R4BR6BU32R26F4D24G4L26H4U2
R26U10L22H4U8E28D48R6R18D4L18U4"
460 DATA"8R508D14R26F4D22G4L26H4
U2R26U8L22H4U8E28D48R6R18D4L18U4
BD32L14ND10F10U10BR6D10BR6U10F1
0U10BR6NR10D4NR10D6R10"
465 DATA"BR12BD18R26F4D8G4F4D8G4
L26H4U8E4H4U8E4BD6BR4R18D6L18U6B
D14R18D6L18U6B06BR28R4BR4R4BR6R
16U6L4U26L8G8D2R6D16L4D6BR30H4U2
4E4R20F4D24G4L20BU6BR4R12U20L12D
20"
470 DATA"BR36BD44R16U6L4U26L8G8D
2R6D16L4D6BR30H4U24E4R20F4D24G4L
20BU6BR4R12U20L12D20BD14BL30R6ND
10R6BR6NR10D4NR10D6R10BR6U10F10U
10"
475 DATA"BR14BD18R26F4D24G4L26H4
U2R26U10L22H4U8E28D48R6R18D4L18U
4BD26BR28R4BR4R4BR6R16U6L4U26L8G
8D2R6D16L4D6BR26R16U6L4U26L8G8D2
R6D16L4D6"
480 CLS0:FDR1=1T010:TEM$=P$(1,1)
:P$(1,1)-P$(1,2):P$(1,2)-TEM$:NE
XT
485 GOTO100
490 CLS:PRINT@101,"YOU TRIED"NC+
NW"TIMES &":PRINT@165,"ANSWERED"
NC"CORRECTLY"
495 PRINT@229,"WHILE DOING"NW"WR
ONG."
500 NQ=NC+NW:1F NQ=0THEN ND=1
505 MS=INT(NC/NQ*100)
510 PRINT@293,"YOUR SCORE IS"MS"
%."
515 PRINT@357,"ANOTHER TRY (Y/N/
C) ?";
520 X$=INKEY$:1FX$="Y"THEN RUN
525 1FX$="N"THENCLS:END
530 1FX$="C"THEN265
535 GOTO520

```

Novices Niche

A Winning Combo by Bill Bernico

Have you ever wanted to play a game but couldn't find a pair of dice? Or maybe you've created a game program and are looking for some onscreen dice. Let CoCo help in your quest. *Dice* is a short program that draws a pair of dice on the CoCo 3's high resolution screen. To roll the dice, just press a key.

Dice uses the RND function to select two numbers between 1 and 6 to be displayed as dots on the faces of the dice. Since the HDRAW command is used to draw the dice, you can incorporate the routine

into your own program and use the scale subcommand to scale the dice to the desired size.

The Listing: DICE

```
1 'DICE ROUTINE BY BILL BERNICO
2 ATTR0,0:HSCREEN2:HCLS4:HCLOR8
,4:DT$="RDLU2R2D3L3U3F":DI$="BL4
BUR22D22L22U22E5R22NG5D22NG5U22L
22G5BF3":B=RND(6):HDRAW"BM112,94
"+DI$:Z=B:GDSUB4:C=RND(6):HDRAW"
BM152,94"+DI$:Z=C:GDSUB4:T=B+C:H
PRINT(11,B),"YOU RDLLED"+STR$(T)
```

```
:HPRINT(13,16),"HIT A KEY
3 EXEC44539:GOTD 2
4 IF Z=1THENHDRAW"BR7BDB"+DT$
5 IF Z=2THENHDRAW"BR2BD2"+DT$+"B
R10BD12"+DT$
6 IF Z=3THENHDRAW"BR2BD2"+DT$+"B
R5BD6"+DT$+"BR5BD6"+DT$
7 IF Z=4THENHDRAW"BR2BD2"+DT$+"B
R10BD12"+DT$+"BU12"+DT$+"BD12BL1
0"+DT$
8 IF Z=5THENHDRAW"BR2BD2"+DT$+"B
R10BD12"+DT$+"BU12"+DT$+"BD12BL1
0"+DT$+"BU6BR5"+DT$
9 IF Z=6THENHDRAW"BR2BD2"+DT$+"BD
6"+DT$+"BD6"+DT$+"BR10"+DT$+"BU6
"+DT$+"BU6"+DT$:RETURNELSERETURN
```

Graphics CoCo 3

Hi-Res Input Editor by Bill Bernico

Input 3 demonstrates a programming routine that allows graphics-screen input and backspacing. With this routine, you can build your own BASIC programs in which users can enter and edit their responses on the Hi-Res graphics screens. Run INPUT3 to see how it works. The input and backspace subroutine is in lines 5 through 11 and is called in Line 3.

The Listing: INPUT3

```
0 'COPYRIGHT 1990 FALSOFT, INC.
1 'INPUT TEXT 3 BY BILL BERNICO
```

```
2 RGB:HSCREEN2:HCLS4:HCLOR8,4:H
PRINT(5,2),"CDCD 3 TEXT INPUT RD
UTINE":HPRINT(7,4),"(BACKSPACE T
D ERASE)":HCIRCLE(B0,65),20:HDRA
W"BM130,47R35D35L35U35BR90G35R70
H35":HPOINT(B0,65),6,B:HPOINT(13
5,48),3,B:HPOINT(235,70),2,B
3 HPRINT(5,13),"NAME":Z$="":GDS
UB5:HPRINT(2,21),"IS "+Z$+" CDRR
ECT? (Y/N)
4 X$=INKEY$:IFX$="Y"THEN13ELSEIF
X$="N"THEN2ELSE4
5 HLINE(B0,103)-(320,111),PRESET
,BF:Z$="":X=10
6 Y$=INKEY$:IFY$=""THEN6
7 IFY$=CHR$(13)THENRETURN
```

```
8 IFY$=CHR$(B)AND LEN(Z$)>0THENZ
$=LEFT$(Z$,LEN(Z$)-1):HCLDR4,4:
HLIN((X*B)-B,95)-(X*B,111),PRES
ET,BF:HCLDRB,4:X=X-1:GOT06
9 Z$=Z$+Y$
10 HPRINT(X,13),Y$:X=X+1
11 IFLEN(Z$)>30THENRETURN
12 GDTD6
13 CLS:PRINT"NDW WORK IT INTO YO
UR PRDGRAM!":END
```



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Programming Structure

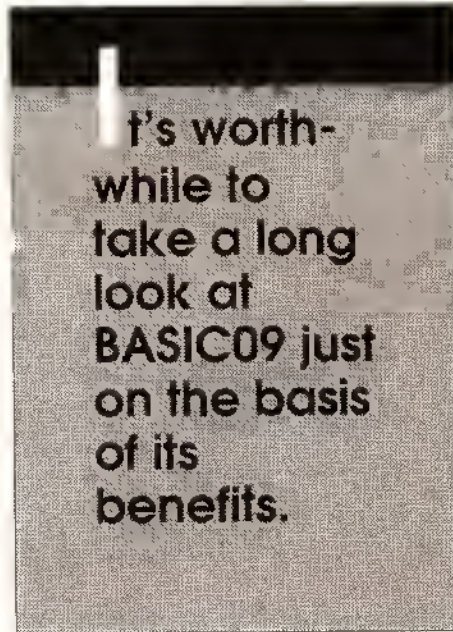
by William Barden, Jr.
Contributing Editor

BASIC, as a built-in operating system in your CoCo 1, 2 or 3 is different from BASIC09 used under OS-9. For one thing, Extended Color BASIC and Disk BASIC were developed by Microsoft, while BASIC09 was developed by Microware. It would have been difficult for Microware to develop a BASIC identical to Microsoft's Extended Color BASIC because of the design of OS-9, the operating system under which BASIC09 runs. Also, aside from making it easy to switch between the two BASICs, it wouldn't necessarily be desirable, since BASIC09 offers some powerful features. BASIC09 is somewhat harder to use than Extended BASIC, but it is faster, it is a structured language, and certain aspects of it are more powerful.

Just to clear the air, BASIC09 does have its disadvantages as well. First, you must work under OS-9 to use it. Fortunately, running BASIC09 is probably the easiest thing to do under OS-9, and it's worth the effort. Secondly, BASIC09 is not as *interactive* as the Microsoft BASICs on the CoCo. BASIC09 is harder for a beginner to use, although OS-9 aficionados might disagree.

It's worthwhile, however, to take a long look at BASIC09 just on the basis of its benefits. There's no question that BASIC09 is about three to 10 times faster than Extended or Disk BASIC on the CoCos, so I won't belabor that point. I'll talk instead about the basic structured philosophy of BASIC09 and why that's important. In the

course of investigating that question, I'll uncover some of the powerful aspects of BASIC09.



Spaghetti Code

BASIC has a reputation of resulting in *spaghetti code*, that is, a tangled mess of interwoven strands of computer pasta. Statements in typical programs aren't executed in sequence from beginning to end, but rather as a series of GOTO's that take you every which way through the code. Typical BASIC programs are hard to follow with all of their loops, nooks and crannies.

Spaghetti code programs are hard to maintain and debug. Even the programmer who writes such a program will find it difficult to decipher when he or she pulls it out of a drawer six months after using it. Because of the huge amounts of money spent in industry on program maintenance (about 90 percent of the total cost of programming projects), a great deal of effort was expended to develop *structured* pro-

gramming languages to eliminate such convoluted programs. The result is Pascal, C, Ada and structured BASIC languages, among others. BASIC09 fits into the structured BASIC niche.

Structured languages are much easier to understand because of the way they are written and printed. Although they tend to be verbose — lots of words, white space and print formatting — they are definitely *in*. No self-respecting college teaches spaghetti BASIC in their computer science curriculum — it's all structured. Industry hires many programmers who write in structured languages. New languages such as Modula-2 are designed along structured lines.

Structured-Language Elements

Although you won't find this as gospel in courses about structured programming, "Barden's Buffer" maintains there are five elements of structured languages. I'll list them, explain them, and show you some examples in BASIC09. First the list. BASIC09 and other structured languages:

- generally don't use line-numbered statements.
- are modular.
- use several types of loops.
- use local variables.
- use data types.

Line Numbers

It's impossible to write a program without line numbers in Extended BASIC, but in BASIC09, it's the usual case. Although line numbers can be used optionally, most BASIC09 programs do not use them. Think about it. Line numbers in Extended BASIC are used as place markers for GOTOs and GOSUBs. You can still use GOTOs and GOSUBs in BASIC09, but most of the code flows from beginning to end with loops in the middle. An Extended BASIC loop doesn't need line

Bill Barden has written 35 books and hundreds of magazine articles about small computers. His newest Color Computer project, Connecting the CoCo to the Real World, is a book of CoCo interfacing projects. He has over 20 years experience in the industry on systems ranging from mainframes to micros.

numbers. There's a loop control variable that controls the loop instead. For example:

```
100 FOR I=1 TO 100
110 IF A(I)<100 THEN T1=T1 + A(I)
) ELSE T2=T2 + A(I)
120 NEXT I
```

In BASIC09 this would be written in much the same way but with more indentations and physical structure:

```
FOR I:=1 TO 100
IF a(i)<100 THEN
t1=t1 + a(i)
ELSE
t2=t2 + a(i)
ENOIF
NEXT I
```

How do you call a subroutine or get back to different points in a program without line numbers? Subroutines are generally written as their own procedures in BASIC09 —

separate programs that are given their own names. They're called by this name as well. Instead of using a GOSUB 10000 statement, you might use a RUN Total(t2) instead. (Naming subroutines makes their functions a lot more understandable.) As far as getting back to a point in a program, you'd normally want to do this for a loop condition. Structured languages force you to recognize that loop and use one of several types of loop control structures, which I'll talk about in a moment. As a matter of fact, the whole concept of spaghetti code is blamed on licentious use of GOTOs. In a classic letter to a computer science magazine, E. W. Dijkstra deemed GOTOs "harmful" and started the whole controversy over spaghetti code, so you won't see too many GOTOs in structured programs, although many languages begrudgingly allow them.

Modularity

Extended and Disk BASIC programs are one humongous program. Programs in BAS-

IC09 and other structured languages tend to be collections of *modules*. A module is a collection of BASIC code that performs a certain function — adding the elements in an array, printing a record in a particular format, or inserting a record in a list, for example. There's no limit to the number of lines of code that can be used, but most modules are less than 100 lines or so. Unlike Extended and Disk BASIC, BASIC09 modules are entered at the beginning and exited at the end. In spaghetti code, of course, you can break out of code and GOTO any place in the program, or enter code in the middle of a routine.

These BASIC09 modules are called *procedures* and are given names. A large program would have several procedures with many different RUN statements to call them. A BASIC09 program to read a mailing list entry, search an existing mailing list for the entry to eliminate duplicates, insert the entry, and then print the entry might look like this:

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```

PRINT "Getting next entry..."
RUN GetEnt (LS)
RUN SearchL (FNO)
IF fnd THEN
PRINT "Entry exists!"
ELSE
RUN InsertL (LS)
RUN PrintE (LS)
ENDIF

```

You can look upon the procedures as nice, neat, little subroutines with names used in place of GOSUBS with line numbers. Of course, if you don't use a lot of subroutines in Extended or Disk BASIC, you need to change your coding philosophy! (The truth of the matter is that you should have been using neat, modular subroutines in Extended and Disk BASIC as well . . .)

Structured Loops.

Another key to structured programming is the use of several types of loops. In Extended or Disk BASIC there's really only one type of loop, the FOR . . . TO loop. Because line numbers are discouraged in BASIC09 (and other structured languages) there's not only the FOR . . . TO loop but three other loops as well. Here are examples of each, all of which accomplish the same thing — adding the number of parts on hand for 10 items in an inventory:

```

WHILE i<11 DO
total:= total + oh(i)
i:= i + 1
ENDWHILE
REPEAT
total:= total + oh(i)
i:= i + 1
UNTIL i=11
LOOP
total:= total + oh(i)
i:= i + 1
EXITIF i=11 THEN
ENDEXIT
ENOLOOP

```

There are some subtle differences between the three types of loops. The WHILE loop is executed only if the WHILE condition is true. The loop won't be executed at all if the condition is false. The REPEAT loop is always executed at least once before a terminating condition can be checked. The LOOP structure is also executed at least once before the terminating condition can be checked. FOR . . . TO loops in both Disk BASIC and BASIC09 check the terminating condition before the loop is executed.

As with Extended BASIC, BASIC09 loops can be large or small and can contain any number of nested loops — loops within loops.

Local Variables

Once a variable in Extended BASIC programs is referenced, it can't be used for anything else. It exists as that variable throughout the entire program. Woe to a BASIC programmer who uses the same variable name later in the program, forgetting that he used it earlier. That variable will be clobbered by the second use. A global variable is one recognized throughout the entire program. All variables in Extended BASIC are global variables.

Structured languages, however, such as BASIC09 use local variables. Variable names are recognized only within the procedure in which they are referenced. You can use the same variable name in many different procedures without problems. This makes the whole problem of mistakenly using the same variable later in a program much less of a possibility. It also allows different programmers to write different modules of a larger program without regard to variable names used by the other programmers.

Every program must have global variables, the main variables in the program where key elements are stored. These can be established and maintained in a main procedure. When subroutines are run as procedures, variables can be passed as parameters to and from the procedure in the calling sequence. The following call inserts an entry in a mailing list and returns the size of the list in another variable:

```
RUN InsertE1(Entry1, Size1)
```

In Extended BASIC, parameters are not really passed; they just exist from being previously defined, and they are manipulated by all parts of the program, including subroutines.

BASIC09, like other structured languages, also allows you to pass variables by *value* or *reference*. When variables are passed to a procedure by value, they are not changed by that procedure. This protects the contents of variables while allowing procedures (subroutines) to operate on them. Of course, the variable can still be changed by the procedure that calls the lower-level procedure that uses the variable.

There are times, though, when you want the called procedure to change the parameter. In this case the parameter is passed by reference. The location of the variable is passed to the procedure, which then changes the actual value of the variable. This is especially valuable in a type of procedure called a recursive procedure in which a procedure calls itself many times for operations on the same data until some terminating condition is reached.

The important thing to remember here is that BASIC09 allows either local variables

that do not change the content of variables passed as parameters or an alternative condition that allows procedures to change the content of variables. In short, it's everything you'd want to do.

Data Types

In Extended BASIC, there are only two variable types. A numeric data type is treated as either an integer or *floating-point* mixed number. A string data type provides for character data. Structured languages, though, allow many different types of variables. BASIC09 allows five different data types — BYTE, INTEGER, REAL, BOOLEAN and STRING. BYTE variables are whole numbers from 0 to 255; INTEGER variables are whole numbers from -32768 to +32767, and REAL variables are mixed (floating-point) numbers. BOOLEAN variables can hold only two values, TRUE or FALSE. STRING variables are similar to Extended or Disk BASIC variables.

Variables are typed by defining them in DIM (dimension) statements in BASIC09. If a variable is not typed, it is assumed to be type REAL. Here are some typical BASIC09 DIM statements:

```

DIM name1, name2; STRING
DIM count, size; INTEGER
DIM sex; BOOLEAN

```

There are several good reasons for using data types. First, it helps to define the variables and forces you to consider the ranges of numbers that can be used with them. Secondly, data types can be very efficient in terms of memory. A BOOLEAN data type, for example, takes up only one bit in most languages. While you can accomplish the same thing in an Extended or Disk BASIC variable, it will take 40 times the amount of storage, five bytes vs. one bit.

The Bottom Line

BASIC09 differs from Extended BASIC because of the structure of OS-9 and contemporary thought about computer languages. There's no question that you can do a lot using only Extended BASIC. However, you can accomplish those things and more with BASIC09, at higher speeds. In the process, you'll learn a structured language whose concepts are very easy to translate into such popular languages such as Pascal, C and Ada. You'll also learn good programming techniques that will free you from the horrors of spaghetti code. Finally, you'll be able to apply some advanced techniques such as recursion that are simply not possible in Extended BASIC on the CoCo.

See you next month with more CoCo topics.



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Getting the Picture With OS-9

by Tim Kientzle

This is the first of a series of articles that discusses various picture storage formats and presents programs for displaying some of these formats under OS-9 Level II. Although written with the OS-9 Level II user in mind, the information in this series is very useful to CoCo 3 users as well. I compare the three most popular CoCo 3 picture storage formats and present a BASIC99 program to display an uncompressed VEF picture. In future articles I will eventually build up this program to handle more sophisticated formats.

How We Got Here

In the days of 16K Extended Color BASIC, saving and loading pictures was easy. You knew where graphics screens started in memory and how big they were, so you could simply CSAVEM that section of memory to cassette. But like everything else, storing graphics has become more complicated, primarily because graphics images are a lot bigger.

When *CoCo Max* made its debut, the

Tim Kientzle, currently pursuing a doctorate in mathematics at the University of California at Berkeley, has worked with the CoCo since 1982. He is best known in the CoCo world as the database manager for the CoCo SIG on Delphi, and as the author of the V-Term terminal emulator. He can be reached on Delphi as TIMKIENZLE. Or you can contact him at 14 Croxtou Avenue, Oakland, CA 94611.

	MGE	CM3	VEF
Palette data	Yes	Yes	Yes
Different resolutions	No	Yes ¹	Yes ²
Number of lines	200	192, 384 ¹	200
Horizontal resolution	320	320	160, 320, 640 ²
Number of colors	16	16	2,4,16 ²
Animation information	1 kind	2 kinds	None
Compression	Poor	Good	Fair ³
Picture title	Yes	No	No
Patterns	No	Yes	No

Notes:

- 1) CM3 stores either one or two 320-by-192, 16-color "pages."
- 2) VEF handles 320-by-200 in four or 16 colors, 640-by-200 in two or four colors, and 160-by-200 in 16 colors.
- 3) "Squashed" VEF is newer and not yet widely supported.

Table 1: Format Comparisons

largest pictures used a whopping total of 12K. Nowadays CoCo 3 users routinely work with 60K or 90K graphics images, and pictures from other systems can contain 256K or more of graphics data. In order to save both disk space and download time, we need to find some way to reduce the size of these images. For this reason many modern storage formats incorporate compression schemes to reduce the total size of the file. Also, it is now considered necessary to store additional information with the picture data, such as palette data, picture resolution and size, the picture's name, and information about animation.

All of this gets confusing, especially since each new graphics editor seems to use

its very own storage format. Including the older CoCo I and 2 formats, there are easily 15 distinct graphics formats for the CoCo. When you consider formats used on other machines, there are hundreds of storage methods.

Graphics and OS-9

Many people think using graphics with OS-9 is difficult. Two major reasons for this involve memory considerations and confusion about window types. Let's address the second issue first.

A window in OS-9 Level II is some part of a screen. There are two types of screens. One type is the VDG screen, named after the Video Display Generator of the CoCos I

and 2. VDG screens exist in order to allow older OS-9 Level I programs using 32-by-16 text screens and 256-by-192 graphics to run under OS-9 Level II. These screens are handled by the vdgint module, which doesn't support the type of graphics we'll be doing. In order to run the programs presented in this series, you need to be working on a screen handled by grfint or windint. Any window on a 40-by-24 or 80-by-24 text screen is sufficient. Check your OS-9 manual to learn how to create one of these windows. Or, better yet, see Dale Puckett's "KISSable OS-9" column on Page 58 of this issue.

Unfortunately, by the time you get the OS-9 windows system running on a 128K CoCo 3, there isn't enough memory left to have both a high-resolution graphics screen and BASIC09 in memory at the same time. So the programs in this article won't run on

Bytes	Description
1	Compression type:0=no compression; 128=Squashed
1	Picture resolution 0 - 320-by-200, 16 colors 1 - 640-by-200, 4 colors 2 - 160-by-200, 16 colors 3 - 320-by-200, 4 colors 4 - 640-by-200, 2 colors
16	Palette values

Figure 1: VEF Header Format

a 128K system. If you use C or assembly language, you can create this type of graphics, but it requires a great deal of care in order to fit everything into the available memory.

You may want to put together a special

disk to play with these graphics programs. Such a disk should contain (at a minimum) shell.grfdrv, BASIC09, gfx2.syscall and runb in the CMDS directory. It is also a good idea to create a SYS directory on this disk and copy stdfonts from your OS-9 Level II

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disk so that after booting OS-9 you can merge the standard fonts into the system using:

```
merge /dd/sys/stdfonts
```

This loads the fonts that OS-9 uses on graphics screens into memory. When you start playing with graphics screens, this comes in useful; otherwise you may get stuck on a graphics screen, unable to see what you're typing!

One Problem, Three Answers

There are currently three popular storage formats for CoCo 3 images. Although there are others, these three seem to account for the bulk of the CoCo 3 graphics files currently available.

The MGE format was developed by Greg Miller and Erik Gavriluk for use in their *Color Max 3* graphics program. Public domain utilities to save and load images saved in this format were released early, making this format very popular. It is also a simple format, which has encouraged the writing of other programs to support it. The biggest drawback is that it uses a fairly simple compression method that actually lengthens many files. For this reason, MGE files are frequently stored uncompressed.

The CM3 format was created by Colorware for use in the *CoCo Max III* graphics program. Its greatest strength is that the compression method used works well, and it can handle double-height pictures and two kinds of animation effects. The format is, however, more complicated.

VEF format was developed by the people who developed OS-9 Level II for the CoCo 3. It has become a defacto standard for all OS-9 graphics work, due primarily to the fact that an OS-9 Level II viewer program for this format was available before OS-9 Level II was released. It is simple and many OS-9 utilities exist for converting, saving, loading and editing VEF images. It stores little extra information, and the compressed version, developed for use in *MVCanvas*, is new enough to not be widely supported yet.

The differences between the three graphics formats are summarized in Table 1. As you can already see, there are trade-offs involved. MGE is easy for most RS-DOS users to use, thanks to a simple format and the availability of public domain utilities. CM3 has an effective compression method and good animation support. VEF can store images in varying resolutions. We'll focus on the uncompressed formats in this article and talk in more detail about specific compression methods later.

The Listing, Please

Look carefully at the listing and enter it.

Bytes	Description
1	Zero for original MGE format
t6	Palette data
1	Palette type:0=RGB, 1=CMF
1	Compression type:0=compressed, 255=uncompressed
30	Picture title terminated with a null (zero) byte
1	Color cycling speed
1	First and last palettes for cycling, encoded as First*16+Last.

Figure 2: MGE Header Format

You can remove the comments; they exist primarily to help you read and understand the listing. The program can be divided into roughly three parts:

- 1) open file and read header data
- 2) set up screen
- 3) read picture data from file and display it on the screen

OS-9 Level II 512K

The Listing: VEF

```
PROCEDURE VEF
0000      (* Display a VEF format picture file on a window screen
0037      PARAM Filename:STRING
003E      BASE 0
0040
0041      (* Stores info about the screen we're using
006C      (* sctype=OS9 screen type; bytes=bytes/line; width = pixels/line
00AC      TYPE LineType=INTEGER; bytes:INTEGER; width:INTEGER
00C3
00C4      (* Since there are two different sizes of lines, we create a structure
010A      (* with two different-sized arrays, so we can use fast GET and PUT
014C      (* commands for I/O.
0160      TYPE LineType=long(i60):BYTE; short(80):BYTE
017B
017C      DIM palette(16):BYTE
0188      DIM compress:INTEGER
018F      DIM line:LineType
0198      DIM scrn:ScrnType
01A1      DIM path,scpath:BYTE
01AC      DIM i:INTEGER
0183      DIM char:BYTE
01BA
018B      (* First, open the file
01D2      OPEN #path,Filename:READ
01DE
01DF      (* Get the header information
01FC      RUN GetHeader(path,scrn,sctype,palette,compress)
0218      (* Create the screen and set up "scrn" structure.
0249      RUN SetScreen(scpath,scrn)
0258
0259      FOR i=0 TO 15 \(* Set the palettes
027C          RUN GFX2(scpath,"palette",i,palette(i))
029D      NEXT i
02A8
02A9      FOR i=1 TO 8 \(* VEF convention is to skip top 8 lines
02E1          RUN GetLine(path,scrn.bytes,compress,i)
02FD      NEXT i
0308      FOR i=0 TO 191 \(* Load and display each line
0335          RUN GetLine(path,scrn.bytes,compress,i)
0351          RUN PutLine(scpath,scrn,i,line)
036A      NEXT i
0375
0376      RUN GFX2("Be!!") \(* Tell the user we're done
039D      GET #scpath,char \(* Wait for a key press
03BE      RUN GFX2("KillBuff",1,1) \(* Kill the buffer we used
03EE      RUN GFX2("Select") \(* Select the screen where we started
0421      CLOSE #path \(* close the disk file
043D      IF scpath>2 THEN \(* If it's not Std/0, close the screen
0470          CLOSE #scpath
0476      ENDF
0478      END

PROCEDURE GetHeader
0000      (* Read header info from "path". return window type, palettes,
003E      (* and compression code,
0056      PARAM path:BYTE
005D      PARAM wintype:INTEGER
```

Two-Liner Contest Winner . . .

Grab the kids and the dog and gather around the old CoCo to celebrate a traditional kid's favorite. Watch the stars twinkle on the screen as the CoCo plays a familiar tune.

The Listing:

```
5 PMDDE4,1:PCLS:SCREEN1,1:C$="C5
BM128,70D20U10R5L10R5E5G10E5F5H1
0":D$="C0BM128,70D20U10R5L10R5E5
G10E5F5H10":S$="CCGGAAG":T$="FFE
EDDC":U$="GGFFEEDD"
10 D=RND(255):O=RND(191):PSET(O,
O):X=X+1:IFX=100THEN DRAW C$:PLA
Y S$:DRAW D$:PLAY T$:DRAW C$:PLAY
U$:DRAW D$:PLAY U$:DRAW C$:PLAY S$:D
RAW D$:PLAY T$:DRAW C$:FDRX=1T0200:
NEXTX:DRAW D$:FDRX=1T0200:NEXTX:D
RAW C$:DRAW D$:ELSE10
```

Shawn Gildroy
Mt. Pleasant, Pennsylvania

For this winning two-liner contest entry, the author has been sent copies of *The Fourth Rainbow Book of Adventures* and the accompanying tape.

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Save your bride to be from the horrors of the evil Luthor's domain! Screen after screen of beautiful graphics and exciting arcade action with fully animated characters. Great digitized sound. Walk, run, jump, climb and fight. Game includes an optional continue feature that allows you to keep playing even if you loose! Set your own level of stress! It's great arcade action! Requires 512K and 1 disk drive. ~~\$24~~ ON SALE!!!! JUST \$29
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Reviews August '88, July '89, September '89

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Reviewed June '89

WEEKLY WINNER 3.0

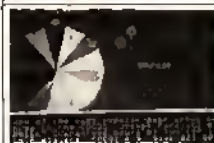
Recently updated, WW 3.0 now handles 3,4,5,6 and 7 digit lotos. We've personally seen it pick 4 and 5 out of 6 in the Ohio SUPER LOTTO and have had reports of winnings from users in other parts of the US. Enhance YOUR chance! Invest in WEEKLY WINNER 3 today ONLY \$15
MSDOS Version only \$21.00

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This is the BEST "RISK" play alike available for the COCO 3. Screen shows the entire world and zooms in on the area you choose. For 1 to 6 players. It's great entertainment for a mere ~~\$27~~ ON SALE!!!! ONLY \$19
Reviewed August '89

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NEW!!

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Toledo, Ohio 43614 (419) 389-1515

The *header* is the first part of the VEF picture file. The *GetHeader* procedure is responsible for reading the header and interpreting the results. For VEF format, the header consists of 18 bytes as shown in Figure 1.

Setting up the screen is done in the *SetScreen* procedure. Since some of the graphics operations we'll do later need the size of the window in pixels, or the number of bytes on a line, we set up that information in the *scrn* variable structure.

SetScreen does use one small trick. Instead of calling *gfx2* for the *DWSet* and *Select* operations, we set up an array with the codes, so we can do both with just one *PUT* operation. If we use *gfx2* to do these separately, OS-9 temporarily loses track of which screen it is displaying.

Get/Put buffers are very powerful tools for creating OS-9 Level II graphics, because we can't directly manipulate screen memory. We can, however, copy data between screen memory and *Get/Put* buffers and manipulate the data there. To get the program to run quickly, we read a line of data from the file, store it in a *Get/Put* buffer, then *PUT* it on the screen. Repeating this for each chunk of the graphics data puts the entire picture on the screen.

To put the data into the *Get/Put* buffer, we could either use the *GPLoad* command to load the data or we could map the buffer into our workspace and copy the data into the buffer directly. The latter method is noticeably faster and somewhat more difficult to understand.

I've isolated the parts of the program that might need to be changed later. In future articles I'll give you only the listings for the *GetHeader* and *GetLine* procedures, since they are the only ones that will change.

Some Homework Problems

You might be interested in modifying this VEF program to handle uncompressed MGE format pictures. Figure 2 shows the format of an MGE header to get you started.

Once you get the MGE program working, you can work on making several improvements. Here are some ideas:

- Display the picture title at the bottom of the screen while loading.
- Cycle the palettes while waiting for the user to press a key.

Tune in Next Month

Next month I'll talk about methods to reduce the size of files. In particular, I'll describe some of the many variations on a compression technique known as Run-Length Encoding. It is the simplest technique and, for that reason, one of the most popular compression techniques around. □

```

0064      PARAM palette(16):BYTE
0070      PARAM compress:INTEGER
0077
0078      (* Stores all the info in a VEF header in one variable
00AE      TYPE VEFheader=comp:BYTE; VEFTYPE:BYTE; pals(16):BYTE
00CA      DIM header:VEFheader
00D3
00D4      GET #path,header \(* Actually read the header info from path.
0109
010A      compress=header.comp \(* Set compression type
012C      palette=header.pals \(* Set palettes
0146      wintype=8-header.VEFTYPE \(* Convert VEF picture type into window type
01B0      IF wintype<7 THEN
018C          wintype=wintype+1
0197      ENDIF
0199      END

PROCEDURE GetLine
0000      (* Gets one line of graphics data from the file into "line".
003C      (* "bytes" is the length of the line expected, "compress"
0075      (* is the compression format
0091      BASE 0
0093      TYPE LineType=long(160):BYTE; short(80):BYTE
00AE
00AF      PARAM path:BYTE
00B6      PARAM bytes:INTEGER
00BD      PARAM compress:INTEGER
00C4      PARAM line:LineType
00CD
00CE      IF bytes>80 THEN
00DA          GET #path,line.long
00E8      ELSE
00EC          GET #path,line.short
00FA      ENOIF
00FC      END

PROCEDURE PutLine
0000      BASE 0
0002      TYPE LineType=long(160):BYTE; short(80):BYTE
001D      TYPE ScrnType=sctype:INTEGER; bytes:INTEGER; width:INTEGER
0034
0035      PARAM scpath:BYTE
003C      PARAM scrn:ScrnType
0045      PARAM linenum:INTEGER
004C      PARAM line:LineType
0055
0056      RUN GFX2(scpath,"gpload",1,1,scrn.sctype,scrn.width,1,scrn.bytes)
00BA      IF scrn.bytes>80 THEN
0099          PUT #scpath,line.long
00A7      ELSE
00AB          PUT #scpath,line.short
00B9      ENOIF
00BB      RUN GFX2(scpath,"Put",1,1,0,linenum)
00D9      END

PROCEDURE SetScreen
0000      (* Creates the screen, and sets the "scrn" variable
0033      TYPE ScrnType=sctype:INTEGER; bytes:INTEGER; width:INTEGER
004A      PARAM scpath:BYTE
0051      PARAM scrn:ScrnType
005A
005B      DIM scrncode(14):BYTE
0067      DIM i:INTEGER
006E      FOR i=1 TO 14
007E          READ scrncode(i)
00B7      NEXT i
0092      (* This is the "magic" sequence that will set up the new screen right.
00D8      (* It has the codes for DWSet, Select, CurOff
0105      DATA $1B,$20,$08,$00,$00,$28,$1B,$00,$01,$00,$1B,$21,$05,$20
0141
0142      scrn.width=320 \(* Width is the width of the screen in pixels
017B      IF scrn.sctype=5 OR scrn.sctype=7 THEN
0194          scrn.width=640
01A0      ENDIF
01A2
01A3      scrn.bytes=160 \(* Linesize is number of bytes per line.
01D6      IF scrn.sctype=5 OR scrn.sctype=6 THEN
01EF          scrn.bytes=80
01FA      ENOIF
01FC
01FD      OPEN #scpath,"/w":UPDATE \(* Create a new window
0220      (* scpath = 1 \ RUN GFX2(scpath,"DWEnd") \ (* Use the same window
0261
0262      RUN GFX2(1,"Select") \(* Select our StdOut screen
02BE
02BF      scrncode(3)=scrn.sctype \(* Byte 3 is the screen type
02B9      scrncode(6)=scrn.width/8 \(* Byte 6 is the screen width in characters
02F5      PUT #scpath,scrncode
02FF      END

```



Pyramix

This is a fascinating CoCo 3 game of skill and coordination. Pyramix is 100% machine language written exclusively to take advantage of all the power in your 128K CoCo 3. The Colors are brilliant, the graphics sharp, the action fast. Written by Jordon Tsvetkoff and a product of ColorVenture. Disk: \$19.95



The Freedom Series



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Novices Niche

Descriptive Error Messages

by Geoff Friesen

Error messages generated by the Color Computer BASIC interpreter are not user-friendly. For example, if a Syntax Error occurs then ?SN ERROR is displayed instead of the more readable BAD SYNTAX. The interpreter is capable of displaying more descriptive error messages.

ERRMSG is a program which, when run, installs a new error message display mechanism. ERRMSG takes a few seconds to install and must be reinstalled whenever the Reset button is pressed. When an error occurs, a more descriptive error message is displayed.

ERRMSG has been designed to cooperate with other machine language programs that have been installed above the BASIC work space. It accomplishes this feat in lines 130, 140, 720, 730 and 740. Lines 130 and 140 obtain the last address used by BASIC by examining locations \$0027 and \$0028. Location \$0027 contains

the most significant byte. This last address is stored in locations \$8045 and \$8046. These last two locations are used by Extended BASIC. Can we get away with this? Yes. Extended BASIC begins at \$8000 and the first 100 bytes or so contain code that is executed only once to initialize Extended BASIC when the power is turned on or the Reset button is pressed. It is not otherwise executed. Since the BASIC image is restored before the initialization code is executed, there are no problems.

Line 720 obtains the last address from \$8045 and \$8046 and reduces the amount of memory that BASIC can use by 63 bytes (the 63 bytes contain the machine language used by ERRMSG). Lines 730 and 740 obtain the starting address for the machine language routine (which is really the new last address used by BASIC plus one).

If ERRMSG is loaded after other machine language programs, there should be no conflicts. ERRMSG works with BASIC+ (which I introduced in the September 1989 issue of THE RAINBOW) if ERRMSG is loaded last.

Note that the UR error message in BASIC+ does not have a more descriptive counterpart in ERRMSG. Hence, UR ERROR is displayed if this error occurs even after ERRMSG has been installed.

Error messages are stored in virtual memory beginning at \$6E000. Lines 180 and 310 use the memory manager to access this region. If a RAM disk or some other program uses virtual memory beginning at \$6E000, you will have problems.

The Color Computer BASIC interpreter can appear more professional and user-friendly through the use of more descriptive error messages.

The Listing: ERRMSG

```

0 ' COPYRIGHT 1990  FALSOFT, INC
100 REM -----
110 REM ERRMSG
120 REM -----
130 POKE &H8045, PEEK(&H27)
140 POKE &H8046, PEEK(&H28)
150 CLEAR 200, &H4000
160 P1=&H4000
170 P2=&H4050
180 POKE &HFFA2, &H37
190 FOR EM=1 TO 40
200 READ EM$
210 L=LEN(EM$)
220 POKE P1, P2/256
230 POKE P1+1, P2 AND 255
240 P1=P1+2
250 FOR I=1 TO L
260 POKE P2+I-1, ASC(MID$(EM$, I, 1
))
270 NEXT I
280 P2=P2+L+1
290 POKE P2-1, 0
300 NEXT EM
310 POKE &HFFA2, &H3A
320 DATA NEXT WITHOUT FOR
330 DATA BAD SYNTAX
340 DATA RETURN WITHOUT GOSUB
350 DATA NEED MORE DATA
360 DATA BAD FUNCTION PARAMETER
370 DATA OVERFLOW
380 DATA OUT OF MEMORY
390 DATA UNDEFINED LINE
400 DATA BAD ARRAY SUBSCRIPT
410 DATA ARRAY WAS DIMENSIONED
420 DATA DIVISION BY ZERO
430 DATA USE ONLY IN PROGRAM
440 DATA TYPES DO NOT MATCH
450 DATA OUT OF STRING SPACE
460 DATA STRING TOO LONG
470 DATA COMPLEX STRING FORMULA
480 DATA CANNOT CONTINUE
490 DATA BAD FILE DATA
500 DATA FILE ALREADY OPEN
510 DATA BAD DEVICE/DRIVE NUMBER
520 DATA INPUT/OUTPUT ERROR
530 DATA BAD FILE MODE
540 DATA FILE NOT OPEN
550 DATA INPUT PAST END OF FILE
560 DATA DIRECT STATEMENT
570 DATA UNDEFINED FUNCTION
580 DATA FILE NOT FOUND
590 DATA BAD RECORD NUMBER
600 DATA DISK FULL
610 DATA OUT OF BUFFER SPACE
620 DATA DISK WRITE PROTECTED
630 DATA BAD FILE NAME
640 DATA BAD FILE STRUCTURE
650 DATA FILE ALREADY EXISTS
660 DATA FIELD OVERFLOW
670 DATA SET TO NONFIELDLED STR
680 DATA VERIFY DETECTS FLAW
690 DATA WRITE/INPUT PAST EDR
700 DATA HIRES GRAPHICS ERROR
710 DATA HIRES PRINT ERROR
720 CLEAR 200, PEEK(&H8045)*256+P
EEK(&H8046)-62
730 SA=PEEK(&H27)*256
740 SA=SA+PEEK(&H28)+1
750 FOR I=1 TO 40
760 READ EM$
770 NEXT I
780 FOR I=SA TO SA+38
790 READ B$: POKE I, VAL("&H"+B$)
800 NEXT I
810 DATA 1A, 50, 86, 37, 87, FF, A2, 8E
820 DATA 40, 00, 3A, AE, 84, CE, 00, 00
830 DATA A6, 80, A7, C0, 4D, 26, F9, 86
840 DATA 3A, B7, FF, A2, 1C, AF, 8E, 00
850 DATA 00, BD, B9, 9C, 7E, AC, 68
860 POKE SA+14, (SA+39)/256
870 POKE SA+15, (SA+39) AND 255
880 POKE SA+31, (SA+38)/256
890 POKE SA+32, (SA+38) AND 255
900 POKE &HAC60, &H7E
910 POKE &HAC61, SA/256
920 POKE &HAC62, SA AND 255
930 POKE &HE48C, &H7E
940 POKE &HE48D, &HAC
950 POKE &HE48E, &H57
960 POKE &HE4A3, &H7E
970 POKE &HE4A4, &HAC
980 POKE &HE4A5, &H57
990 CLS: NEW: END

```

Disk-Drive Blues

by Marty Goodman
Contributing Editor

I have what seems like disk drive or controller problems with my CoCo 3 system. When I attempt to get a directory listing, the listing comes back garbled, often with each letter of the filenames repeated. Yet when I switch the controller and drive to another CoCo 3, they work perfectly. More confusing, when the disk controller is not in that CoCo 3, the CoCo appears to perform perfectly as an Extended BASIC computer. Is this a disk drive, controller or possibly a CoCo 3 motherboard problem?

Steve Ricketts (STEVEPDX)
Boring, Oregon

I've seen problems like the one you describe, which are usually caused by a defective 6809 chip (68B09E in the case of the CoCo 3). Several times I have seen a bad 6809 that produced no symptoms whatsoever when a disk controller was not connected to the computer. The only apparent symptom was that with the controller in, disk access failed or was garbled. This can be explained by a failure of the NMI or HALT circuitry in the 6809 itself.

If possible, get another disk system or bring your suspect CoCo 3 to a place that has one. See if another disk system misbehaves when used with your CoCo 3. If this is the case, the problem is in your CoCo 3 and you will likely have to replace the 68B09E chip. This is a tricky task as the 40-pin chip is soldered in place.

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a longtime electronics tinkerer and outspoken commentator — sort of the Howard Cosell of the CoCo world. On Delphi, Marty is the SIGop of RAINBOW's CoCo SIG and database manager of OS-9 Online. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.

Steve responds.

It appears it is my CoCo 3. How should I replace the 68B09E?

I recommend destructive removal in this situation. Open the CoCo, remove the motherboard and the ground-plane sheet. Save the clips that hold the ground plane in place. Next use a solder sucker and soldering iron to clean as much solder as possible from each pin of the 6809 chip. Use a fine, small wire cutter (preferably one with angled jaws) to sever each of the 40 pins that hold the chip to the board. The chip will fall out.

Next use a soldering iron and long-nosed pliers to heat and gently lift out all the stubs of the clipped pins. Use the soldering iron and solder sucker as needed to clean any remaining solder in the holes the chip was in. Finally insert and solder a 40-pin socket where the 68B09E used to be. Insert the new 68B09E in the socket.

This technique minimizes the chance of damaging the delicate traces and pads on the circuit board at the expense of totally destroying the original chip.

End-All Monitors

Can you recommend an RGB monitor for the CoCo 3? How about if I am considering getting an MM/1 or Tomcat system? I also want to maintain compatibility with IBM VGA protocols?

Ernest N. Dotson
Charleston, West Virginia

As you may know, two monitors I strongly recommended for CoCo 3 users (the Magnavox 8CM515 and the Sony KV1311CR) are no longer in production. The Magnavox 8CM515 has been replaced by an updated unit, the Magnavox TCM135. This monitor (available from Microcom and Howard Medical) has the same resolution and overall quality of the older 8CM515 but features, in addition, provisions for stereo

audio inputs and chrominance-luminance video inputs used by the old Commodore 64 and by S-VHS style VCRs.

This monitor should work reasonably well with the standard video output on both the MM/1 and Tomcat systems. It is not compatible with IBM VGA-type systems, because it cannot sync above 15.75 KHz and its dot size is only .41mm. If you want sharper resolution and more flexible video inputs, you must use one of the lower-end multisync monitors. Some of these are available for \$400 or less. Do not buy a standard VGA monitor, which implies VGA only. Such a monitor does not work with either the CoCo 3 or the newer OS-9/68K computers.

Just Say No to Halt

Is there any practical way to modify a normal Tandy-style disk controller to make it a no-halt controller? No-halt operation would be so convenient for my OS-9 system.

Philip Byown (THEFERRET)
San Rafael, California

No, you would have to add and modify too much to achieve no-halt operation for any retrofit to existing controllers. It just isn't practical.

Jumper Search

I cannot find jumpers for drive selection on my 5¼-inch Tandon 360K drive. It seems to be jumpered as Drive 0. I want to select it as Drive 1.

Clayton G. Kinz
Colorado Springs, Colorado

The older full-height Tandon (TM100-2) drives have a 16-pin DTP IC socket used for drive selection. Those drives actually have two sockets labeled 2F and 1E in silk-screen on the PC board. You want the one labelled 1E and located near TP11. In this socket should be obvious jumpers or some plastic

item with jumpers in it. Move the jumper up one space to the next pair of holes in the socket, and you will change the selection from Drive 0 to Drive 1. The other socket should be empty; it is the terminator resistor socket and the added drive should not have a terminator resistor.

Newer half-height Tandon 5¼-inch floppies usually have a visible jumper or switch. In some cases the jumper in question (DS0, DST, etc.) may consist of a wire soldered directly to pads on the drive's logic board. In that situation you have to cut the old jumper and solder a new one.

Analog TTL Monitor

Is there any way I can hook my CoCo 2 to my Tandy CM-5? How else might I get around using a TV with my CoCo 2?

A.W. Stone
Fernley, Nevada

There is no practical way to hook the CM-5 to the CoCo 2, because the CoCo 2 does not produce any video output remotely compatible with the CM-5's CGA TTL video input. Some CoCo vendors, at one time, sold adaptors that allowed hooking a composite color monitor to the CoCo 2, but these may no longer be available. In any case, composite color monitors are relatively hard to find at prices competitive with cheap or used color TV sets.

Y-Cable Connectors

Where can I purchase the Kell Am style 40-pin male and female edge connectors needed to make a CoCo Y-cable?

Bill Flinn
San Diego

It may be the case that EAP Corporation (P.O. Box 14, Keller, Texas; 817-498-4242) still sells such connectors in small quantities to the public. If so, you are in luck. If not, I know of no other place to get them in quantities under a hundred.

To make such cables you must use Kell Am brand, female card-edge connectors with the Kell Am male or another brand of row-reversing connectors. The Kell Am male card-edge connectors hook to the cable in a mirror image of the ordinary female connector. Also, crimping a Kell Am male card-edge connector to a cable is a bit tricky. You must push each pin individually with some blunt tool after the initial crimping unless you own a special \$150 die made specifically for crimping such connectors.

PoCo/CoCo Connection

Can a CoCo be used to read and write a Tandy Portable Disk Drive disk? This is the sort of disk formatted on the Brother 3½-inch disk drive used with the Tandy Model 100, 102, 200 and WP2 lap computers.

Bruce Isted (OS9UGVP)
Calgary, Canada

The disks used are normal and ordinary enough, but the format used is 40-track single density. With proper assembly language modifications to the DSKCON routine, I believe you could have the CoCo reading and writing that kind of information.

I think the data is written in IBM format — the sort readable by the Western Digital controller chip used in CoCo controllers. I'm not familiar with the directory and file allocation structure on such disks.

Some persons have found it easier to decipher the codes used to talk to the Brother unit via the serial line and use the entire Brother unit connected with the CoCo or IBM PC via a serial cable. To do that, you need to incorporate a level converter in the serial cable, because the lines coming out of the Tandy Portable Disk Drive are RS-232 in timing, but TTL in level. Travelling Software's LAPDOS does exactly this. Its integral cable incorporates an MC145406P CMOS level converter chip, which they cleverly power from the PC's serial line using diodes and capacitors.

I note with some amusement that the IBM PC's standard floppy disk controller, unlike that of the CoCo, would be utterly unable to read Model 100 style disks directly in a 3½-inch drive, because that controller is, by convention, hard-wired for double density and cannot read or write single density under software control.

Your technical questions are welcomed. Please address them to CoCo Consultations, THE RAINBOW, P.O. Box 385, Prospect, KY 40059.

We reserve the right to publish only questions of general interest and to edit for brevity and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

Questions can also be sent to Marty through the Delpid CoCo SIG. From the CoCo SIG > prompt, pick Rainbow Magazine Services. Then at the RAINBOW > prompt, type ASK (for Ask the Experts) to arrive at the EXPERTS > prompt, where you can select the "CoCo Consultations" online form, which has complete instructions.

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The Assembly Line,

Part V: A New R.A.M.

by William P. Nee

Welcome to Part V. This month we'll teach your computer how to read and modify a BASIC program while it's running. To get started, let's first review *tokens* (not the subway type), and program lines and how the computer processes them.

All Aboard

There are many keywords in BASIC — those commands used over and over again like FOR, NEXT, PMODE, RND, etc. When the computer reads the lines in a BASIC program, it first looks for those keywords. If it finds one, the computer replaces it with a *token* — either a one-byte number from \$80 to \$E0 or a two-byte number from \$FF80 to \$FFA7. Tokens are a map telling the computer in a roundabout way where a specific ROM routine is stored. These tokens are usually shorter than the words they replace, so the line is reduced in length and made easier for the computer to process. Anything that is not a keyword is replaced by its ASCII value.

Where does the computer store this new coded line? Locations \$0019 and \$001A contain the address of the beginning of the first line in the BASIC program currently in memory. The location of the first line may bounce around, depending on how much memory you PCLEAR, whether you have a disk, and other factors, but it's always stored in \$0019 and \$001A.

Bill Nee reversed the snowbird trend by retiring to Wisconsin from a banking career in Florida. He spends the long, cold winters writing programs for his CoCo. He can be contacted at Rt. 2, Box 216C, Mason,

The format of this new line starts with a two-byte number as the location of the next line — sort of a computer line number.

*Teaching your
computer to
read and
modify BASIC*

Another two-byte number represents the BASIC program line number. If the BASIC program starts with Line 10, it is translated as \$000A. This is followed by the line itself, using tokens whenever possible or the character's ASCII value. Finally, a zero signifies the end of a line.

Let's look at an example of a computer line and translate it to BASIC. Assume \$0019 and \$001A contain \$2601; start there and read everything through the end of the line up to zero:

```
2601-26 11 00 0A C8 34 2C 31 3A  
BC 3A BF 31 2C 30 0
```

The first two bytes indicate the next line begins at memory address \$2611; the next two are the current BASIC line number —

\$000A or 10. Since the next byte is greater than \$7F, it must be a token, and, sure enough, \$C8 equates to PM00E. \$34 is the hexadecimal ASCII value of 4, \$2C represents a comma, and \$31 represents a 1. The next value, \$3A, stands for a colon.

At this point I'd like to point out the advantage of combining lines. Every line uses at least four bytes of memory: two for the next line location and two for the line number. By combining lines you can save those four bytes, reduce memory, and decrease execution time. You must add a colon for each combined line, but you also eliminate the zero at the end of lines. Back to the example. Finished decoding yet? Yes, it's just the BASIC PMODE, PCLS and SCREEN commands.

Play by Play

Now let's put what we've learned to some use. This is definitely a job for machine language. I learned this while I was working on a BASIC program in which I wanted to define variables without stopping the BASIC program, but the system wouldn't let me. I could enter an actual number but not an assignment for a variable, even if it was previously defined. I had to modify the program as if I were rewriting it each time with new variables. Machine language provides a good solution to this problem.

Listing 1 is a machine-language program that lets you modify a given line in your BASIC program; then the BASIC program runs as if you had rewritten it. Just tell the machine language routine the line number you want to modify and enter the change.

Let's modify Line 40 (of Listing 2),

which presently reads DEF FNF(X)- followed by a lot of spaces. (Make sure to read the Up and Running section before entering Listing 2.) So far, 12 spaces of that line have been used by the computer — two for the location of the next line, two for the BASIC line number, one for the token for DEF, a space, one for the token for FN, four for the ASCH values for F(X) and one for the token for "equals." Start with the 13th location and begin replacing those spaces with your own tokens or ASCH values.

The BASIC line number passed to the ML program is stored in LINE. Next the program loads Register Y with the location of the first program line and Register X with the BASIC line number. This is compared to the value in LINE; if it's not the same, Register Y is reloaded with the location of the next line and Register X with that line number. Eventually, Register X will be the same as LINE.

When a match is found, the location in Register Y is increased by 13 since this is where we will begin storing our informa-

tion. The subroutine at SA390 stops the program and waits for the input. When you've finished, the program begins to parse, or read, what you just entered. Since the goal of our sample session is to modify a math program, we'll only look for tokens related to math functions (+, -, SIN, SQR, EXP, etc.). At the end of the subroutine the information is stored in a buffer starting at \$02DD, and Register B contains the length of the input (not tokenized) plus one.

To begin, load Register X with \$02DD and decrease Register B by one. Now load Register A with the first buffer character and compare it to a plus sign. If the comparison is true, store the token for a plus sign (\$AB) at the location in Register Y, increase Register Y by one, and decrease Register B by one. If the first character isn't a plus sign, go to the next check for a minus sign.

Take a look at the LOG check (Line 500). If the first character is L, the program assumes you typed LOG, since no other keyword in this program begins with L.

Now move the input location in Register X over a total of three spaces, decrease Register B by three, and add \$FF99 (the token for LOG) to the line. What if two keywords begin with the same letter? If the character read is an A, this could mean ATN or ABS.

In Lines 860 through 900 you can see that after reading the A, the program has to check the next character. If it's a T, you must have typed ATN; if it's not, you entered ABS. In either case, eliminate three characters from the input by moving Register X over three spaces and decrease Register B by three.

The only other problem arises when the routine comes across an E. At the beginning of the BASIC program I defined P as 3.14159 (PI) and E as 2.71828 (natural log base). So, when the routine encounters an E, does this mean the variable or the keyword EXP? In lines 1180 through 1240 the routine must again check the next letter; this time if it's not an X, you meant to use just E. If it is an X, the program inserts the token \$FF97 into the line. You can define other variables



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System Requirements (both programs)

CoCo3, OS-9 LVL II, Multi-Vue, Disk Drive and 512k
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in the BASIC program; just don't let them be the first letter of any of the keywords.

If you were only going to run the program once, it could end here. But if you ran it again and defined a function with fewer characters, all those leftover ones from the old function would still be in the line — a guaranteed crash. The program must keep inserting blank spaces in the line until it reaches zero (the actual end of the line). Anything in the line from a previous run has been erased.

Up and Running

After you've entered Listing 1, check for errors with A/NO/NS/WE; when it's error-free, save the source code with W INPUT, SRC and assemble it with A INPUT, BIN /NS/WE.

Listing 2 is the BASIC program. It automatically loads the machine language portion if necessary. Extended BASIC defines ten USR locations you can identify (USR0 through USR9); use just one. Line 10 defines USR0=&H7000, the execution address. Now any number can be passed to the machine language program. Line 30 does this with ZZ=USR0(40) passing 40 as the line number to be modified; ZZ is just a dummy variable. Lines 70 and 90 pass 80 and 100 to the machine language program as two other lines to be modified. Be sure to type lines 40, 80 and 100 as written, leaving enough blank spaces — each line presently has 27

spaces after the equal sign (=), which are represented as vertical bars in the listing.

Notice that the variables in lines 80 and 100 will also come out thirteen spaces over, but that's no problem. The BASIC program is used to calculate the value of any integral function between Value A and Value B. Using the Gauss formula for the approximate integral:

$$(B-A) \left(FN F((B+A)/2 + (B-A)/2/SQR3) + FN F((B+A)/2 - (B-A)/2/SQR3) \right) / 2$$

The program computes 1024 intervals, adding them together and keeping track of the absolute value as it goes along. This is useful for finding the area between any two functions or the area between a function and the x axis. When the program asks for the lower and upper limits, you can enter a number or variable P, E, SQR(3), etc. Try doing that in BASIC.

There is room for two different sets of lower/upper limits — usually A, B, C or A, B, C, D. When the program has finished computing the value, it indicates possible roots (where the function crosses the x axis) and what fraction of P the roots are — so many integrals involve a solution with P. You can then request a plot of the function between your lowest and highest limits. The computations can handle division by zero, but the plotting cannot without error trapping.

Let's try a simple example. The integral of $1/x$ between 1 and any number is the LOG of that number. Run the program and enter $1/x$ as the function; for the lower limit enter 1 and for the higher, enter 10. You can see both the actual value and absolute value increasing. After 1024 intervals you get the answer 2.30258509. Break the program and type PRINT LOG(10). Of course the computer does this a little more quickly. Now run the program and enter a function of $SIN(X)+COS(X)$ from $-P/2$ to $+P/2$. The actual value is 2, the absolute value is 2.828, and there is a root at $+P/4$. Plot the function and see if it looks like the answer.

Here's one more example. Try a function of $SIN(X)-LOG(X)+EXP(X)$ between .2 and 1.4; you should get a result of 4.0509.

Experiment with the number of intervals N in Line 110 — a smaller number gives quicker but less accurate results. Functions you can use in this program are:

SIN	ATN	SQR	COS	LOG
INT	TAN	EXP	ABS	

Try adding the machine language routine to your own program with your own vocabulary. Just be sure to pass the next line after the ZZ=USR0 function. In the next article we'll use any leftover tokens to take a bus ride on an endless tour. □

64K Disk



Listing 1: INPUT

```

00100      ORG      $7000      00370      LDA      #$AD      00640      STA      ,Y+
00110 START  JSR      $B3ED      00380      LBRA     INPUT      00650      LDA      #$95
00120      STD      LINE      00390      00660      BRA      INPUT
00130      LDY      $19      00400 DIVD  CMPA     #' /      00670      TAN      CMPA     #' T
00140 AGAIN  LDX      2,Y      00410      BNE     POWER      00680      TAN      CMPA     #' T
00150      CMPX     LINE      00420      LDA      #$AE      00690      BNE     INT
00160      BEQ      CONT      00430      LBRA     INPUT      00700      LEAX     2,X
00170      LDY      ,Y      00440      00710      SUBB     #2
00180      BRA      AGAIN      00450 POWER  CMPA     #' ^      00720      LDA      #$FF
00190 CONT  LEAY     I3,Y      00460      BNE     LOG      00730      STA      ,Y+
00200      JSR      $A390      00470      LDA      #$AF      00740      LDA      #$96
00210      LDX      #$2DD      00480      LBRA     INPUT      00750      BRA      INPUT
00220      DECB
00230      00500 LOG      CMPA     #' L      00770 INT   CMPA     #' I
00240 READ  LDA      ,X+      00510      BNE     COS      00780      BNE     ATN
00250 ADD   CMPA     #' +      00520      LEAX     2,X      00790      LEAX     2,X
00260      BNE     SUBT      00530      SUBB     #2      00800      SUBB     #2
00270      LDA      #$AB      00540      LDA      #$FF      00810      LDA      #$FF
00280      LBRA     INPUT      00550      STA      ,Y+      00820      STA      ,Y+
00290      00560      LDA      #$99      00830      LDA      #$B1
00300 SUBT  CMPA     #' -      00570      LBRA     INPUT      00840      BRA      INPUT
00310      BNE     MULT      00580
00320      LDA      #$AC      00590 COS   CMPA     #' C      00860 ATN   CMPA     #' A
00330      LBRA     INPUT      00600      BNE     TAN      00870      BNE     SQR
00340      00610      LEAX     2,X      00880      LDA      ,X++
00350 MULT  CMPA     #' *      00620      SUBB     #2      00890      SUBB     #2
00360      BNE     DIVD      00630      LDA      #$FF      00900      CMPA     #' T

```

00910	BNE	ABS	01090	STA	,Y+	01270	SUBB	#2			
00920	LOA	#\$FF	01100	LOA	#\$9B	01280	LDA	#\$FF			
00930	STA	,Y+	01110	BRA	INPUT	01290	STA	,Y+			
00940	LDA	#\$94	01120			01300	LDA	#\$97			
00950	BRA	INPUT	01130	SIN	LDA	#\$FF	01310				
00960			01140		STA	,Y+	01320	INPUT	STA	,Y+	
00970	ABS	LOA	#\$FF	01150	LDA	#\$B5	01330	DECB			
00980		STA	,Y+	01160	BRA	INPUT	01340	LBNE	REAO		
00990		LDA	#\$B2	01170			01350				
01000		BRA	INPUT	01180	E	CMPA	#'E	01360	FILL	LOA	,Y
01010				01190	BNE	INPUT		01370	BEQ	DONE	
01020	SQR	CMPA	#'S	01200	LOA	,X		01380	LOA	#32	
01030		BNE	E	01210	CMPA	#'X		01390	STA	,Y+	
01040		LDA	,X++	01220	BEQ	EXP		01400	BRA	FILL	
01050		SUBB	#2	01230	LOA	#'E		01410	OOONE	RTS	
01060		CMPA	#'Q	01240	BRA	INPUT		01420	LINE	RMB	1
01070		BNE	SIN	01250				01430	END	START	
01080		LOA	#\$FF	01260	EXP	LEAX	2,X				

80	.....	196
170	.....	104
250	.....	73
340	.....	214
ENO	.....	238

Listing 2: INPUTBAS

```

0 'COPYRIGHT 1990 FALSOFT, INC.
10 CLEAR500,&H7000-1:DEFUSR0=&H7
000:IF PEEK(&H7000)<>189 THEN LO
ADM"INPUT":POKE &HFF40,0
20 CLS:E=EXP(1):P=4*ATN(1)
30 PRINT"F(X)-":ZZ=USR0(40)
40 DEF FN F(X)=|
|
|
|
50 PRINT@32,"":INPUT"HOW MANY I
NTEGRALS [1] ":XX:IF XX<=0 THEN
XX=1 ELSE IF XX>2 THEN 50
60 FOR QQ=1 TO XX:PRINT"INTEGRAL
"QQ"-
70 PRINT"LOWER LIMIT ":ZZ=USR0(
80)
80 A(CQ)-|
|
|
90 PRINT"UPPER LIMIT ":ZZ=USR0(

```

```

100)
100 B(CQ)=|
|
|
|
110 PRINT:NEXTQQ:TA=0:AA=0:RR=0:
MX=0:N=1024
120 FOR QQ=1 TO XX:SU=0:SA=0
130 XH=(B(CQ)-A(CQ))/N:X2=XH/2:X
R=X2/SQR(3)
140 S1=A(CQ)-X2:XR:S2=A(CQ)-X2+X
R
150 S=SGN(FNF(S1+XH)+FNF(S2+XH))
160 FOR K=1 TO N
170 SS=SGN(FNF(S1+K*XH)+FNF(S2+K
*XH)):IF SS<>S THEN S=SS:RR=RR+1
:R(RR)=A(CQ)+(B(CQ)-A(CQ))*(K-1)
/N
180 VV=FNF(S1+K*XH)+FNF(S2+K*XH)
:IF ABS(VV)>MX THEN MX=ABS(VV)
190 SU=SU+VV:SA=SA+ABS(VV)
200 PRINT@32*(4*QQ-2)+13,USING"#
### +###.#####":K,SU*X2
210 PRINT@32*(4*QQ-1)+1B,USING"+
###.#####":SA*X2:NEXTK
220 SU=SU*X2:TA=TA+SU:SA=SA*X2:A
A=AA+SA:NEXTQQ
230 PRINT@32*(4*XX+1),USING"TOTAL
AREA +###.#####":TA
240 PRINTUSING"ABS AREA +###.
#####":AA

```

```

250 IF RR<>0 THEN PRINT"ROOT CHA
NGES AT -":FOR R=1 TO RR:PRINTUS
ING"+###.##### P*+###.##":R(R),R
(R)/P:NEXTR
260 INPUT"ANY NEW LIMITS (Y/N) -
":AS:IF AS<>"Y" THEN 280
270 FOR N=1 TO 14:PRINT@32*N,STR
ING$(31,32);:NEXT:GOTO 50
280 INPUT"WANT A PLOT (Y/N) -":A
$:IF AS="Y" THEN 300
290 STQP
300 PMOOE4,1:PCLS:SCREEN1,1
310 LINE(12B,0)-(12B,191),PSET:L
INE(0,96)-(255,96),PSET
320 A=A(1):B=B(XX):YF=180/MX:IF
ABS(B)>ABS(A) THEN XF=100/ABS(B)
ELSE XF=100/ABS(A)
330 LINE(12B+XF*A,96)-(12B+XF*A,
96),PSET
340 FOR N=A TO B STEP 1/(B-A)/XF
350 Y=FN F(N):Y=INT(YF*Y+.5)
360 IF ABS(Y)>90 THEN 380
370 LINE-(12B+XF*N,96-Y),PSET
380 NEXT
390 LINE(12B+XF*B,96-Y)-(12B+XF*
B,96),PSET
400 EXEC &HADFB
410 GOTO 260

```

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OS-9 Graphics Primitives

by Dale L. Puckett
Contributing Editor

Many BASIC09 programs have appeared in the pages of this magazine over the past several years, but few of them have paid tribute to the graphics end of things. To help you understand OS-9 graphics and how you can use them in your own programs, let's review some OS-9 graphics primitives. I'll show you how to use them from the command line or from within a procedure file. Then, I'll discuss how to use them within your own BASIC09 programs.

Getting Ready

Before you can exercise the drawing commands built into OS-9 you must ensure that your system is set up properly. Otherwise, you'll be swimming in error messages. First and most importantly, you must be working in a graphics window.

OS-9 supports six window types. Two of these display text only; if you attempt to draw on a text window, an error message appears, which often does not indicate the real problem. Text windows have several advantages. Because they're much faster, they're handy for people who write text-based applications like word processors or databases. Information is displayed three to four times faster, and a text window uses less memory.

Each of the four OS-9 graphics windows give you a choice of resolution and number of colors you can use. Both of these factors affect the amount of memory required to use the window. For example, a Type 5

Type	Size	Colors	Memory
01	40 x 24 text	8	2K
02	80 x 24 text	8	4K
05	640 x 192 pixels	2	16K
06	320 x 192 pixels	4	16K
07	640 x 192 pixels	4	32K
08	320 x 192 pixels	16	32K

Table 1: OS-9 Window Types

Color	Number
White	0
Blue	1
Black	2
Green	3
Red	4
Yellow	5
Magenta	6
Cyan	7
White	8
Blue	9
Black	10
Green	11
Red	12
Yellow	13
Magenta	14
Cyan	15

Table 2: Default Colors

window allows you to display 640-by-192 pixels in two colors, and uses only 16K of memory. To use four colors at this resolution requires 32K of memory. Unfortunately, you cannot use more than four colors at this resolution. To get more, you must switch to a window with a resolution of 320-by-192 pixels. A four-color, low-resolution window uses 16K of memory, while a 16-color window gobbles up 32K. Table 1 lists the OS-9 window types and characteristics.

I usually use a Type 7 window for most of my projects, since it presents the best compromise between resolution and the number of colors. Speaking of colors, you also need to know each color's palette number before you can issue the proper command to set the foreground, background and border colors of your windows and various drawing tools. The default colors are listed in Table 2.

Before you can draw, you need to make a number of decisions regarding the type, size, location and color of the window you want to use. Once you've made up your mind, you must translate the numerical values to the proper numbering system. If you are sending graphics commands to OS-9 from the command line (OS9: prompt), you must speak in hexadecimal notation. When you're programming in BASIC09 and running gfx2 commands to do your drawing, you'll be able to send commands with decimal numbers.

Several other commands must also be issued before you can use OS-9's drawing commands. For example, since you are using graphics windows, you must merge a set of fonts into the system. Otherwise, you won't be able to see the commands you are typing. Do this by entering:

```
merge /dd/sys/stdfonts >/w
```

You must also merge a set of pointers and patterns into the system. Use the following commands:

```
merge /dd/sys/stdptrs >/w
merge /dd/sys/stdpats_4 >/w
```

OS-9 uses the images stored in the stdfonts file to draw letters on your graphics windows when you type. The images stored in the stdptrs file are used to draw the various mouse pointers on the screen, and the stdpats_4 file makes it easy to fill

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an enclosed area in a window with a number of standard patterns. You'll want to add these commands to your startup file, since they're needed each and every time a graphics window is opened.

You can change the type of OS-9 window currently selected. In fact, most applications set up the type of window required. Indeed, one of the handiest tools you can have is a procedure file or *merge file* you can use to create a desired window type on the fly. I have three of these files stored permanently in my root directory (/dd) — *mtw*, *mgw5* and *mgw7*. To change the window I'm working in to an 80-by-24 text window, I type:

```
merge /dd/mtw
```

The transformation occurs almost as fast as you can blink your eyes. First, the original window goes blank. Then a second later, a new window pops onto the screen, followed by the prompt for the Shell I'm running in the window. Let's create these files for you.

To get the job done, you need to close the device window you're using, create a new window, select the font to be used in the window and select the window we have just created. These individual commands will do the job:

```
display 1b 24
display 1b 20 2 0 0 50 18 1 0 4
display 1b 3a c8 01
display 1b 21
```

This sequence is used to create my *mtw* file. To create *mgw5* and *mgw7*, substitute one of the two lines below for the second of the previously listed commands:

```
display 1b 20 5 0 0 50 18 1 0 4
display 1b 20 7 0 0 50 18 1 0 4
```

Notice that only the number that determines the type of window has been changed. Notice also that when you use the *display* command to send graphics commands to OS-9, you must use hexadecimal numbers. The upper right corner of the window is at coordinate 0,0. Each is 50 hexadecimal characters (80 decimal characters) wide. Likewise, the hexadecimal 18 creates a window 24 (decimal) lines deep. Stand by! It gets more complicated when you start

dealing with 640 pixels on a line and have to write that in hexadecimal.

Next use the *build* or *edit* command to store the four-line sequence in a file named *MakeTmw*. Assuming it is stored in your current data directory, type *MakeTmw* at the Shell prompt and OS-9 will treat it as a procedure file to change your window type.

Now let's add two additional steps to the process and make a merge file that works a bit faster than a procedure file. First note that you do not need to type all four of the lines above. Rather, you can type:

```
display 1b 24 1b 20 7 0 0 50 18
1 0 4 1b 3a c8 1 1b 21
```

Action	Code	Coordinates
Arc	1b 52	Radius, Area
Bar	1b 4a	Opposite corner
Bar (relative)	1b 4b	Offset to opposite corner
Box	1b 48	Opposite corner
Box (relative)	1b 49	Offset to opposite corner
Circle	1b 50	Radius
Ellipse	1b 51	Horiz & Vert radius
Line	1b 44	Opposite end
Line (relative)	1b 45	Offset to opposite end
Line (and move)	1b 46	Opposite end
Line (relative & move)	1b 47	Offset to opposite end
Point	1b 42	Location
Point (relative)	1b 43	Offset to location
Action	Code	Parameters
Kill device window	1b 24	
Kill overlay window	1b 23	
Make device window	1b 20	Type, location, size, colors
Make overlay window	1b 22	Save switch, location, size
Position draw pointer	1b 40	Location
Position draw ptr (rel.)	1b 41	Offset to location
Position graphics cursor	1b 4e	Location
Change background color	1b 33	Color number
Change border color	1b 34	Color number
Change default color	1b 30	
Change foreground color	1b 32	Color number
Change palette color	1b 31	Palette #, Color Table #
Change working area	1b 25	Location, size
Bold text	1b 3d	0 for plain, 1 for Bold
Proportional text	1b 3f	0 for plain, 1 for Proportional
Transparent text	1b 3c	0 for plain, 1 for transparent
Select drawing logic	1b 2f	0 for none, 1=AND, 2=OR, 3=XOR
Select font	1b 3a	Group #, Buffer #
Select graphics cursor	1b 39	Group #, Buffer #
Select pattern	1b 2e	Group #, Buffer #
Select window	1b 21	Group #, Buffer #
Fill screen area	1b 4f	
Get screen image	1b 2c	Group, buffer, location, size
Put screen image	1b 2d	Group, buffer, location
Scaling	1b 35	0=Off, 1= On

Table 3: Display codes for graphics commands

Better yet, store this line in a procedure file named `MakeGW7`. Then type the following line at the Shell prompt:

```
makegw7 >mgw7
```

If you're curious, type `dump mgw7` and look at the contents of the file. If not, just type `merge mgw7` and press `ENTER`.

Viola! You should now have a four-color, Type 7 graphics window in front of you. Notice that all of the commands above assume that you created the procedure file in your current data directory and are still in the same directory when you try to use it. Again, since I use the files almost every few minutes, I leave them stored in my root directory (`/dd`). This lets me get at them instantly from anywhere in OS-9's hierarchical directory system without needing to remember which directory I stored them in. It also saves typing.

Let's examine the four-line sequence above a little closer. The word `display` merely runs the OS-9 `display` command. You can use this utility to print characters on the screen that aren't really printable. The `1B` is the escape character. It tells the Input/Output routines that the next character is special. The two-character sequence `1B 24` tells OS-9 to end or close the current device window. When `CC310` sees this sequence, it calls an internal routine named `OWEnd` for Device Window End. Likewise, the sequence `1B 20` calls `OWSet`, and `1B 21` calls `OWSelect`. Perhaps this BASIC09 code that does the same job will make it easier to understand:

```
RUN gfx2("OWEnd")
RUN gfx2("OWSet",7,0,0,80,24,1,0,4)
RUN gfx2("Font",200,1)
RUN gfx2("Select")
```

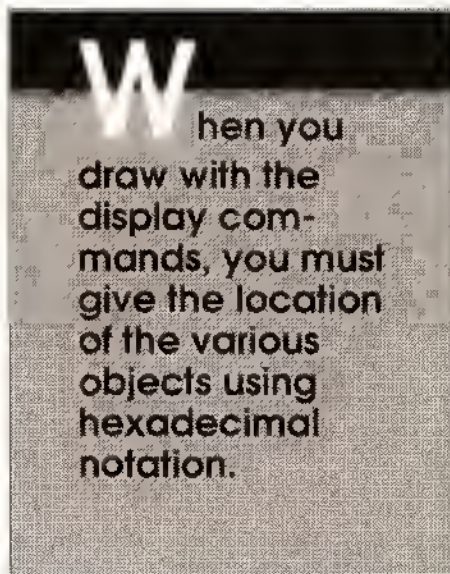
Drawing From the Command Line

If you want to maintain your sanity while working with graphics using `display` commands, you need a table of codes at your fingertips. Table 3 should fill the bill.

When you draw with the `display` commands, you are giving the location of the various objects using hexadecimal notation. The horizontal coordinates can be any number from 0 to 639. There are 192 available pixels vertically, from 0 to 191. Because remembering the Hexadecimal value of 540 — or any random number — can be quite taxing, you'll want to get a decimal-to-Hex conversion chart. Perhaps you can write a BASIC09 program to print one, using the `HEX$` function.

Before you begin to draw using the drawing commands, it is helpful to sketch

a plan on a piece of graph paper. Most graph paper is numbered from 0 to 24 along the horizontal axis and from 0 to 18 along the vertical axis. If you multiply every horizontal grid position by 30, you will have grids representing pixels 0 through 660 in 30-pixel increments. In the vertical direction, you can let each grid represent 20



pixels. This gives you pixels 0 through 180 — just 12 pixels short of the 192 displayed by your CoCo.

With this prep work out of the way, you can pencil in a rough sketch of the final drawing. The first step is to draw a rectangle on a piece of graph paper. Make it 640 dots wide by 180 dots high. The rectangle represents the entire (almost) screen.

To successfully draw with the built-in graphic functions, you need to consider two more issues. First, remember that you are speaking hexadecimal when you work with the `display` command. Because of this, you must convert all pixel locations from decimal to hexadecimal before typing them. Secondly, remember the location of the invisible draw pointer.

For example, if you intended to place the draw pointer at a position 16 pixels over and down from the upper left corner of the window, you would immediately assume you should type, `display 1B 40 16 16`. Not so! Decimal 16 is 10 in hexadecimal notation. If you knew this already, you are a prime target for the next most common mistake! You would just type, `display 1B 40 10 10`, right? Wrong!

The internal data structures within the graphics handling routines expect to receive integer parameters. The `display` command sends byte-wide data to the standard output path. What to do? Simple, just send the high-order byte of the integer, followed

by the low-order byte. For example, to place the draw pointer 16 pixels down and over from the upper left corner of the screen, type:

```
display 1B 40 00 10 00 10
```

If you plan on typing graphics commands interactively using `display`, consider another problem. If you are drawing in the same window you are using to type the commands, the prompts printed and the characters you type can overlap your drawing. It's not a pretty picture. Conversely, if you redirect your drawing to a window on another screen, you will need to use the `CLEAR` key to move to the other screen before you can see the results of your latest command.

The solution is to create a small window at the bottom of the screen, since you want to see the picture as soon as you press `ENTER`. In that small four-line window, you can start a Shell. From its prompt, you can redirect drawing commands to the larger window in the top part of the screen. Enter the following lines in a procedure file using the `build` command or your favorite editor.

```
wcreate :z
/w1 -s=7 0 0 80 20 2 0 4
/w2 0 20 80 4 2 7

display 1B 21 >/w2
shell 1=/w2&
```

To run this procedure file, make sure it is stored in your current data directory, then type its name. Also, the `wcreate`, `display` and `shell` commands must already be loaded into memory or stored in your current execution directory. After you run this procedure file, you can move to the Shell in the green control window (`/w2`) by pressing the `CLEAR` key until the cursor moves to a position behind the prompt in that window.

While you are drawing, you must also know whether OS-9's automatic scaling feature is turned on or off. To turn it on, type this line:

```
display 1B 35 1 >/w1
```

To turn it off, type the following:

```
display 1B 35 0 >/w1
```

If you draw with scaling turned off, be absolutely certain the coordinates you pass to the drawing commands are indeed within the window you are using. If you tell OS-9 to draw outside the window, you'll receive an Error 189 — Illegal Coordinates. If you

Listing 1: Objects.scr

```

display c ; * clear screen
display lb 32 2 ; * foreground color black
display lb 40 0 46 0 a ; * place cursor
display lb 48 0 8c 0 3c ; * draw box
display lb 40 1 4a 0 20 ; * draw pointer to circle center
display lb 50 0 32 ; * draw circle
display lb 40 1 e0 0 14 ; * position pointer
display lb 48 2 60 0 28 ; * draw another box
display lb 40 0 68 0 5a ; * position for ellipse
display lb 51 0 58 0 12 ; * draw ellipse
display lb 40 0 e8 0 46 ; * position for another box
display lb 48 1 a8 0 60 ; * draw box
display lb 40 2 1a 0 5a ; * position for second ellipse
display lb 51 0 40 0 12 ; * draw ellipse
display lb 40 0 10 0 80 ; * position cursor
display lb 48 0 c8 0 96 ; * draw another box
display lb 40 1 4a 0 80 ; * position cursor
display lb 50 0 30 ; * draw a circle
display lb 32 3 ; * make foreground green
display lb 40 1 e0 0 80 ; * position
display lb 4a 2 60 0 96 ; * draw bar
display lb 32 2 ; * color back to black
display lb 40 1 4a 0 8c ; * move into circle
display lb 2e cc 01 ; * select dot pattern
display lb 4f ; * flood circle with dots
display lb 40 0 20 0 90 ; * move inside rectangle
display lb 32 3 ; * make it green
display lb 2e cc 02 ; * vertical line pattern
display lb 4f ; * and fill it
display lb 2e 0 0 ; * you MUST turn pattern off
; * now you write the commands to fill the rest
; * before you draw again
display lb 32 1 ; * make color blue
display lb 40 0 5 0 5 ; * to upper left corner

```

have scaling turned on, your objects may not be drawn exactly where you expected because OS-9 scales them to fit. The scaling feature is useful because it gives you a way to draw an object to full scale (640-by-192 pixels) but display it in a smaller window. The more pixels you have available while drawing, the better your finished product looks.

While you're drawing, remember to keep track of the draw pointer at all times. Issue a *position draw pointer* command before each drawing command, unless you want several objects drawn from the same starting position. Type the procedure file shown in Listing 1 to get a feel for how the OS-9 graphics commands work.

Notice that since this is an OS-9 procedure file, we will be feeding it to a Shell for processing. For this reason, I used the semicolon to separate the actual commands on each line from the comments that tell you what to expect will happen. The asterisk is the comment symbol. (If you are using *Shell+*, be sure to disable wildcards if you enter the comments!) Also notice that if you need to print a text message in your window, you must use *display* to send a string of characters to the window. If you use the *echo* command instead, you send a



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carriage return to the window and move the objects you have drawn.

To try the procedure file above, use an editor to enter it into a file named `objects`. After you've saved the file, type:

```
objects >/w1
```

The objects drawn should pop onto the screen rather quickly.

Now that you understand the graphics primitives built into OS-9, it's time to get creative. You can use a procedure file similar to `objects` to handle many chores, such as drawing a startup screen for an application program. How about using it for a To Do list or a telephone message form? Just about anything you can draw by hand can be drawn with these graphics primitives.

Getting and Putting Images in a Buffer

With your drawings created on the screen, you can save them into a buffer and display them instantly whenever you need them. Here's an example. Let's recreate the first circle from our procedure `objects`, capture the image on the screen into a buffer and print it elsewhere in the window. Listing 2 does just this.

After clearing the screen with the first line, move the draw pointer to the upper right portion of the screen and draw a circle. Then use the `GetBk` commands to capture the image into a buffer in memory. Once that buffer is in memory you can print it wherever you like, whenever you like. I printed three — one in the upper left corner of the screen and two low on the screen just to each side of the center. Note that if you make a mistake while typing the display codes for the `GetBk` command, you must kill that buffer using the command `display 1b 2a group buffer` before retyping the line to `GetBk Pixels`.

Listing 3 shows the BASIC09 code that does exactly the same job for you. Notice that the pixel locations here are expressed in decimal instead of hexadecimal.

Finally, the start of a generic calendar you can build on is shown in Listing 4. Perhaps it will be the first of many screen forms you can use daily on your Color Computer. The listing draws the lines for the calendar. You need to use the proper display commands to position the text cursor and then use `display` to print the names of the month and the individual days, as well as the actual numerical date.

If you want to get snazzy, draw some symbolic images, put them in a buffer and print them in the squares to represent various dates. Once you have your calendar the way you like it, you can merge the display

codes into a merge file and display it on the screen whenever you like. Perhaps you'll want to see it every time you boot OS-9 on your CoCo. Have fun experimenting!

Another Special Treat

Kevin Darling, the OS-9 guru, uploaded a new `gfx2` package to the OS-9 SIG on Delphi and the OS-9 SIG on CompuServe in mid-July. This new `gfx2` package is far

superior to the original `gfx2` from Tandy. If you have access to Delphi or CompuServe, by all means jump online and download it. If not, find a friend who can download it for you. It is a *must have!* While you're at it, get a copy of Kevin's fast graphics patch from one of these online services. You'll find graphics routines run a full five times faster. Your programs will be much more impres-

```
display 1b 48 2 7b 0 9b ;* draw box around everything
display 2 29 33 ;* position text cursor
;* Print a closing message
display 20 54 68 61 74 27 73 20 41 4c 4c 20 46 6f 6c 6b 73 21 20
```

Listing 2: GetPutDemo.scr

```
display c ;* clear screen
display 1b 40 1 4a 0 20 ;* draw pointer to center of circle
display 1b 50 0 32 ;* draw circle
* Now store the circle in group #80, buffer #1
display 1b 2c 50 1 1 16 0 0 70 0 48 ;* get image in buffer
display 1b 2d 50 1 0 0 0 0 ;* put one in upper left
display 1b 2d 50 1 0 9f 0 6f ;* another near center
display 1b 2d 50 1 1 30 0 6f
```

Listing 3: GetPutDemo.b09

```
PROCEDURE GetPutDemo
DIM WinPath:BYTE
OPEN #WinPath,"/w1":WRITE
RUN gfx2("clear") \ (* Clear Screen
RUN gfx2("Circle",330,32,50) \ (* Draw circle
RUN gfx2("Get",80,1,278,0,112,72) \ (* Get circle into buffer
RUN gfx2("Put",80,1,0,0) \ (* Put it in upper left corner
RUN gfx2("Put",80,1,159,111) \ (* Put in lower left center
RUN gfx2("Put",80,1,304,111) \ (* Put in lower right center
RUN gfx2("Killbuff",80,1)
END
```

Listing 4: Calendar.scr

```
display c ;* clear screen
display 1b 40 0 30 0 19 ;* position cursor
display 1b 48 2 3f 0 9f ;* draw outside edge
display 1b 40 0 31 0 1a ;* make lt
display 1b 48 2 3e 0 9e ;* double thick
display 1b 40 0 30 0 37 ;* start of first line
display 1b 44 2 3f 0 37 ;* draw it
display 1b 40 0 30 0 55 ;* start of second line
display 1b 44 2 3f 0 55 ;* draw it
display 1b 40 0 30 0 73 ;* and third
display 1b 44 2 3f 0 73 ;* do it
display 1b 40 0 30 0 91 ;* just above last week
display 1b 44 0 30 0 91 ;* put it on screen
* Now do vertical dividing lines
display 1b 40 0 46 0 19 ;* top of first line
display 1b 44 0 46 0 9f ;* draw it
display 1b 40 0 96 0 19 ;* top of second line
display 1b 44 0 96 0 9f ;* draw it
display 1b 40 0 e1 0 19 ;* top of third line
display 1b 44 0 e1 0 9f ;* draw it
display 1b 40 1 2c 0 19 ;* top of fourth line
display 1b 44 1 2c 0 9f ;* draw it
display 1b 40 1 77 0 19 ;* top of fifth line
display 1b 44 1 77 0 9f ;* draw it
display 1b 40 1 c2 0 19 ;* between Friday and Saturday
display 1b 44 1 c2 0 9f ;* draw it
```

Listing 5: DrawBox.b09

```

PROCEDURE DrawBox
0000 DIM Grp_Ptr,Ptr_Arr,Ptr_Pen:INTEGER
000F Grp_Ptr:=202 \Ptr_Arr:=1 \Ptr_Pen:=2
0024 DIM WR_Cntnt:INTEGER
002B WR_Cntnt:=0
0032 DIM valid,fire,mx,my,area,sx,xy:INTEGER
0051 DIM startx,starty,currx,curry:INTEGER
0064 DIM scanrate,timeout,follow:INTEGER
0073 scanrate:=3 \timeout:=1 \follow:=1
0088 DIM ButtonDown,ButtonUp:INTEGER
0093 ButtonDown:=1 \ButtonUp:=0
00A1 RUN gfx2("SetMouse",scanrate,timeout, follow)
00C0 RUN gfx2("GCSet",Grp_Ptr,Ptr_Pen)
00D7 RUN gfx2("logic","xor")
00EA RUN gfx2("clear")
00F7
00F8 (* Main Loop *)
0107 REPEAT
0109 RUN gfx2("Mouse",valid,fire,mx,my)
012A UNTIL fire=ButtonDown
0136
0137 startx:=mx \starty:=my
0147 currx:=mx \curry:=my
0157 RUN gfx2("SetDPtr",startx,starty)
0170
0171 WHILE fire=ButtonDown DD
017E RUN gfx2("Mouse",valid,fire,mx,my)
019F IF currx<>mx DR curry<>my THEN
01B4 RUN gfx2("box",currx,curry)
01C9 currx:=mx \curry:=my
01D9 RUN gfx2("box",currx,curry)
01EE ENDF
01F0 ENDWHILE
01F4
01F5 RUN gfx2("logic","off")
0208 RUN gfx2("box",currx,curry)
021D RUN gfx2("GCSet",0,0) \(* Turn graphics cursor off
024B END

```

sive as your menus begin to pop down instead of slurp down.

The new gfx2 not only makes it easy for you to write point-and-click BASIC09 programs with windows and menus (like *MVFinance* in our April and July columns), but it can make it very easy for you to experiment with drawing programs using the BASIC09 compiler.

To get started, I rewrote the code for the DrawBox procedure from our *KISSDraw* series to use the new gfx2 routines, SetMouse and Mouse. The DrawBox procedure is a simple program that clears the screen, turns on the mouse and lets you draw one box.

To learn how to integrate DrawBox into a full-fledged drawing program, compare the code here to that in our *KISSDraw* series. You can easily combine the menu routines in the *MVFinance* program with the drawing routines from *KISSDraw*, modified like DrawBox here, to roll your own quick and dirty graphics editor. You'll have a lot of fun in the process. If there's enough demand, maybe we can redo the project here in "KISSable OS-9."

Next month we'll cover Communications. I'll come up with something for fellow hams. Until then, 73, put on the shoulder pads and keep on hacking! ☺

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EPROM Programmer

Part III

by Tony DiStefano
Contributing Editor

Assume you have finished building the EPROM programmer and are reasonably sure it works. Of course you have tested it using the guidelines in Part II of this series. As we all know, hardware is only half of this project; the other half is software. The software I have written for the EPROM programmer is simple, but it does the job. It is written completely in assembly language.

We present this software in such a way as to accommodate everyone. The most common denominator here is BASIC — all CoCo users have it, and just about everyone knows enough about BASIC to be able to enter the driver software in the form of a BASIC program, as shown in the listing.

Enter the listing using THE RAINBOW's Check Plus system. This method works well and is necessary with this type of program — if you have just one character wrong, the whole program may crash. With a formatted disk in the drive, run MAKEPROM to generate the machine-language EPROM programmer software. Once you have the software for the EPROM programmer, all you have to do is load and EXEC it.

Next month I'll provide a manual of sorts that explains how to use the software and the programmer. This is required reading for programming an EPROM. Some of you more experienced users may be able to use the programmer and software without the reading the manual, but there is one piece of information you will need — the data buffer for the programmer starts at \$3000 and is as long as the selected EPROM. Good Luck! □

Tony DiStefano is a well-known early specialist in computer hardware projects. He lives in Laval Ouest, Quebec. Tony's user-name on Delphi is DISTO.

32K Disk

✓ 150	.....	193
1070	.....	18
1150	.....	59
1230	.....	15
1310	.....	163
1390	.....	48
1470	.....	214
1550	.....	2
1630	.....	62
1710	.....	141
1790	.....	47
1870	.....	186
1950	.....	37
2030	.....	105
2110	.....	32
2190	.....	252
2270	.....	194
2350	.....	215
2430	.....	239
2510	.....	249
2590	.....	216
2670	.....	136
END	.....	118

```

150 SAVEM"EPROMDR/8IN",&HE00,&H1
4EC,&HE00
160 END
1000 DATA 7F,FF,40,1A,50,8D,A9,2
8,30,8D
1010 DATA 4,81,17,3,19,CE,FF,51,
17,3
1020 DATA 5D,B7,3,89,81,31,27,11
,81,32
1030 DATA 27,8,81,33,27,4,81,34,
26,DD
1040 DATA CC,40,0,20,3,CC,20,0,F
D,3
1050 DATA 80,C3,30,0,FD,3,86,17,
2,FC
1060 DATA 10,8E,0,0,6F,C4,6F,42,
7F,3
1070 DATA 83,5F,86,D0,97,8C,8E,0
,0,9F
1080 DATA 8D,8D,A9,62,5C,26,FA,8
E,5,4A
1090 DATA 9F,88,17,3,13,81,30,2E
,2,20
1100 DATA F7,81,36,2E,F3,AD,9F,A
0,2,34
1110 DATA 12,30,8D,5,E3,17,2,A9,
35,12
1120 DATA 81,31,27,21,81,32,10,2
7,0,FD
1130 DATA 81,33,10,27,2,22,81,34
,10,27
1140 DATA 0,37,81,35,27,8,81,36,
10,27
1150 DATA 0,4B,27,BD,16,91,8A,30
,8D,5
1160 DATA ED,17,2,7B,8E,30,0,17,
3,83
1170 DATA 86,FF,BC,3,86,10,27,3,
97,A1
1180 DATA 5F,27,7,30,1,17,2,E0,3
0,1F
1190 DATA 17,2,C,30,1,20,E7,30,8
D,5
1200 DATA D7,17,2,53,8E,30,0,17,

```

The Listing: MAKEPROM

```

10 ' PROGRAM TO GENERATE THE
20 ' EPROM PROGRAMMER SOFTWARE
25 ' ON DISK.
30 ' BY TONY DISTEFANO FDR
40 ' TURN OF THE SCREW.
50 '
60 ' MUST DO A "PCLEAR 8" BEFDRE
70 ' STARTING THIS PROGRAM.
90 CLEAR 500
100 FDR I = &HE00 TO &H14E8
110 READ A$
120 X = VAL("&H"+A$)
130 POKE I,X
140 NEXT I

```

Still pounding away at that keyboard?



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3.5B
1210 DATA A6.5F.A7.B0.BC.3.86.27
.5.17
1220 DATA 1.EF.20.F2.16.3.67.30.
BD.5
1230 DATA F5.17.2.35.C6.4.17.94.
A1.10
1240 DATA 25.2.F0.8E.2.DD.17.3.6
0.86
1250 DATA D.AD.9F.A0.2.1F.10.17.
3.1
1260 DATA 1F.98.17.2.FC.86.20.AD
.9F.A0
1270 DATA 2.A6.B4.17.2.F1.86.20.
AD.9F
1280 DATA A0.2.7F.3.88.17.2.52.B
1.5E
1290 DATA 27.51.B1.A.27.52.81.D.
10.27
1300 DATA FF.B.81.30.25.EB.81.39
.23.8
1310 DATA 81.41.25.E3.81.46.22.D
F.B7.2
1320 DATA DD.AD.9F.A0.2.17.2.2A.
B1.30
1330 DATA 25.F9.B1.39.23.8.81.41
.25.F1
1340 DATA B1.46.22.ED.B7.2.DE.AD
.9F.A0
1350 DATA 2.7F.2.DF.34.10.8E.2.D
D.17
1360 DATA 2.EF.1F.10.1F.98.35.10
.A7.80
1370 DATA 16.FF.84.30.1F.16.FF.7
F.30.1
1380 DATA 16.FF.7A.B6.3.89.B1.32
.10.2E
1390 DATA 0.B7.30.8D.5.3A.17.1.9
0.8E
1400 DATA 30.0.C6.CC.E7.C4.A6.80
.A7.5F
1410 DATA CA.20.E7.C4.7F.3.82.86
.1.17
1420 DATA 1.39.7C.3.82.B6.3.82.8
1.F
1430 DATA 27.E.C4.7B.E7.C4.A6.5F
.CA.84
1440 DATA E7.C4.A1.1F.26.E3.B6.3
.82.48
1450 DATA 4B.17.1.19.34.16.8F.3.
84.9E
1460 DATA 88.17.1.F9.86.20.AD.9F
.A0.2
1470 DATA B6.3.B2.C6.5.3D.1F.98.
17.2
1480 DATA 24.9F.88.35.16.B6.3.B2
.B1.F
1490 DATA 26.10.C4.7B.E7.C4.A6.5
F.CA.B4
1500 DATA E7.C4.A1.1F.10.26.1.F.
BC.3
1510 DATA B6.10.27.0.9C.17.0.C7.
A6.80
1520 DATA A7.5F.17.1.D6.20.BF.30
.8D.4
1530 DATA B3.17.1.9.8E.30.0.B6.3
.89
1540 DATA 81.33.27.4.C6.DC.20.2.
C6.D4
1550 DATA E7.C4.A6.80.A7.5F.CA.2
0.E7.C4
1560 DATA 7F.3.82.86.1.17.0.BD.7

C.3
1570 DATA 82.B6.3.82.81.F.27.E.C
4.7B
1580 DATA E7.C4.A6.5F.CA.84.E7.C
4.A1.1F
1590 DATA 26.E3.B6.3.82.48.48.17
.0.9D
1600 DATA 34.16.BF.3.B4.9E.BB.17
.1.67
1610 DATA 86.20.AD.9F.A0.2.B6.3.
82.C6
1620 DATA 5.3D.1F.98.17.1.92.9F.
88.35
1630 DATA 16.B6.3.82.81.F.26.10.
C4.7B
1640 DATA E7.C4.A6.5F.CA.B4.E7.C
4.A1.1F
1650 DATA 10.26.0.7D.BC.3.86.27.
C.17
1660 DATA 0.37.A6.80.A7.5F.17.1.
46.20
1670 DATA 91.B6.FF.A7.5F.C4.DF.E
7.C4.16
1680 DATA 1.A0.30.8D.4.9.17.0.6E
.8E
1690 DATA 30.0.17.1.76.A6.80.A1.
5F.27
1700 DATA 3.17.0.DC.BC.3.86.27.5
.17
1710 DATA 0.5.20.ED.16.1.7D.31.2
1.10
1720 DATA 8C.10.0.26.7.10.8E.0.0
.5C
1730 DATA E7.C4.6F.41.39.34.10.C
4.F7.E7
1740 DATA C4.8E.0.6F.30.1F.26.FC
.4A.26
1750 DATA F6.CA.8.E7.C4.35.90.34
.10.C4
1760 DATA EF.E7.C4.8E.0.6F.30.1F
.26.FC
1770 DATA 4A.26.F6.CA.10.E7.C4.3
5.90.6F
1780 DATA 42.6F.C4.BF.3.84.30.8D
.2.2C
1790 DATA 17.0.6.17.0.AD.16.FD.1
D.34
1800 DATA 10.8E.5.A3.9F.B8.35.10
.34.12
1810 DATA A6.80.81.4.27.6.AD.9F.
A0.2
1820 DATA 20.F4.35.92.34.32.BD.A
9.28.30
1830 DATA BD.2.BC.8D.E5.B6.3.89.
81.31
1840 DATA 27.E.B1.32.27.10.81.33
.27.12
1850 DATA 30.BD.2.D6.20.10.30.8D
.2.B8
1860 DATA 20.A.30.8D.2.B8.20.4.3
0.BD
1870 DATA 2.B9.8D.BE.30.8D.2.2.B
D.B8
1880 DATA 35.B2.34.14.AD.9F.A0.0
.26.1A
1890 DATA A.94.26.E.C6.B.D7.94.9
E.88
1900 DATA A6.B4.8B.10.8A.8F.A7.B
4.8E.4
1910 DATA 5E.BD.A7.D3.20.E0.C6.2
0.E7.9F
1920 DATA 0.88.35.94.F7.3.83.34.

16.BF
1930 DATA 3.84.30.8D.2.8F.17.FF.
74.17
1940 DATA 0.1B.30.8D.2.89.17.FF.
73.17
1950 DATA 0.4D.30.8D.2.8A.17.FF.
69.A6
1960 DATA 5F.17.0.41.17.0.1C.35.
96.34
1970 DATA 16.BE.3.84.30.1F.1F.10
.B3.30
1980 DATA 0.FD.3.B4.17.0.2A.B6.3
.85
1990 DATA 17.0.24.35.96.AD.9F.A0
.0.81
2000 DATA 3.26.D.32.64.86.FF.A7.
41.C4
2010 DATA DF.E7.C4.16.FC.44.81.2
0.26.8
2020 DATA AD.9F.A0.0.81.20.26.F8
.39.34
2030 DATA 2.44.44.44.44.81.A.25.
4.88
2040 DATA 37.20.2.8B.30.AD.9F.A0
.2.A6
2050 DATA E4.84.F.B1.A.25.4.BB.3
7.20
2060 DATA 2.8B.30.AD.9F.A0.2.35.
82.6F
2070 DATA 42.B6.3.B9.B1.33.26.4.
C6.40
2080 DATA 20.2.C6.48.E7.C4.34.10
.8E.0
2090 DATA 0.30.1F.26.FC.35.10.39
.7D.3
2100 DATA 83.26.7.30.BD.1.FB.17.
FE.D2
2110 DATA 16.FB.E3.CC.0.0.34.6.A
6.80
2120 DATA 81.30.25.26.81.39.23.A
.81.41
2130 DATA 25.1E.81.46.22.1A.80.7
.80.30
2140 DATA 68.61.69.E4.68.61.69.E
4.68.61
2150 DATA 69.E4.6B.61.69.E4.A8.6
1.A7.61
2160 DATA 20.D4.4D.35.90.D.D.20.
20.54
2170 DATA 48.45.20.44.49.53.54.4
F.20.45
2180 DATA 50.52.4F.4D.20.50.52.4
F.47.52
2190 DATA 41.4D.4D.45.52.D.20.20
.20.20
2200 DATA 20.20.20.42.59.20.54.4
F.4E.59
2210 DATA 20.44.49.53.54.45.46.4
1.4E.4F
2220 DATA D.20.20.20.20.20.20.20
.20.20
2230 DATA 20.20.20.20.56.20.31.2
E.33.D
2240 DATA D.D.20.20.20.20.20.20.
20.20
2250 DATA 31.20.2D.20.32.37.36.3
4.D.20
2260 DATA 20.20.20.20.20.20.20.3
2.20.2D
2270 DATA 20.32.37.31.32.3B.D.20
.20.20
2280 DATA 20.20.20.20.20.33.20.2

D, 20, 32
 2290 DATA 37, 32, 35, 36, 20, 31, 2F, 3
 2, D, 20
 2300 DATA 20, 20, 20, 20, 20, 20, 20, 3
 4, 20, 20
 2310 DATA 20, 32, 37, 32, 35, 36, 20, 3
 2, 2F, 32
 2320 DATA D, D, D, 20, 43, 48, 4F, 4F, 5
 3, 45
 2330 DATA 20, 31, 2C, 20, 32, 2C, 20, 3
 3, 20, 4F
 2340 DATA 52, 20, 34, 3F, 20, 4, 45, 50
 , 52, 4F
 2350 DATA 4D, 20, 4E, 4F, 54, 20, 50, 5
 2, 4F, 47
 2360 DATA 52, 41, 4D, 4D, 45, 44, 20, 5
 0, 52, 4F
 2370 DATA 50, 45, 52, 4C, 59, 20, 20, 2
 0, 20, 41
 2380 DATA 54, 20, 41, 44, 44, 52, 45, 5
 3, 53, 3A
 2390 DATA 20, 4, D, 20, 20, 31, 2D, 45,
 50, 52
 2400 DATA 4F, 4D, 20, 45, 52, 41, 53, 4
 5, 44, 20
 2410 DATA 3F, D, 20, 20, 32, 2D, 50, 52
 , 4F, 47
 2420 DATA 52, 41, 4D, 20, 45, 50, 52, 4
 F, 4D, 2E
 2430 DATA D, 20, 20, 33, 2D, 56, 45, 52
 , 49, 46
 2440 DATA 59, 20, 45, 50, 52, 4F, 4D, 2
 E, D, 20
 2450 DATA 20, 34, 2D, 52, 45, 41, 44, 2
 0, 45, 50
 2460 DATA 52, 4F, 4D, 2E, D, 20, 20, 35
 , 2D, 52
 2470 DATA 45, 54, 55, 52, 4E, 20, 54, 4
 F, 20, 42
 2480 DATA 41, 53, 49, 43, D, 20, 20, 36
 , 2D, 45
 2490 DATA 58, 41, 4D, 49, 4E, 45, 2F, 4
 3, 48, 41
 2500 DATA 4E, 47, 45, 20, 4D, 45, 4D, 4
 F, 52, 59
 2510 DATA D, D, D, 43, 4F, 4D, 4D, 41, 4
 E, 44
 2520 DATA 3A, 20, D, D, 53, 54, 41, 54,
 55, 53
 2530 DATA 3A, D, 4, 20, 20, 45, 50, 52,
 4F, 4D
 2540 DATA 20, 53, 45, 4C, 45, 43, 54, 4
 5, 44, 20
 2550 DATA 49, 53, 20, 41, 20, 4, 32, 37
 , 36, 34
 2560 DATA D, 4, 32, 37, 31, 32, 38, D, 4
 , 32
 2570 DATA 37, 32, 35, 36, 20, 31, 2F, 3
 2, D, 4
 2580 DATA 32, 37, 32, 35, 36, 20, 32, 2
 F, 32, D
 2590 DATA 4, 41, 54, 20, 4, 20, 45, 58,
 50, 45
 2600 DATA 43, 54, 45, 44, 20, 4, 20, 46
 , 4F, 55
 2610 DATA 4E, 44, 20, 4, 20, 2D, 20, 4F
 , 48, 21
 2620 DATA D, 4, 20, 20, 20, 20, 20, 20,
 20, 20
 2630 DATA 20, 20, 20, 20, 20, 20, 20, 2
 0, 20, 20
 2640 DATA 20, 20, 20, 20, 20, 20, 20, 2
 0, 20, 20
 2650 DATA 20, 20, 20, 20, 20, 20, 20, 2
 0, 20, 20
 2660 DATA 20, 20, 20, 20, 20, 20, 20, 2
 0, 20, 20
 2670 DATA 20, 20, 20, 20, 20, 20, 20, 4
 , 43, 48
 2680 DATA 45, 43, 48, 49, 4E, 47, 20, 4
 6, 4F, 52
 2690 DATA 20, 46, 46, 27, 53, 4, 4D, 4F
 , 56, 49
 2700 DATA 4E, 47, 20, 45, 50, 52, 4F, 4
 D, 20, 54
 2710 DATA 4F, 20, 4D, 45, 4D, 4F, 52, 5
 9, 4, 56
 2720 DATA 45, 52, 49, 46, 49, 4E, 47, 2
 0, 45, 50
 2730 DATA 52, 4F, 4D, 4, 50, 52, 4F, 47
 , 52, 41
 2740 DATA 4D, 4D, 49, 4E, 47, 20, 41, 4
 4, 44, 52
 2750 DATA 45, 53, 53, 3A, 20, 4, 53, 54
 , 41, 52
 2760 DATA 54, 20, 41, 44, 44, 52, 45, 5
 3, 53, 3F
 2770 DATA 20, 4, 0, 0, 0, 0, 0, 0, 0, 0

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New Machines Coming

by Eddie Kuns
CoCo SIG Database Assistant

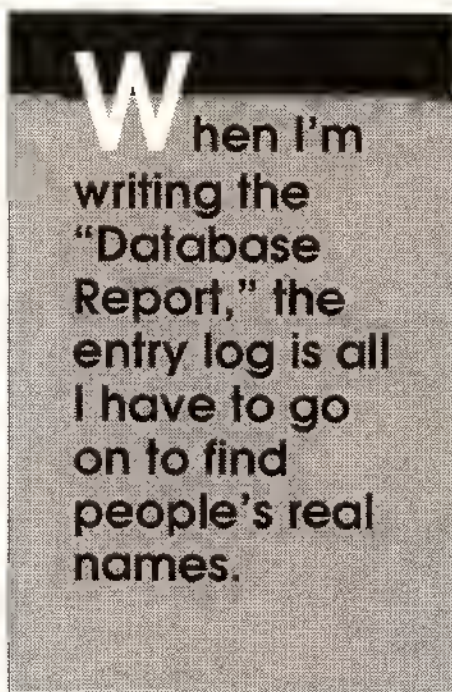
The biggest news in the OS-9 databases this month concerns the new computers being sold (hopefully, by the time you read this) by Kenneth Leigh Enterprises, the MM/1; and Frank Hogg Laboratories, the Tomcat. Several postings, including Marty Goodman's RAINBOWfest news (posted from the April '90 Chicago RAINBOWfest), discuss these two systems. Also, Paul Ward of Kenneth Leigh Enterprises posted a press release containing information about the MM/1 in the CoCo SIG Product Reviews & Announcement section of the databases. The SIG forums are abuzz with discussion and excitement about the new machines!

The OS-9 utility OS9Arc creates archive files in the popular MS-DOS .ARC archive format. The *Extractor* provides easy, menu-driven access to *Ar* and *Pak*, two popular archiving programs under OS-9. *DAM* graphically illustrates how fragmented your hard drive is.

The patch to CCheck allows it to work on floppy drives. Matt Singer's upload in the OS-9 Telecom section of the databases describes how to convert a Deluxe RS-232 Pak so it can be used at the same time as an unmodified one. As you might guess, *Disney Dwarves* contains VEF pictures of the lovable Disney dwarves. *PICWIN09* is a graphics editor that requires a Hi-Res mouse and *Multi-Vue*.

The CoCo SIG CoCo 3 Graphics section of the databases saw the most action this month. *SPLITTER.IMG*, uploaded by Richard Trasborg, is a demo picture that Michael Trammell produced using a color

splitter. Richard also submitted a number of digitized pictures in various formats. Donald Ricketts' patch to *DS69View* allows



the program to create and view 16-level pictures and to use 40 tracks on a disk.

Alvin Kimball contributed a RAM disk, including patches to allow it to be used with EDTASM. Rick Adams released the latest version of *Delphitem Version 3.0*.

The Entry Log

One useful feature of Delphi is the Entry Log. If you want to find the last time someone logged on, all you need to do from either SIG prompt is type `ent username`. If you're not at either SIG prompt, but within the forums (for example), you can type `/ent username` instead. For example, to find the last time I logged into Delphi, type:

```
OS9> ent eddiekuns
```

```
Eddie Kuns (EDDIEKUNS) last on at
25-JUN-90 23:45:55
```

Notice that the command also shows my real name. When you joined the CoCo or OS-9 SIG, you were prompted for your name; this is the name shown when anyone uses the Entry Log. Try this on yourself to find out how your name is defined.

When I'm writing the "Database Report," the entry log is all I have to go on to find people's real names; so if you want to be referred to in a particular way, you might want to set your name. To do this, type set name from either SIG prompt. Each SIG keeps track of your name separately, so you may want to set your name in both SIGs if you belong to both. □

Database Report



General Information:

The MM/1 is here	MARTYGOODMAN	Marty Goodman
Games froaim ColorSystems	ZACKSESSIONS	Zack Sessions
Murphy's Law	NES	Eric Stringer

Utilities:

OS9Arc	POLTERGEIST	Brian Wright
SIZE.AR	COMPEN	Glen Hathaway
The Extractor V1.0	KMTHOMPSON	Kelly Thompson
Dam Improved for Speed	KMTHOMPSON	Kelly Thompson
REN - Rename with Wildcards	TRED	Robert DeBolt

Patches:

Dump Patch	DUANO	Duane Penzien
CCheck Patch	COCOXT	Chris Burke

Eddie Kuns is pursuing a PhD in physics at Rutgers University. He lives in Amrora, Illinois and works as a programmer and researcher at Fermilab. Eddie is co-manager of the CoCo SIG; his username is EDDIEKUNS.

Telcom:
Use 2 RS-232 Paks at Once
MATTSSINGER Matt Singer

Graphics & Music:
Disney Dwarves
ZACKSESSIONS Zack Sessions
Mandelbrot Fractals in VEF
FRANCALCRAFT Frances Calcrafi
Chinese Folks Songs
BAMBOO John Kou
HSCREEN2 to VEF Conversion
ZACKSESSIONS Zack Sessions
Coke 4096 VEF
MIKEHAALAND Mike Haaland
Ballade Pour Adeline 2
MIKEHAALAND Mike Haaland
Picture Window
LL Tom Wood

The MM/1 is Here!
MARTYGOODMAN Marty Goodman
Quick Rfest Progress Report
MARTYGOODMAN Marty Goodman
Pokes, Peeks and Execs
ROMULATOR Dan Konopka

CoCo 3 Graphics:
SPLITTER.IMG Richard P. Trasborg
TRAS Richard P. Trasborg
Melonie Haller
TRAS Richard P. Trasborg
Maud Adams
TRAS Richard P. Trasborg
Candid Camera 1
TRAS Richard P. Trasborg
Car Wash
TRAS Richard P. Trasborg
Car Wash 2
TRAS Richard P. Trasborg
Ingrid1
TRAS Richard P. Trasborg
Bob Guccione's Girls, April
STEVEPDX Donald Ricketts
Bob Guccione's Girls, May 1990
STEVEPDX Donald Ricketts
DS69View Patches
STEVEPDX Donald Ricketts

Baywatchable - 4096
BERNIEO Bernie Olsen
All-Radio Operator
N3FWE Steve Hancock
Printer Animation 1
ROGERH Roger Hallman
Madonna, Geddy and Winona
TRIUMPH Dan Shargel
CHICAGO.GIF
DONHUTCHISON Don Hutchison
Miami Mice (GIF)
DONHUTCHISON Don Hutchison
Mickey Mouse Picture CM3
CHASGIBSON Charles Gibson
Utilities & Applications:
RAMDisk for EDTASM
ALKIMBALL Alvin Kimball
Product Reviews & Announcement:
Home-PAC
DESKMAN Bill Condie
NEW MM/1 Computer for CoCoists
PKW Paul K. Ward
Telecommunications:
DelphiTerm Version 3.0
RICKADAMS Rick Adams

General Information:
More RAINBOWfest News
MARTYGOODMAN Marty Goodman

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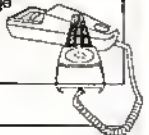
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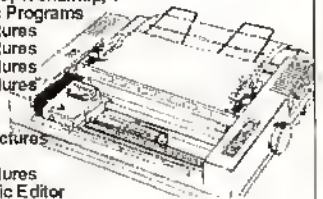
TELECOMMUNICATIONS 1-3

- T1 - Haysao, Kermit, Mikeytom, TeleTom
- T2 - Cobbs BBs Terminal Package
- T3 - GETERM Communications



GRAPHICS 1-14

- GR1 - Atlanta, Cube, Space, +
- GR2 - Objects, Wargame, Worldmap, +
- GR3 - 9 Coco 3 Graphic Programs
- GR4 - 22 Coco Max Pictures
- GR5 - 22 Coco Max Pictures
- GR6 - 22 Coco Max Pictures
- GR7 - 15 Coco Max Pictures
- GR8 - 22 .Bin Pictures
- GR9 - 22 .Bin Pictures
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- GR12 - Coco Max 3 Pictures
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- E2 - 12 Programs For High School Kids
- E3 - 11 Programs Teaching The Coco'S Commands
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| M5 | GR5 | | U5 | GA5 |
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Writest 3.3

Writest, a program for helping teachers, allows you to create matching, multiple-choice, and short/long answer tests. It requires a CoCo 1, 2 or 3 with a minimum of 32K ECB, a disk drive or cassette recorder, and a printer. While the program is not copy-protected and is available on tape or disk, this review is of the disk version.

The instructions for *Writest* are supplied as a file on the disk. Included is an option to send the directions to the screen or the printer, though I would only recommend screen printing as a last ditch effort. The on-screen directions fill 43 screens. They are printed in upper- and lowercase, making for difficult reading in the 32-column mode. You'll want to make a printed copy for easier reference.

You create a test by following the menu prompts. Once the test is complete, you can supply a header, such as English Quiz 3 - Fourth Period. Next, you may print the test or save it to disk for printing at a later date. *Writest* also allows you to print a key test with correct answers. This is very useful for grading papers. Another convenient feature is the ability to randomize the answers for multiple-choice and matching tests.

We've seen programs before that let us print simple text on paper. A handy feature of *Writest* is its ability to support special printing needs. The program includes printing codes for using different type sizes, underlining, graphing quadrants, using math symbols and multiple fonts, and more. It's almost like having a word processor just for making tests.

My first reaction to programs claiming to use printer codes is usually negative — I wonder what page of the printer manual I'll have to read. *Writest* simplifies the process by merging the print driver of choice to your *Writest* file. Now, you need only enter the desired codes, which are listed on a handy print-codes chart. The package even includes a BASIC program, CODECARD, to create a chart for you.

An added feature of this new version of *Writest* is the print drivers. Earlier versions limited printing to the Epson RX-80. Currently *Writest* supports Epson, Panasonic, Seikosha, Star (SG10/15), and Tandy (DMP and DWP) printers.

I was bothered by the clarity of the instructions provided with *Writest*. In its

present form, I find the instruction manual somewhat difficult to decipher. I strongly recommend the author have a novice try the program and update the documentation accordingly. This could only improve an otherwise useful program.

I find *Writest* easy to use in creating and modifying tests. If you are a teacher and spend long hours at the typewriter creating tests, this program is for you. It will save you time and your students may appreciate the appearance of their tests and quizzes.

(CoCosoft, Beech and Broadway, Box 665, New House, NM 88121; 505-279-6455; \$15 plus \$2 S/H)

— Tony Olive

Audio Tape

Hot CoCo!

The goal of today's personal computer is to provide enjoyment while making the things we do somewhat easier to accomplish. A perfect example of meeting this goal is found in *Hot CoCo!*, a music audio tape from MusicWare.

Hot CoCo! is a collection of original compositions created on the Color Computer using *Lyra* and CoCo MIDI 3, and recorded using various synthesizers. Featured on the cassette tape are selections written by Val Burke, Lester Hands, Mike Stute and Mark Steele.

Val Burke, who has written articles for THE RAINBOW, is obviously a jazz man. Three of his four compositions, "Cantor O'Reilly's Song," "What?" and "Lest I Forget," offer a swing mood with a very loose rhythm and blues feel. In "Lest I Forget," Val's use of dynamics and reverb give the music a very realistic depth. It almost sounds as if a full band is playing.

In a serious turn, those who were moved by the crisis in Beijing last year will appreciate the emotion captured by "I Cry For Tian Anmen." Throughout the piece, you'll hear a rhythmic, oriental background melody. For me, the fact that it didn't vary was very effective in illustrating a society in which the controlling force is resistive to change.

Also on Side A are four compositions by Lester Hands, author of *Musica* and *Lyra*. These include "Wish," "Jinx," "Mists" and

"Quartet." In contrast with Val Burke's predominantly swing style, the first three pieces tend toward a New Age/relaxation style. You'll hear lots of strings and softer instruments. Each piece really fits its title, and little effort is required to get the feel of the music.

With "Quartet," Lester Hands shows he knows what the Baroque era was all about. This score gives the listener an idea of how Bach or Gabrieli might sound, were they alive today. Effective creation of New Age music takes a lot of talent, and Lester has done a magnificent job.

Starting off Side B is Mike Stute, author of "The Lyra Companion." Mike provides two works: "Stage of the World" and *The Order of Time*. While it is harmonically clean, I miss the point of the former. "Stage" is slow, trudges along and attempts to build to a melody but never quite gets there. It would probably fit well as background music in movies such as "Risky Business" or "Kill Me Again."

"The Order of Time" makes more sense to me, as it traces a time line from beginning to end. The first three movements "Genesis," "Eve of Destruction" and "Calm Before the Storm" fit together well musically. I was a little disappointed, though, upon hearing the final movement, "Armageddon." I expected a climactic ending but didn't get one. The music builds and builds, but offers no closure. Perhaps this is a way of saying time doesn't end?

The final musician featured on *Hot CoCo!* is Mark Steele. In *Fanfare & Overture in G* and "Invention #2 in D Minor" Mark does an excellent job of mixing classical styles with progressive techniques to achieve a clean, New Age sound. He composes with the accuracy of Mozart, the harmony of Bach and the precision of the more contemporary Mannheim Steamroller.

Mark's third piece, "March of the Miniature ET Warriors" is a delight. It is a complete story told musically, and it incorporates very effective use of dynamics and sound effects.

I particularly enjoyed "My Thirtieth Year." This mellow ballad prompted me to take time to both reflect on the past and look forward to new beginnings. Very well done, indeed!

In all, *Hot CoCo!* provides a superior example of the CoCo's capabilities in a form anyone can enjoy. I was amazed, although I really shouldn't have been, at the talent displayed by the four musicians featured on the tape. I encourage MusicWare

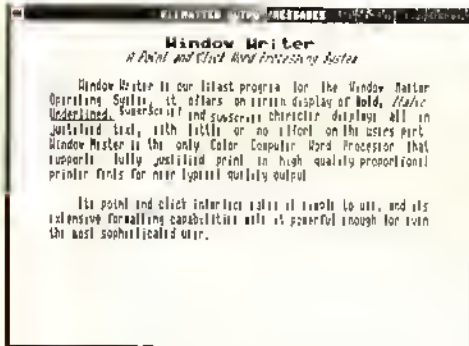
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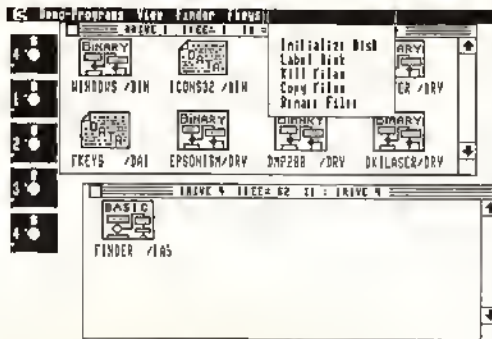
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— Cray Augsburg

Utility MS-DOS

Elite*Xfer

Some CoCo users, myself included, have ventured into the world of the IBMPC and its variants. Some do it because of their jobs, some to gain access to particular programs unavailable to CoCoists any other way. My own interest in the PC domain began when I had to write a paper that grew to nearly one hundred pages and required extensive formatting. CoCo word processors were just not up to the job. The software selection available for PCs is vast. Moving some (or all) of your work to another operating system brings with it a great deal of frustration. Files must either be left behind or transferred to the new system.



For me this meant hours of transferring files between my CoCo and my PC clone using a serial cable and communications programs at both ends. This is an acceptable alternative if the job has to be done only once, and if the cables and communications programs are available for both machines. But if you want to use both machines, it becomes a real inconvenience. This is especially true if the computers are in different locations. What is needed is a program that can translate disk files from one format to the other. Until now, I have not found a workable program to do the transfer; I've tried a couple, but none were very good.

Then I found *Elite*Xfer* by Elite Software. This is a disk of programs that run on an IBM computer (or clone), not on a CoCo.

*Elite*Xfer* allows you to freely move files between RS-DOS and MS-DOS. It also has utilities that allow you to do some house-keeping of CoCo disks. All the options are described below. *Elite*Xfer* requires an IBM PC/XT/AT/PCjr or true compatible with at least 128K bytes of memory and at least one 5¼-inch floppy drive. You must be running PC-DOS or MS-DOS 2.0 or higher. These requirements are minimal. I would guess that more than 99 percent of MS-DOS computers exceed them. There are separate program versions, one for color monitors and one for black-and-white, monochrome and LCD monitors. The versions are identical in their operation. Installation is a snap, especially when compared to many other MS-DOS programs. The disk is not copy-protected and can be easily installed on a hard disk. The disk is accompanied by a well-written manual that explains all program features in detail.

The main function of *Elite*Xfer* is to move files between MS-DOS and RS-DOS disks. The CoCo stores ASCII text files with lines terminated by only a carriage return character. MS-DOS ASCII files have lines terminated by a carriage return character, followed by a line feed character. Translation between the two formats is taken care of automatically by *Elite*Xfer*.

There is also an option to copy files exactly with no end of line translation. This option is not usually useful but could be handy in special circumstances. Before a file is transferred, it's usually a good idea to know what files are available and what their contents are. These tasks are also taken care of by *Elite*Xfer*. It displays a standard CoCo-style directory, allows you to view ASCII files, and shows binary files using a display similar to the OS-9 dump utility program. Thus, you know what it is you're transferring before you do so.

Files can also be deleted from a CoCo disk to make room for other files you may want to transfer. If *Elite*Xfer* could do no more than the things described above, it would be a boon to many of us, and I would recommend it highly. But, there's more!

Elite Software publishes *Elite*Xfer*, which lets you transfer *Elite*Word* documents to MS-DOS disks directly without saving them in ASCII format. Owners of *Elite*Word* can save all kinds of aggravation and time using *Elite*Xfer* to move files to MS-DOS. More important to the rest of us are the other options such as the ability to format a CoCo disk on the MS-DOS machine. This may seem like a little thing until you realize that the two machines can be in different locations and you don't have a formatted disk available. Disks can also be checked by *Elite*Xfer*. This option allows you to verify that every sector of a CoCo

disk can be read correctly. If there is a problem, unreadable sectors are repaired by filling them with either * or 0 characters. This allows you to salvage files from an otherwise unusable disk.

The final option is sector display and editing. Using this option you can look at any sector on the CoCo disk in hexadecimal and ASCII format. You can also edit any sector, byte-by-byte. This is another powerful option that can be used to perform all sorts of miracles such as directory repair. Used carelessly, it can render a disk unusable. Caution is strongly advised.

The flexibility of *Elite*Xfer* is enhanced by its ability to change which drive is for MS-DOS files, which drive is for RS-DOS files and the density of each drive. Files can be selected using MS-DOS wildcard characters and whole disks can be copied in either binary or ASCII format. The program designers did their job of anticipating user needs. The execution is flawless.

If you routinely have a need to move files between RS-DOS and MS-DOS computers, you need *Elite*Xfer*.

(Elite Software, Box 11224, Pittsburgh, PA 15238, 412-795-8492; \$69.95 plus \$3 S/H — limited offer: \$44.50 plus \$3 S/H)

— Don McGarry

Game OS-9 Level II

Pyramid Solitaire

Pyramid Solitaire is a one-player game written for OS-9 by Zack Sessions of Color-Systems. It requires a CoCo 3 with a minimum of 256K, OS-9 Level II, a monitor or color TV, the Windint module from *Multi-View* and a mouse or joystick.

For those unfamiliar with this type of solitaire, cards are arranged in a pyramid—one card, two cards that partially cover it, and so on. The final row has seven cards. Leftover cards are laid in a pile and may be used during play. The object of the game is to get rid of all the cards in the pyramid. You do this by removing any pair of free cards whose face values total 13.

Both numerical and face cards are used (values are given in the manual). A free card is any card on the pyramid not covered by another card or the top card on the pile. Two cards from the pyramid or a pyramid card and a pile card may be teamed. Cards in the pile may be turned over three at a time. One round takes two or three minutes to play. The game is extremely easy to learn and may be enjoyed by children of all ages.

Pyramid Solitaire is graphics-based,

supporting RGB and CMP color sets. The cards are drawn on the screen in clear colors, using the standard symbols for the four suits (a diamond for diamonds, etc.). The game runs in a Type 6 window, and its 40 columns make the cards and menu words big enough to be easily read. The game is played entirely by pointing and clicking with a mouse or joystick. A player may use the mouse to select cards or to turn over cards on the pile. A menu lets you cancel a chosen card if it does not have a card to go with it, undo a move, redeal or quit playing. One super nice feature of this game is that you don't have to type, but can just point and click.

The disk contains the program, an application information file, an icon for *Multi-View* users, and a backup copy of the manual. *Pyramid Solitaire* is not copy-protected, so it may be backed up. The program runs from any directory or subdirectory on a hard or floppy drive. I keep mine in a GAMES directory on the hard drive. The program ran smoothly, with no problems. It is a very enjoyable game that even a novice will have no problems running.

The manual is nine pages long, thorough, clear and well-organized. Author Zack Sessions offers full support for registered owners by giving you his online and

U.S. mail addresses as well as a telephone number. I have had occasion to contact him about this and other programs he has written, and I have always received fast, helpful and courteous service.



The game was originally available as shareware. The commercial *Version 3.0* adds the undo feature, online help, and the ability to start from any type device window. The original window attributes are restored when the game ends. Registered owners of earlier versions may upgrade for \$7, which includes postage.

Being able to play this game on my CoCo is a definite plus. No more finding the cards, laying them out on the table, or discovering, after 16 losing games, that one of my cats has eaten a card or two. When I

win, I even receive a congratulatory sound from my CoCo.

I use OS-9 almost exclusively, so it's good to see a new game for OS-9, especially one that can be enjoyed by the whole family. I like *Pyramid Solitaire*. The game has simple playing rules yet requires some strategy to win. I recommend it to any adult or to children old enough to add two numbers to get 13.

The program's \$10 price includes shipping and handling and is reasonable, considering that I have played for hours and still enjoy it as much as I did the first time.

(ColorSystems, 4616 Castle Hayne Road, Castle Hayne, NC 28429; 919-675-1706; \$10.)

— Toni Long

Finance

OS-9 Level II

1990 CoCo Tax Estimator

If you deal with the Internal Revenue Service only once a year, you need not continue reading this review. However, a number of taxpayers are, for a variety of



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reasons, required to file an estimated tax form known as the 1990 1040 ES. This is a fairly simple form to fill out, but since we all have computers, why not let the machine do the work?

1990 CoCo Tax Estimator, from Puritas Springs Software, is a program designed to assist the taxpayer in determining estimated 1990 income taxes. The program is written in BASIC09 and requires OS-9 Level II. In addition, you should have 512K of memory and an 80-column display. An ATF file and an icon are provided for those who use *Multi-Vue*. The program is provided in I-code format, so there is no possibility of modification.

The program is easy to install. Simply copy the program, icon and ATF files to the appropriate directories. To execute from the Shell prompt, select a standard 80-by-24 text window (Type 2) and type `estimate90`. From *Multi-Vue*, simply double-click on the program's icon. Remember, this is BASIC09 I-code, and `RunB` must be in memory or the current execution directory. A menu appears with options to open, edit, load, save, display and print the file. Another option provides access to the disk menu that provides options to change and display both the execution and working directories. Since you are starting new, just choose the option Open File and proceed to enter the required IRS data as the program prompts. After completing data entry, you can save, display or print the results. If you need to make changes later in the year, you can load the file, correct the data and recalculate for the new figures.

Using my 1990 estimated form, which I prepared in April, I proceeded to enter the data into the program. After completing the data entry, I displayed the results and found excellent agreement with the previously calculated tax. By choosing the print option, I obtained a nice printout, which I promptly filed in my 1990 tax folder.

Assuming you understand the IRS and Form 1040 ES, the *CoCo Tax Estimator* is a very easy to use program. At first I wondered what was the advantage of using it. Form 1990 ES is not extensive and can be easily completed with a standard calculator. Alternatively, you can easily write a spreadsheet, which I have done for a number of years, and accomplish the same thing. But after using the program, I find it nice to have a neat package that can be easily modified as my income changes. Of course, as tax laws change it may become necessary to obtain a revision. In the program's one-page documentation, Puritas Springs Software does not comment on the possibility of future revisions.

I found problems with the Disk submenu, which does not provide displays of

the current and execution directories. Also, when I selected Return to Main Menu, the program asked for the name of the new directory. While the features on the submenu do not affect program operation, with respect to completing the estimated tax, I was annoyed that Puritas Springs did not fully debug their program prior to my review. These bugs have been corrected on the final version.

1990 CoCoTax Estimator is free to all who send Puritas Springs Software a 35-track formatted disk with a return mailer and return postage.

(Puritas Springs Software, The Ameritrust Building, 17140 Lorain Avenue, Cleveland, Ohio 44111; 216-251-8085)

— Donald Dollberg

Utility

OS-9 Level II

Print5

I was always told to never judge a book by its cover. As an avid reader of science fiction and fantasy, I've learned the truth within this phrase. Knowing that, I still became very skeptical when I heard that I would be reviewing something called *Print5*. And when I heard the description, OS-9 print utilities, I became so skeptical that I almost went into a coma. I have to admit that I put the review off for a few hours. *Print5* patiently sat there on the desk, waiting to be reviewed. Occasionally I would glance over and see it, but quickly look away. I hoped that somehow it would just disappear. But it didn't. So, a few hours after receiving it, I began flipping through the manual.

I found I was wrong about *Print5*. Before I tell you just how wrong I was, I'll briefly list the equipment required for *Print5*. First you will need a CoCo 3, preferably with 512K, and OS-9 Level II. At least one disk drive is needed, but two disk drives might be more useful. You will also need a DMP-105/L30 or compatible printer. The manual recommends a Hi-Res monitor and a copy of *The Complete Rainbow Guide to OS-9 Level II*. You should make a few backup copies of the *Print5* disk. I suggest you put the *Print5* modules on your main system disk in CMDS directory.

To use the modules, you'll need to have the `tmode` and `display` modules from your CMDS directory in memory. Three of the four modules can't use the normal text screen at the beginning, so you'll need types 1, 2 and 5 windows to use them. There are programs to help you set up the

windows. If you have 128K you will probably be able to use only one of these at a time.

The one module that you can use from your start-up window is called `ps`. This little module will dump the current screen to the printer. So what? So what indeed. This handy device saved my life a couple of times. You see, I use a public domain word processor called *Ed*. *Ed* is a fine program, but it has a tendency to cause a stack overflow and drop to the Shell. This means everything is lost, unless you've printed it or saved it to disk. Not long after I received *Print5*, *Ed* did just that. I thought the story I had written was a goner. Then I remembered `ps`, which I used to make a dump of the screen to save the text. I lost what had already scrolled off the screen, but at least the text still on the screen was saved. I had to re-type everything from the screen dump, but it's still better than losing it altogether, or writing it by hand and then re-typing it.

The `ps` module offers other beneficial features, which can be invoked using parameters. For example, if you type `ps 35 10` it prints the top 10 rows of text, with a margin of 35 columns. If you type `ps 20`, the entire screen is printed with a margin of 20.

Is this really a beneficial feature? If you had a text file of approximately 22 lines with carriage returns at the 40th column, you would not want all the text printed on the left. You wouldn't want to load a word processor and insert 20 spaces in front of every line, either. Instead with *Print5* you merely enter:

```
display c: list text.file: ps 20
```

It is important to clear the screen, list the file, and run the `ps` module all in one line so as not to dump any text that is not supposed to be dumped. There are also many other uses for the `ps` module.

The next module is called `pg`, which requires a Type 5 graphics screen. `pg` is used to create a sideways screen dump. The left margin, as well as the number of lines to be printed, can be specified. This feature can be very helpful, especially when working with two text files. It can be used if one file is to be dumped normally while the other is to be dumped sideways. For example, let's say the first file is an ad for a used car, and the second file is a phone number printed several times. You want the printed copy arranged so that several people can tear a copy of the phone number from the page. To do this you would enter:

```
display c: list car.ad: ps  
display c: list phone.num: pg
```

The number of uses for the `pg` module are

limited only by the boundaries of your own imagination.

The next module is called *pgw*. It is the same as *pg*, but the printout is twice as wide which makes the copy look twice as tall when looking at it sideways.

The final module is *phc*. There are four parameters for this one — type style, left margin, the number of lines to print and the number of columns to print. Condensed, elite and *pica* are the type styles from which you can choose. Since the number of columns can be specified, it is also very convenient to choose the type style to be used.

Some of the more common errors that occur with the *Print5* package are explained in the manual. Solutions for these errors are also given. I encountered no errors while using the modules, so errors aren't necessarily commonplace when using them.

There is still more to *Print5*. The second part of the manual lists a couple of BASIC09 procedures that are on the disk, and how to use them. For these, it is highly recommended that you have 512K. Even though you will run out of memory quickly, 128K will work.

You will need to start BASIC09 in a Type 5 window. The procedure *bf.b* can be used to scale down and dump graphics images. Even though I did not have a tremendous need to print graphics, some people will find this to be a worthwhile feature and drivers are included for Epson- and IBM-compatible printers. The *bf.b* graphics routine can be used to make your ads more artistically appealing.

One understandable, though annoying problem with *pg*, *pgw* and *phc* is that they seem to print rather slowly. *ps* is capable of working at normal speed, however.

Even though there is more to the *Print5* package, I have covered the main areas of interest. It is a valuable package and the *ps* module alone makes it worth the price.

(G.T.T.D. Software, P.O. Box 187, Pablo, MT 59855; 406-883-2306; \$23.95, \$2 S/H)

— Jeff Byers

Utility

CoCo 3

Revelation!

Revelation! is a prophecy of things to come and an introduction to the CoCo Community by the program's author, Mr. Robert Offermann. Improvements made to the CoCo by *Revelation!* include Hi-Res graphics screens that use a larger number of pixels, acceptance of lowercase commands, 62 preprogrammed macro keys and many other useful additions.

With *Revelation!*, the CoCo's screen height is 225 pixels rather than 192 — enough for 28 lines of text! The program reverses the CLEAR and backslash keys to prevent accidental screen erasures during input. The function keys have been programmed to allow you to switch between fast and slow modes (to change the speed of the CPU) and to provide a shift-lock key. While in the high-speed mode the CPU is temporarily slowed down for disk access. The ALT key combines with other keys to produce *macros*. Macros are key combinations that produce a longer sequence of useful characters such as commands. For example, holding ALT down and pressing A prints ATTR on the screen. The user can't modify the macros, however.

Revelation! prints the full names of errors. For example, instead of ?SN ERROR the screen displays ?Syntax Error. Also the OK prompt has been replaced with the word Ready.

You can enter PCLEAR values from 0 to 18 to reserve from 0 to 18 graphics pages. PALETTE RGB and PALETTE CMP now reset all 16 palettes, rather than 15. The CLS command allows the use of numbers up to 255, clearing the screen in various ways. This is similar to my program CLS255, printed in the January 1989 issue of THE RAINBOW.

During DSKINI the verify (second) sweep across the disk has been bypassed, thereby greatly speeding up the process. (Verification errors are very rare during DSKINI.)

Revelation! doesn't work with ADOS or C-DOS, even with their respective DIS-ABLE/UNDO commands. I have a controller that can hold up to four DOSs. I normally have only an Extended ADOS-3 EPROM in my controller. When I found I couldn't run *Revelation!* with ADOS, I remembered I had a Disk BASIC ROM, which I immediately inserted into my controller as well. *Revelation!* worked perfectly.

Words on the screen are very hard to read on a TV. *Revelation!* is meant to be used with a composite or RGB monitor. In addition, it will work with Color Venture's RAM disk.

A label on the disk reminds the user to make a backup copy. One problem I discovered was that when I typed PCLEAR 0, then CLEAR 0, there was no memory left. It repeatedly printed Out of String Space, and I had to reboot the program. [Editor's Note: Mr. Offermann has confirmed that this bug has been fixed and PCLEAR 0: CLEAR 0 works with no problems. In addition, he says the problem existed only in the review copy, and no production copies were released with this error.]

Even though commands may be entered in lowercase, I discovered that filenames must be entered in uppercase letters. At

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first, I couldn't get any program, BASIC or machine language, to load under *Revelation!*. Each time I entered a filename I got a File Not Found Error — the name I typed didn't exactly match the name on the disk in terms of case. Some graphics demonstration programs are included on the disk to show off the expanded screen. They are exciting to watch on the larger monitor.

Included with the program is a registration form. Not only can it be used to register the purchaser as an owner who will receive future upgrades, it includes a questionnaire about the user's system and personal software preferences.

A lot of thought and planning went into this program and its documentation. The documentation includes a reference card explaining the macros, control characters, etc. More complete instructions are included on the disk. The documentation on the screen is colorful and uses several fonts.

Robert Offermann states in the onscreen documentation that he is buying a Commodore system and plans to study software products developed for it, with the intention of producing similar programs for the Color Computer. I like the fact that he is "spying" on the competition!

Revelation! is a revelation of things to come if the CoCo Community accepts and supports it.

(Robert E. Offermann, II, 2447 Oak Park Way, Orlando, FL 32822; 407-282-6272; \$25)

— Lee Deuell

All programs ask how many questions you want to answer and provide a final score at the end. If you answer correctly, the program responds with words like Great or Super. An incorrect answer usually solicits a displeasing sound and the program informs you of the correct answer. It may also ask you the same question later on.

These five educational programs use sound, graphics and random patterns for teaching.

Math Quiz is by far the most complex of the five programs. This program offers addition, subtraction, multiplication, division and times tables at four levels of difficulty: easy, intermediate, difficult and challenging. Addition on the easy level is at about the second grade level, while the advanced and challenging levels can require you to use a pencil and paper. The times table is especially useful for drilling young children on their multiplication tables. The program would be of more value, however, if it corresponded to the way in which children study these tables in school. They normally do a twos table then a threes table and so on. As it is, the program presents all the tables at random and the child may not be at a given level yet.

Vocabulary presents you with a series of definitions and asks you to match each with the correct word, presented in multiple-choice fashion. There are 100 possible definitions. These words are definitely for adults and high school or college students. A few examples are *procrastinate*, *misanthropist* and *obsequious*.

Homonyms is a program written at the elementary school level. Homonyms are words that sound alike but are spelled differently and have different meanings. Here you are presented a sentence and must complete it with the correct word that fits the context of the sentence. An example of this is HOW MANY DAYS ARE THERE IN A _____? (1) WEAK OR (2) WEEK.

Spelling is a little like the homonyms program in that you must select from a list

of words to correctly complete the sentence. The main difference here is that you have the same word spelled two different ways, one of which is incorrect. Some of these words exercise the various rules of spelling like the old *i before e except after c* rule. Typical examples are the choice between (1) BELIEVE OR (2) BELEIVE and the choice between (1) MUSTACHE OR (2) MUSTASH. One small glitch I found in *Spelling* is that the program ends with the question WOULD YOU LIKE TO REVIEW MORE HOMO-NYMS?, even though I was in the *Spelling* program. [Editor's Note: Mr. La Spada assures us this minor bug is now fixed.]

Last but not least is the *Number Guess* program. This one is just plain fun. The computer picks a random number and you try to guess what it is. The program gives you clues such as YOU'RE TOO LOW until you guess the correct number. Some clues are a little misleading, however. Let's say the computer has picked 61 and you enter 65 as a guess. You see a clue such as YOU'RE ALMOST THERE, to which you guess 66. Then you might be told CAN'T GET MUCH CLOSER even though your guesses are getting farther away from the chosen number. This is odd, but the game lasts much longer. All numbers are chosen in a range between 1 and 100.

All programs in the collection work as advertised. They are designed for elementary to high school students. Not a bad buy for \$8.

(Sebastian S. La Spada, 531 Main Street, Dunkirk, NY 14048; 716-366-5261, disk, \$8)

— Larry Birkenfeld

Education

CoCo 2 & 3

Education Galore

This review covers a collection of short, much-needed educational programs written by Sebastian La Spada, intended for use on the CoCo 2 or 3. The five programs I reviewed are *Math Quiz*, *Vocabulary*, *Homonyms*, *Spelling* and *Number Guess*.

The programs require 64K RAM and come on disk or cassette tape. All the programs are written in BASIC. My review copy came on disk accompanied by a handmade 13-page, dot-matrix printed manual. The manual actually covers 11 different programs and contains more of a brief description of each than actual user instructions. This is not a real handicap since the programs are pretty much self-instructing and very easy to operate.

There are certain features common to all five programs. They include the use of sound and tunes, colorful block graphics and the use of random pattern generation.

Game

CoCo 1, 2 & 3

Tuty

Pull up a chair, Kenny Rogers, for a little gamblin' CoCo style. I'm talkin' Vegas minus Wayne Newton — just you, some fruit and Lady Luck.

The slot-machine type game, Tuty (fruity), by CB Games appeals to the gambler in all of us. You simply roll the fruit and cross your fingers. Well, actually there's more to this game.

There are up to six different fruits that can appear onscreen in various combinations. Each fruit combination is worth a designated number of points. After each roll, your job is to pick out the worthless fruit and discard it. If you are able to save at least one good piece of fruit, you can roll again, filling the remaining fruit slots. Once more you pick out the bad fruit, keeping the pointers. If you fill all of the slots with good

fruit, you can take another turn, risking all of the points you've won, or you can pass the turn to your opponent. If you do not fill all of the slots, you are left with what points you've earned and your turn passes to another player. The objective of the game is to obtain a set number of points before your opponent. Despite the fact that playing *Tuty* doesn't require much strategic skill, the program moves quickly and kept me interested in rolling fruit all afternoon.



Tuty's success as a slot-machine type game is its ability to stir up an atmosphere of gambling excitement. It puts you on a winning streak, during which you continually roll, say, pineapples and watermelons. Then unexpectedly *Tuty* ends your spree by dishing out a plate of dud fruit. It lures you

into gambling, then takes away your winnings — well, not always. Not always means you're left always trying to decide if you should take a chance. That's the excitement of gambling. Only with *Tuty*, you won't lose the house.

One player may challenge *Tuty*, or up to four players may compete against each other. The graphics and sound are average. A CoCo 1, 2 or 3 is required; a joystick and RGB monitor are optional.

(CB Games, P.O. Box 2496, Kalispell, MT 59901; 406-257-3832; \$24.95)

— Kelly Goff

Game CoCo 3

Spectral Forces

"The battle calls! To the brave, to the cunning, to the true soldier, the battle calls! Is there one who will answer? Is there one who will save our village of Adaling? Is there one who dares to test the evil Garth? Is there but one true warrior? Who? Who dares to accept the challenge?"

"I will," you answer. "I dare!"

Well, you stuck your foot in your mouth

again! You, Lars, the philosopher. What kind of an adventurer are you? You had better be a damed good one if you are going to beat Garth and his legion of evil in *Spectral Forces*.

Spectral Forces is an Adventure for the 128K CoCo 3 with at least one disk drive. It uses, at your option, either the 32-, 40- or 80-column screen. You may also select between all uppercase or upper- and true lowercase combined.

Forces takes place in and around the corrupt little village of Adaling, a den of thieves ruled by Lord Fandel, a miserly old dog who lives in luxury's lap while his subjects live in rotting wooden sheds. It's no wonder the only law in the land is prejudiced toward outsiders. Justice means little in this town. Like it or not, you had better learn their thieving ways real fast.

As in most Adventures of this sort, magic abounds in a variety of forms. The magic is both mysterious and predictable. Secret passages secured by magic often lead to more magic, and all of it is confusing, misleading and by all means deadly.

The cast of characters is as deadly as the magic itself. Meet and defeat, if you can, the Dragon, who can be found guarding valuable treasures. Beware of his fiery breath as he attacks.

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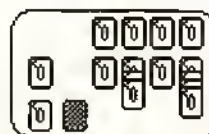
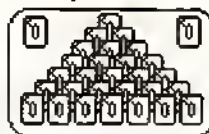
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Classic Solitaire

Klondike • Pyramid • Canfield



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La Belle Lucie

Deal 52 cards into 18 stacks, then try to reconcile them into 4 foundations. This solitaire is not for the faint of heart! Hoyle rules. 128K CoCo3, disk, joystick \$14.95

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Perhaps you'll have better luck against the Catoblepas, the Hydra, the Succubus or one of nearly a score of other nasties, each of whom is more than willing to introduce you to the ultimate enemy, death!

Spectral Forces
is efficiently
written and
response time is
good. It should
provide several
hours of
entertainment for
the experienced
adventurer.

Forces offers several interesting features. The BREAK key has been disabled, preventing accidental interruption of the game when pounding one's keyboard in frustration. (Or am I the only one who does this?)

One of the most interesting is the Scribe feature. By simply typing SCRIBE ON you can obtain a hard copy of what is being printed on your screen. This is handy when you forget what just scrolled off the top screen. Don't need the scribe anymore? Just type SCRIBE OFF. A very nice feature!

The text for the location descriptions is stored on disk. This allows for more extensive descriptions while taking up little memory.

Since this is a text Adventure, one of the challenges is to create your own map. Good luck! Counting all the twists and turns in the maze of tunnels, you have in excess of 225 locations to map.

Documentation is just six single-sided, typewritten sheets but is more than adequate. The story of the village of Adaling in itself makes for interesting reading.

Since *Spectral Forces* was written for the CoCo 3, I would like to see it take advantage of a few more of its features. For

example, a short routine at the beginning to select foreground and background colors and save other default settings would be nice.

The game also lacks the ability to restart without rerunning. If you quit or die and want to play again, it's back to the beginning and back through the title page and options screens.

The most annoying item I found was the statement, "I don't understand." If you use a noun or verb, the game doesn't understand. If you try to go in a direction not permitted the program says, "I don't understand." A little variety would be nice here. Why not have the program say, "You can't go that way," or "Say that again," or even "Hey dummy! The door is locked!" to add a little variety.

Despite these minor shortcomings *Forces* plays quite well. It is efficiently written and response time is good. It should provide several hours of entertainment for the experienced adventurer.

And so, with trusty falchion in hand, I prepare to defend and protect Adaling. Willingly I will face mammoth spiders, ghouls, giants and squonk, if you will, but someone please answer this question — what the heck is a falchion?

(Marc Campbell Innovations, 266 Riverview Drive, Ephrata, PA 17522; 717-939-3181; \$24.95 plus \$2 S/H)

— Randy Cassel

Game	CoCo 3
------	--------

Classic Solitaire

After programming for several hours, I often like to play a video game to relax. With many of the arcade/action games, it's hard to do that. You have to shoot this thing, watch out for that thing, and so on. But recently I found a video game that I can relax with.

The game is *Classic Solitaire* by Eversoft Games, Ltd. It actually consists of three different solitaire card games. *Classic Solitaire* requires a CoCo 3 (128K is okay), a disk drive and one joystick. An RGB monitor enhances the program's 16-color Hi-Res display, but a composite monitor or TV is very comparable as far as colors and legibility goes. Kudos to the programmers for this compatibility.

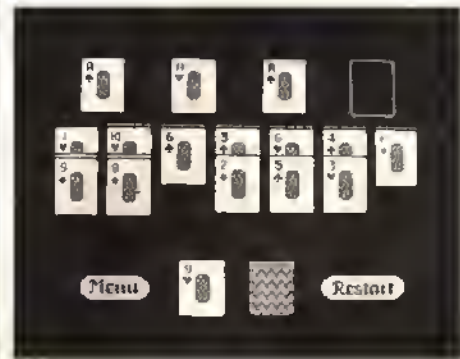
To get the games running, enter RUN"MENU". The font used on the menu screen is a refreshing departure from the

standard fonts you see with other programs.

Klondike is the most common form of solitaire. The game requires you to make a row of seven stacks of cards, then build suits on each ace encountered, in a row above, in ascending order.

The second game, *Canfield*, puts 13 cards in a stack called *the stock*. You make a row of four cards, then one card is used as the aces are in *Klondike* to start the suits in the foundation. All built suits must start with a card of the same face value, and the suits are built in ascending order.

Finally, *Pyramid* has the cards laid in a pyramid shape, with one card at the top to a row of seven cards at the bottom. The object of this game is not to build suits but to match a pair of cards whose face values total 13. These cards are then removed from the pyramid, but only if they are not covered by other cards.



Classic Solitaire has four levels of playing difficulty: *easy*, in which you go through your hand one at a time as many times as you want; *medium*, which requires you to flip through the hand three at a time; *hard*, in which you can only go through the hand three times; and *expert*, in which you are allowed to go through the hand only once. *Pyramid* lets you use the expert option.

When you switch games by returning to the menu screen, you must have the disk in the drive, because the program accesses the disk when the menu is selected. Make a backup of the game disk onto a RAM disk if you have one. This can save you a little wear and tear on the disk. If you notice that your disk is wearing out, Eversoft Games Ltd. will replace the original disk for a fee of \$5.

All in all, if you want non-violent games or just like playing a nice, relaxing game of solitaire, then *Classic Solitaire* deserves a look. I enjoyed playing *Classic Solitaire*, but I still can't win that darn *Pyramid* game!

(Eversoft Games, Ltd., P.O. Box 3354, Arlington, WA 98223-3354; 206-653-5263; \$14.95)

— Richard L. McNabb

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The following products have recently been received by THE RAINBOW, examined by our magazine staff and issued the Rainbow Seal of Certification, your assurance that we have seen the product and have ascertained that it is what it purports to be.

PM*Print, for printing PMODE3 color or PMODE4 black-and-white artifact color on the NX1000 or compatible printer. Includes four PMODE print drivers, big/small black-and-white, big/small color, that can be loaded and executed from your BASIC program or used as stand-alone programs. Includes BASIC programs useful for editing colors and other special tasks. Works with most Epson-compatible color printers for color. Requires a CoCo 1, 2 or 3 and a disk drive. *Supersoft, Inc., 363 Oakwood Avenue, Jackson, MI 49203, (517) 787-3610; \$8.95 plus \$2.50 S/H.*

Sprite-BASIC, a program that lets you create sprites, (which are objects that can be moved around the screen without disturbing the background graphics picture). Gives you all the new commands needed to create your own BASIC games. Does not require expert programming skills. Requires a CoCo 3 and a disk drive. *Supersoft, Inc., 363 Oakwood Avenue, Jackson, MI 49203, (517) 787-3610; \$44.95 plus \$2.50 S/H.*

CHI PagesE V.2.0, an upgraded version of CHI Pages. Includes desktop publishing, Hi-Res paint, form maker, greeting card designer, calligrapher or CAD program utilizing HSCREEN 3. Requires a CoCo 3 128/512K, RGB or composite monitor (no TV), at least one disk drive, High Resolution Joystick Interface, joystick or mouse, and a printer. *Coloss Computer Design, 1917 Madera St., #8, Waukesha, WI 53186, (414) 549-0750; \$49.95 plus \$3 S/H.*

CHI Lettrec, an NLQ program designed primarily for the earlier versions of Epson or compatible printers without NLQ capability. Features 14 different NLQ fonts, graphics point-and-click interface and pull-down menus. Allows importing of ASCII text from CoCo word processors. Requires 64K CoCo 1 or 2, one disk drive, mouse/joystick and an Epson or compatible printer. *Coloss Computer Design, 1917 Madera St., #8, Waukesha, WI 53186, (414) 549-0750; \$24.95 plus \$3 S/H.*

CHI Clipart Set 2, a three-disk set collection of 672 pieces of clipart for all versions of the CHI Pages CoCo 3 desktop publishing program. Includes cartoons, D&D fantasies, radical concepts, education, animals, sports and more. Requires CHI Pages or CHI PagesE. *Coloss Computer Design, 1917 Madera St., #8, Waukesha, WI 53186, (414) 549-0750; \$19.95 plus \$3 S/H.*

◆ **Monster Mash**, a CoCo 3 action/arcade game featuring 16-color Hi-Res graphics and full joystick play control. Lets user travel through over 70 rooms, collecting gold and fighting monsters. Requires player to gather magic mirrors needed to defeat Medusa. *Bivare Enterprises, c/o Kandl Stinson, Box 265, Allen, OK 74825, (405) 857-9932; \$22.*

◆ **The Entity**, a text Adventure written in machine language. Places user in the role of an alien trying to accomplish 10 good deeds that will speed up the development of the earth by 150 years. Requires a CoCo 3 and a disk drive. *Bivare Enterprises, c/o Kandl Stinson, Box 265, Allen, OK 74825, (405) 857-9932; \$18.*

◆ **Labelase**, an OS-9 labeling program with many features. Works with your currently configured printer. Can be run in an 80-column text or graphics window. *Constellation Computer Consultants, P.O. Box 423, Sanford, ME 04073; \$14.95 plus \$2 S/H introductory offer.*

◆ **Connecting the CoCo to the Real World**, by William Barden, Jr., an easy-to-use book explaining safe, inexpensive projects for the CoCo 1, 2 and 3. Includes descriptive information on the internal design of the Color Computer. Shows reader how to measure wind direction, make a water detector, capture and playback sounds, create a multi-circuit burglar alarm and more. *William Barden, Jr., 8 Sun Timour, Rancho Simu Margari, CA, 92688; \$19.95.*

KJV on Disk #11, 1 Samuel from the King James version of the Bible, in ASCII files for the CoCo 1, 2 and 3. Word processor or text editor is recommended for viewing the files. Requires at least 32K and one disk drive. *BDS Software, P.O. Box 485, Glenview, IL 60025-0485; \$3.*

The Goldberg Utilities, two volumes of powerful OS-9 utilities. Over twenty utilities in all. Volume 1 includes append, cls, copy, count, d, grep, head/tail, lower/upper, pk/unpk, sort, unload, val, zcopy, plus an explanation of CoCo 3 memory allocation and how to use it best. *Kenneth Leigh Enterprises, 1840 Blinnure Street, NW, #10, Washington, DC 20009, (202) 462-1210; each volume \$24.95 plus \$2.50 S/H.*

CoCo Cassette #94, a monthly collection of software programs that includes: *Flash Carl* (educational

program), *Real Estate Listings* (house listing database for realtors), *Bible Questions 1*, *Spelling Quiz 1*, *No Left 3* (game), *Picture, Picture Viewer 3* (graphics), *Tank Showdown* (game), *Tarzar 5 Adventure*, *Gemis* (strategy game), and *Fourcubr* (3-dimensional tie-tac-toe), *T&D Software, 2490 Miles Standish Drive, Holland, MI 49424, (616) 399-9648; \$8, \$70 for yearly subscription.*

Rus*Max 1.0, a program that enables printing of 16- and 4096-color or black-and-white RASCAN pictures. Works with NX-1000, DMP-240 and GSX-140 printers. CGP-220 prints color images only. Lets user edit colors of RASCAN 16-color images. (RASCAN not required for printing IMG images.) *Supersoft, Inc., 363 Oakwood Avenue, Jackson, MI 49203, (517) 787-3610; \$24.95 plus \$2.50 S/H.*

Star*Max+, program that lets you print CM3, MGE and HSCREEN 2 pictures using NX-1000, DMP-240 and other Epson-compatible printers. Has full-color editing and RGB to CMY conversion process to create a picture with real WYSIWYG colors, Black-and-white drivers with gray-scaling included. *Supersoft, Inc., 363 Oakwood Avenue, Jackson, MI 49203, (517) 787-3610; \$21.95 plus \$2.50 S/H.*

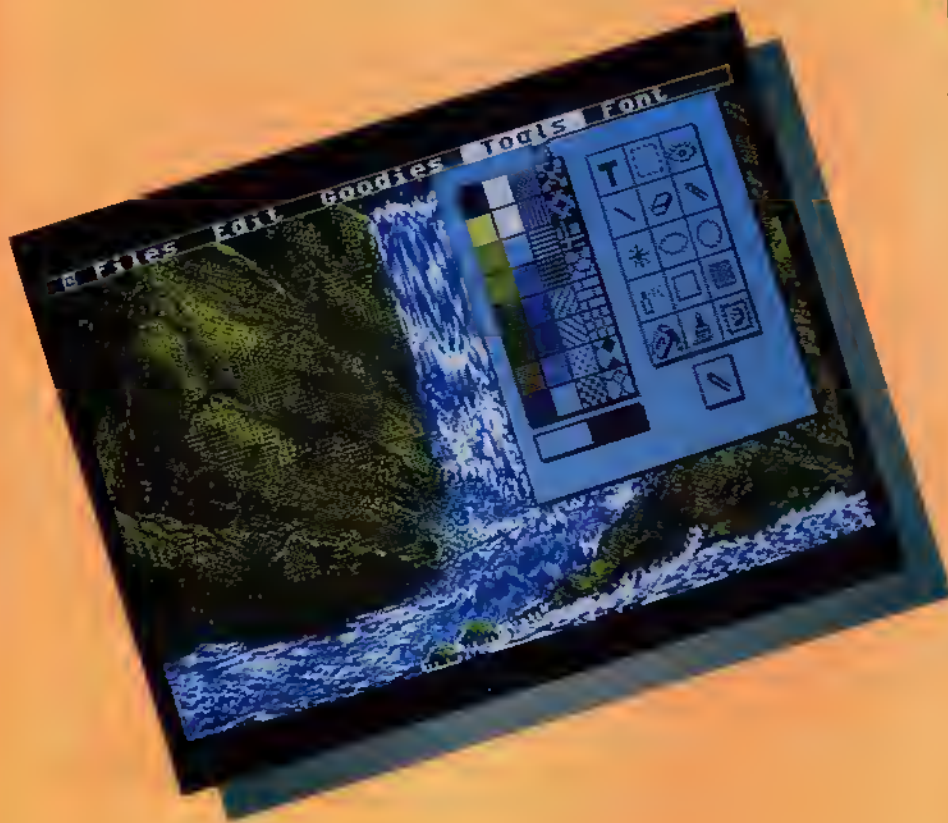
SoundTrax, a sound-sequencing system for the Color Computer 3. Has four-voice, polyphonic capability; reads digitized sounds accurately. Uses a point-and-click editor. Lets you compose music with your CoCo. Requires a disk drive and mouse/joystick. *Sunlog Systems, 21 Edinburg Drive, Pittsburgh, PA 15235, (412) 372-5674; \$34.95 plus \$2.50 S/H.*

Demio Disk of SoundTrax files, three files that let you hear the sound quality obtainable using *SoundTrax*. Contains "Louie Louie", "Kyum-Gai Rap", and a surprise song. *Sunlog Systems, 21 Edinburg Drive, Pittsburgh, PA 15235, (412) 372-5674; \$4.95 plus \$2.50 S/H.*

◆ **First product received from this company**

The Seal of Certification is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a Seal, the magazine certifies the program does exist—that we have examined it and have a sample copy—but this does not constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW reviewers for evaluation.



MVCanvas -- A Hi-Res Graphics Editor for the OS-9 Family

When I was first assigned this review by THE RAINBOW, I asked myself, "What? Another graphics editor for the CoCo 3? I already have a full-featured graphics editor with a whole library of pictures by yours truly." But wait, this graphics editor is a little different.

MVCanvas lets you choose from four different screen resolutions; it operates under the OS-9 *Multi-View* environment; and it can convert most Disk BASIC graphics images to its native VEF format. That means I can enter the uncharted world of 640-by-200 resolution graphics, have access to my existing library of pictures, and enjoy all the advanced features of OS-9 and *Multi-View* — multiple windows, directories, multitasking and more!

MVCanvas is a full-featured, bit-map graphics editor that runs completely under OS-9 Level II and *Multi-View*. The program lets you create full-screen VEF-format pictures at four different screen resolutions:

320-by-200 with four or 16 colors and 640-by-200 with two or four colors. Because *MVCanvas* runs under its own window, all of *Multi-View*'s features and utilities are easily accessible. Memory permitting, you can even run other OS-9 programs along with *MVCanvas*. You can also take further advantage of OS-9's windowing abilities by displaying one or more full-screen *MVCanvas* pictures while simultaneously editing another. Pictures may be saved to disk and printed using a variety of dot-matrix and color inkjet printers.

MVCanvas requires a CoCo 3 with a minimum of 256K, the OS-9 Level II operating system, *Multi-View* and at least one disk drive that can handle single-sided, 40-track disks, such as the Tandy FD-501. For those more proficient at OS-9, instructions are provided for running *MVCanvas* without *Multi-View*. I used a 512K CoCo 3 with an RGB monitor, two Tandy FD-501 single-sided disk drives, a Tandy mouse with the High Resolution Joystick Interface and the DMP-105 and DMP-132 dot-matrix printers.

The *MVCanvas* package comes with two OS-9 formatted disks and a 32-page manual. One disk contains the editor and printer drivers; the other contains utilities.

The editor disk is formatted for 40 tracks. If your OS-9 system and disks are set up for 35 tracks, run a procedure file (included on the utilities disk) to change the /d0 device descriptor from 35 tracks to 40 tracks. This procedure temporarily (until you reboot) enables your system to read, format and backup 40-track disks. More about installing *MVCanvas* later.

Once backup copies are made, you run *MVCanvas* by booting from the *Multi-View* disks and, using the mouse or keyboard, double-clicking on the *MVCanvas* icon. A new window opens automatically, leaving the *Multi-View* window intact and just a CLEAR key away. With each startup, *MVCanvas* refers to an environment file that you can edit to set default directory paths.

The editor lets you view and have access to almost the entire graphics screen area — the only part of the picture missing is the

top 16 pixels hidden by the menu bar. You can easily gain access to that strip by using a Scroll command that scrolls the entire picture up or down 16 pixels.

All of *MVCanvas*'s options and tools are invoked "Multi-View" style by pointing and clicking the cursor on the appropriate menu

MVCanvas offers the features you expect from a comprehensive graphics editor.

option or tool icon. In keeping with the *Multi-View* protocol, most of the options can also be called using two-key ALT combinations from the keyboard.

MVCanvas offers the features you expect from a comprehensive graphics editor. All the standard drawing tools are included: Pencil, Line, Ray, Box, Circle, Ellipse, Brush, Fill, Spray Can, Bar (a filled box), Text and Eraser. Advanced graphics editing options such as Cut & Paste are also available. For fancy animation effects, palette switching is supported, allowing you to rotate eight of the 16 (or two of the four, depending upon screen resolution) palette slots at definable cycle speeds.

MVCanvas supports full point-and-click file management. Directories can be displayed and directory paths modified. If you need more OS-9 command power, an OS-9 overlay window with a shell can be summoned temporarily and then deleted. Picture files are saved through an optional file compression *run-length-encoder* routine that reduces the disk space taken up by a screen to two-thirds to one-sixteenth the space it would otherwise require, depending upon the screen's complexity. A separate "uncompression" routine is provided should you ever want to reverse the compression of your screens for use by another application.

Once you have *MVCanvas* running, you can begin creating your masterpiece right away. The toolbox is opened by selecting the Tools option on the menu bar. A menu box opens, revealing icons for 16 different tools and a color palette showing 2, 4 or 16 colors. Also displayed is a palette of 16 different, pre-defined patterns including dots, bricks, tiling and more. An RGB sliding bar color mixer lets you build and

modify your color palette for each picture. You also have the option of changing the border color.

If you don't like what you've just drawn, you can use the Eraser to erase with a selectable background color, or you can use the Undo command to delete the last drawing operation performed. For close-up work, use the Fat-bits zooming option. With access to the full-color palette, Fat-bits lets you edit the colors of single pixels within an enlarged 24-by-24 pixel block, while a separate window simultaneously displays the changes on an actual-size view of the edit area. If you don't like the changes made, you can select the Cancel option before exiting Fat-bits and start again.

From the Tools menu you have the option of adding text to your pictures. While you are limited to one size of text (8-by-8 pixels) and screen positioning (in 8-by-8 pixel increments), there are five fonts to choose from (many more are available from electronic bulletin boards), and each font can be made plain, bold, transparent, reversed, underlined or proportional. Some of the font options such as bold, proportional and underline can be combined.

Once you've got some graphics drawn, you can make use of *MVCanvas*'s advanced editing features. Selected portions (up to 25 percent of the screen) can be cut (clipped), copied, pasted and saved to disk. By saving clips to disk you can create an entire scrapbook library of individual images. For even fancier editing effects, an image cut from the screen or just a selected area of the screen can be flipped 180 degrees horizontally or vertically, inverted (reverse the order of the palette colors), swapped (exchange colors in two palette slots) or remapped (change the palette slot of all pixels of one color to another palette slot). For a cut-and-paste shortcut, there is a useful tool called Stamp that enables you to quickly select somewhat smaller areas of the screen and then "rubber-stamp" as many copies of that selected area as you want.

Your pictures can be displayed independent of the editor with a utility called VEFShow. VEFShow automatically opens a separate full-screen window for each picture displayed, allowing you to simultaneously display as many different pictures as memory will permit (determined in part by the individual resolutions of each picture). VEFShow also allows you to enable palette scrolling and adjust the scrolling speed from the keyboard for each picture. Pictures and their windows can be deleted with a click of the mouse button.

If you would like a hard copy of your creation, *MVCanvas* allows you to print your picture on a variety of dot-matrix and color inkjet printers. Printers supported

include Tandy DMP-105 and DMP-110, Epson, IBM, Okidata, Star, Gemini, C.Itoh, color printers by Epson, the Tandy CGP-220 and DMP-240, Star NX-1000 and Citizen GSX-140. While there was a bug in the printer driver that caused problems with my DMP-132 (and is currently being fixed by the author), I had no problem getting good results with my DMP-105. At 600 baud, it took about 25 minutes to print a 5½-by-8 inch fully-shaded hard-copy of a 16 color 320-by-200 screen.

Printing can be executed from the *MVCanvas* editor or from a separate OS-9 window, allowing for simultaneous printing of one screen while editing another. This is a somewhat dubious option though, as it slows down both the editor and the printing process and makes for a rather noisy working environment. There are no additional options for controlling how or where the graphics screen is printed.

MVCanvas includes additional utilities for importing graphics screens created by other major-brand Disk BASIC-based screen editors and video digitizers. Before importing any screens, you need a separate utility to convert the picture files to OS-9 format. This utility is not provided with *MVCanvas*, so I used a program called RS-OS9.BAS (available on Delphi). Using RS-OS9.BAS and *MVCanvas*'s conversion utilities, I successfully converted screens to VEF format from three different sources: *CoCo Max 3* (CM3), *Color Max* (MGE) and *Rascan* (TMG). The results were, as best as I could tell, absolutely perfect. I was very impressed. *MVCanvas* also supports digitized images created by the DS-69 and DS-69B, but I did not have an opportunity to test these formats. OS-9 graphics images from *DeskMate 3* or *The Color Computer Artist* are not currently supported by *MVCanvas*.

MVCanvas has all the features I would normally look for in a pixel-oriented graphics editor. I particularly liked having over 90 percent of the picture visible at one time. Overall, I found the editor works very well, although it responds somewhat slower and is not quite as full-featured as some of its Disk BASIC-based cousins. I assume the speed problem is not a programming issue (*MVCanvas* is written in C), but because *MVCanvas* is operating in the OS-9 environment where other processes are simultaneously supported.

I found I could speed up my favorite tool, Fat-bits, by loading it into memory first. Even when residing in memory though, Fat-bits still took about eight seconds to zoom in on a selected area. But once zoomed in, things moved quickly. Scrolling while in Fat-bits is not supported. The Clip routine is also a separate module that can be loaded into memory, speeding up cut-and-paste functions.

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I found that I had the best cursor control when using a Tandy mouse along with the High Resolution Joystick Interface, but these are by no means required. I got good results working with the standard-resolution mouse, and working solely with the keyboard was surprisingly productive. *MVCanvas* is compatible with any Hi-Res joystick interface (including switchable models) that is compatible with OS-9.

While I did not conduct rigorous scientific testing of *MVCanvas*, I did discover two things that would consistently provoke the editor to a fatal crash: invoking the Undo option while still in the Fat-bits mode, and pressing ESC at the "Are you sure?" file save prompt. In each case, I lost the screen I was working on, up to the last disk save. The author has been advised of these problems and is currently investigating them.

You'll want to keep an eye on the available memory when using the Clip options since they sometimes require a lot of memory, and running out of memory during a Clip operation can cause the whole system to crash, requiring you to reboot. I find that *MVCanvas* runs most reliably when other concurrently running processes are kept to a minimum and plenty of free memory is available.

The manual, while very readable and

generous with operational and technical information, is disorganized and lacks several key pieces of information regarding installation. I could not get *MVCanvas* running by referring just to the manual, so I called the program's friendly and helpful author, Mike Haaland. With Mr. Haaland's help I got *MVCanvas* running, and in the process I learned some things about OS-9.

Even with my intermediate-level knowledge of OS-9 and Mr. Haaland's help, I had a difficult time getting *MVCanvas* started. What is lacking are organized, explicit installation instructions and simplified installation procedures. Because of the difficulty of installation, I am concerned that *MVCanvas* might be currently beyond the reach of all but intermediate to expert OS-9 users.

To get *MVCanvas* working properly you need to know how to run a variety of OS-9 commands from the OS9: prompt and how to use an OS-9 text editor such as Microware's edit (included with the OS-9 Level II disks) to modify procedure files. You'll probably want to modify your *Multi-View* boot file as well to include pipe, piper and pipeman. This involves editing the *Multi-View* boot-list file and using *os9gen* to create a new *Multi-View* boot file.

MVCanvas also includes an optional patch

that modifies *grfdrv*, enabling certain features to run faster — otherwise the program runs painfully slow. While the manual has plenty of information about the patch, it fails to mention that after executing the patch you must modify the attributes of the revised *grfdrv* with the command *attr grfdrv e w r*. Finally, if you decide to make 40-track device descriptors a permanent part of your system, you'll need to know how to use the *cobbl er* command.

I was very impressed with *MVCanvas*, particularly with how well it co-exists with *Multi-View* and other OS-9 applications. Regarding its unique features, I especially liked being able to create graphics in the high-resolution four-color 640-by-200 mode: there is a difference. While there is still room for improvement, *MVCanvas* has the dedicated support and enthusiasm of a programmer new to the CoCo market, and I think we will see even better things from this new source in the future.

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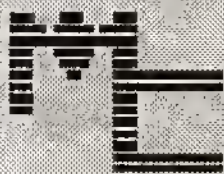
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Novices Niche

Last Line Recall by Geoff Friesen

LLR is a utility that redisplay the last line entered at the OK prompt or via the LINE INPUT statement. To initiate last-line recall, press the F2 function key. *LLR* can save a lot of time when the same data is to be repeated. It is also useful for repeating a command line (especially to correct a mistake in your previous entry).

The BASIC listing pokes the *LLR* object code into memory — just type RUN to install it. Note that the F2 key will have no effect after installing the program, until you enter a line. F2 also does nothing unless the cursor is at the beginning of a line (i.e., the left-most column).

LLR redirects the reset vector upon installation. When the Reset button is pressed, *LLR* automatically reinitializes itself so it is always available.

LLR has been designed to be compatible with other machine language utilities and respects their memory space. However, they may not respect *LLR*.

Therefore, *LLR* should be installed *after* installing other utilities.

I hope you enjoy using *LLR*. I am working on an upgrade which provides a history buffer for the last few lines.

The Listing: LASTLINE

```

0 * COPYRIGHT 1990 FALSOFT, INC
100 *
110 *LLR: LAST LINE RECALL
120 *
130 *(C) 1990, RAINBOW
140 *
150 *
160 CLEAR 200,PEEK(&H27)*256+PEE
K(&H28)-375
170 SA=PEEK(&H27)*256
180 SA=SA+PEEK(&H28)+1
190 FOR I=SA TO SA+119
200 READ B$
210 POKE I,VAL("&H"+B$)

```

```

220 NEXT I
230 EXEC SA+10: CLS
240 PRINT "LLR INSTALLED": NEW
250 DATA 12,87,FF,DF,8D,0F,6E,9D
260 DATA 00,68,9E,72,AF,8D,00,65
270 DATA 30,8C,ED,9F,72,30,8D,00
280 DATA 13,BF,A3,AA,30,8D,00,38
290 DATA 8F,A3,D5,86,7E,B7,A3,A9
300 DATA 87,A3,D4,39,81,08,26,03
310 DATA 7E,A3,AD,81,04,27,03,7E
320 DATA A3,84,C1,01,27,03,7E,A3
330 DATA 9A,6D,8D,00,32,26,F7,33
340 DATA 8D,00,2D,A6,C0,4D,27,EE
350 DATA A7,80,5C,8D,A2,82,20,F3
360 DATA 4F,A7,8D,00,1A,8E,02,DD
370 DATA 33,8D,00,14,A6,80,4D,27
380 DATA 04,A7,C0,20,F7,A7,C4,8E
390 DATA 02,DC,7E,A3,D7,00,00,01

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Continued from Page 6

other devices. I would like to be able to peek at memory to find the time when a particular window is open.

Jean Gravelle
95 Bocage
Pointe-Gatineau, QU J8T 5W5
Canada

We know of no software clock for the CoCo that can maintain time accurately (the interrupts give these programs fits), but DistolCRC offers a hardware real-time clock for users of its disk controller. Another option is ADOS and the SmartWatch real-time clock from SpectroSystems.

The Quest for Hints and Tips

Editor:

I would like to see more articles aimed at the new programmer, such as "Did You Hear The One About Hints and Tips" (January 1990, Page 60). I have read the CoCo 3 manual but it doesn't mention such things as EXEC44539, and the edit commands A, Q and E. There must be more hints and tips to pass along to programmers. I do not understand the techniques of using peeks and pokes in a program, either. The only poke I know is the one for the

printer baud rate. This might be a good tutorial or series for THE RAINBOW.

I mostly write utilities and data storage programs, and I enjoy reading articles on BASIC programming, especially when they pertain to something other than graphics. I enjoyed reading Mr. Perlman's series on database programming. Although I did not enter his program, I have used several of his techniques. Just for the record I am a mother, grandmother, and artist, now delving into the world of computer programming — and I am fascinated with it.

Virginia Hawxhurst
Milford, New York

Down on CoCo DTP

Editor:

I have owned a CoCo I since 1982, and I purchased a CoCo 3 at the most recent RAINBOWfest in Chicago. Your article "The Future of the CoCo" fails to mention about the only thing this computer cannot do — desktop publishing. Laser printers are not compatible and, as you can see from the poor quality of my letter, MAX-10 printouts are extremely crude and rough. I get better printouts with *Scriptit* and the NLQ mode on my DMP-132.

Carl Magna
Greenwood, Indiana

We disagree. We've had an HP LaserJet hooked to a CoCo for years and it works quite well. Of course, you do have a point — we haven't seen any laser printer drivers marketed with the popular graphics and DTP programs.

THE RAINBOW welcomes letters to the editor. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or to conserve space.

Letters to the editor may also be sent to us through our Delphi CoCo SIG. From the CoCo SIG> prompt, type RAI to take you into the Rainbow Magazine Services area of the SIG. At the RAINBOW> prompt, type LET to reach the LETTERS> prompt and then select Letters for Publication. Be sure to include your complete name and address.

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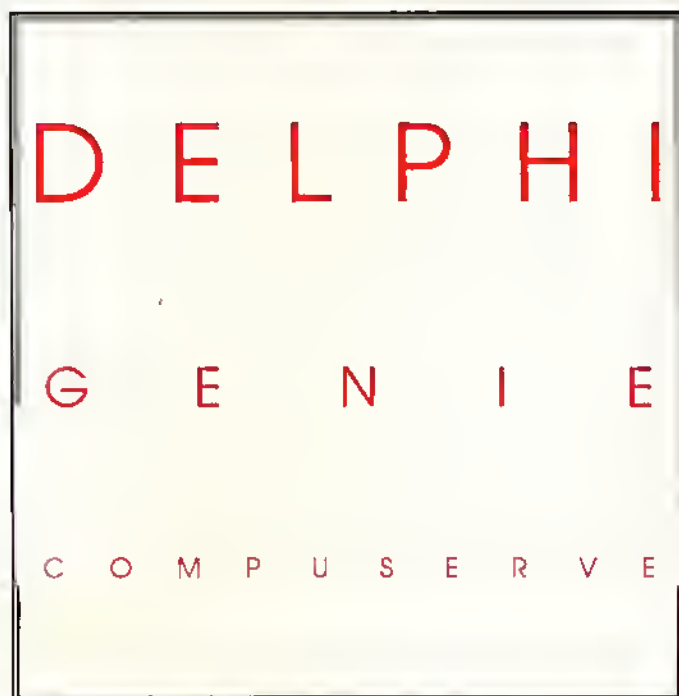
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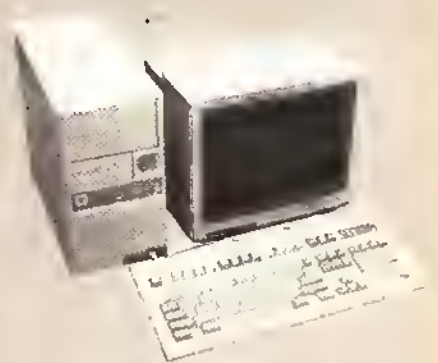
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An original idea for chess players

All the Knight Moves

by Rick Cooper

Uncle Olaf once had a thing for howling. Then he became interested in motor boats. Later he developed a passion for airplanes. It seemed that every few years he developed a new passion that consumed him until something newer came along. It became evident that Uncle Olaf and I shared one common trait—a passion for passions. Mine started with toy cowboys. As a teen I loved baseball cards and sports. During and after college it was chess and, later, the Color Computer. *Chess IQ* is a result of the latter two passions.

If you use a real chessboard, place four pawns at locations C3, C6, F3 and F6. Next place a knight at Location A1. The objective

of the game is to move the knight to each successive, unoccupied square that is not attacked by a pawn. Of course you must use moves that are legal for the knight. This means finding a route that leads to your objective. The order in which you are to hit each square is from left to right on the first row, then on the next row from right to left. Follow this pattern for the other six rows until you reach the upper left square. You should try to do this as quickly and efficiently as possible.

Chess IQ puts letters on each square you can legally hit from the current location. Just press the letter of the square to which you want to move the knight. This allows non-chess players to try their hand. At the opening screen, you have a choice of seeing a demonstration or playing *Chess IQ*. To see a possible solution, use the demo. If you successfully complete *Chess IQ*, you are given an opportunity to record your attempt as the demo. Try the demo again and watch your effort as it is animated on the screen.

Now I'm off to find Uncle Olaf. I want to show him my new jigsaw puzzle program. I'm sure he'll be interested. □

Rick Cooper is a principal, teacher and coach in the Casey County school district. He enjoys programming the Color Computer for educational and recreational uses and believes the real joy of programming is in sharing his work with others. He may be contacted at P.O. Box 276, Liberty, KY 42539, (606) 787-5783.

CoCo 3

70	135
180	137
320	53
410	31
520	67
640	117
750	124
890	186
1000	135
1040	167
1110	201
1220	125
1320	125
1430	215
END	9

3 ' BY
 4 ' RICK COOPER
 5 ' COPYRIGHT (C) 1989
 6 '
 10 OIM CB(12,12),LO(8,8,2),SL(8,
 2),SX(8,2)
 20 ON BRK GOTO 1480
 30 ON ERR GOTO 1480
 40 POKE &HFF09,0
 50 BS-&H6400
 60 MO-0
 70 FOR X=1 TO 12:FOR Y=1 TO 12:
 EAO CB(X,Y):NEXT Y:NEXT X
 80 READ A\$
 90 FOR X=1 TO LEN(A\$):POKE BS+X,
 ASC(MID\$(A\$,X,1))-65:NEXT X
 100 FOR X=1 TO 8
 110 FORY=1 TO 8
 120 LO(X,Y,1)-Y*20+20
 130 LO(X,Y,2)-X*20
 140 NEXT Y,X
 150 FOR X=1 TO 10:HBUFF X,300:NE
 XTX
 160 FOR X=11 TO 18:HBUFF X,100:N
 EXT X

The Listing: CHESSIQ

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 2 ' COCO IQ

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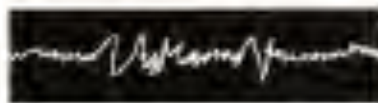
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- ML Tutorial Pt 6
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170 REM KNIGHT
180 PC$="R12U1H2R1U1H3E1R1F2E1U1
H1U1R2F1E1U1H2L1H3L280301R1U1L18
U3L1H1L1G1O1G1D1G1D1G1O4F1G1O1R1
G2D1"
190 FOR X=0 TO 4:PALETTE X,0:NEX
TX
200 HCOLOR 0,1
210 HSCREEN2
220 HDRAW"8M102,98"+PC$
230 HPAINT(102,9B),1,0
240 HLINE(100,100)-(120,80),PSET
,8
250 HGET(100,100)-(118,80),1
260 FOR X=11 TO 18
270 HCLS
280 HPRINT (14,10),CHR$(X+54)
290 HGET(111,79)-(119,87),X
300 NEXT X
310 HCLS
320 PALETTE 0,0:PALETTE 1,63:PAL
ETTE 2,60:PALETTE 3,0:PALETTE 4,
36
330 HCOLOR 4,0:HPRINT(30,4),"T H
E":HPRINT(28,6),"C H E S S":HPR
INT(31,8),"1 Q"
340 HCOLOR 0,0:HPRINT(32,10),"by
":HPRINT(27,11),"Rick Cooper"
350 HPRINT(30,12),"C 1990"
360 HLINE(207,23)-(308,108),PSET
,8
370 HCOLOR 4,0:HLINE(208,24)-(30
7,107),PSET,8
380 HCOLOR 0,0:HLINE(209,25)-(30
6,106),PSET,8
390 HPRINT(27,15),"A) CHESS IQ":
HPRINT(27,16),"B) DEMO"
400 I$=INKEY$
410 IF I$<>"A" AND I$<>"B" THEN
400
420 HCOLOR 1,0:HPRINT(27,15),"A)
CHESS IQ":HPRINT(27,16),"B) DEM
O"
430 IE I$="B" THEN MD=2 ELSE MD=
0
440 HCOLOR 0,0
450 HPRINT(30,16),"MOVES"
460 HPRINT(32,18),"0"
470 EOR X=1 TO 8
480 FOR Y=1 TO 8
490 HLINE(LO(X,Y,1),LO(X,Y,2)):(
LO(X,Y,1)+20,LO(X,Y,2)+20),PSET,
8
500 NEXT Y,X
510 EOR X=3 TO 10
520 IE X/2=INT(X/2) THEN C1=3 EL
SE C1=1
530 FOR Y=3 TO 10
540 GOSUB 910
550 IF C1=3 THEN C1=1 ELSE C1=3
560 NEXT Y
570 NEXT X
580 MO=0
590 X=B:Y=1
600 DI=1
610 N1=B:N2=1
620 HGET(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+20,LO(N1,N2,2)+20
),2
630 HPUT(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+18,LO(N1,N2,2)+20
),1
640 IE N1=X AND N2=Y THEN GOSUB

```

```

1200
650 GOSUB 960:REM GET NEW SQUARE
S
660 IF MD>0 THEN 1-PEEK(8S+MO+1)
:GOTO 700
670 I$=INKEY$:IF I$="" THEN 670
680 I=ASC(I$)-65
690 IF I<0 OR I->T1 THEN 670
700 MO=MO+1
710 IF MD>0 THEN 730
720 POKE 8S+MO,I
730 GOSUB 1140:REM MOVE KNIGHT
740 HPUT(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+20,LO(N1,N2,2)+20
),2
750 N1=SX(1,1):N2=SX(1,2):REM NE
W LOCATION OF KNIGHT
760 MO$="" +STR$(MO-1):HCOLOR 1,
0:HPRINT(30,18),MO$
770 MO$="" +STR$(MO):HCOLOR 0,1:
HPRINT(30,18),MO$
780 GOTD 620
790 DATA 0,0,0,0,0,0,0,0,0,0,0,0
800 DATA 0,0,0,0,0,0,0,0,0,0,0,0
810 DATA 0,0,1,1,1,1,1,1,1,1,0,0
820 DATA 0,0,1,1,1,1,1,1,1,1,0,0
830 DATA 0,0,1,1,2,1,1,2,1,1,0,0
840 DATA 0,0,1,2,1,2,1,2,1,1,0,0
850 DATA 0,0,1,1,1,1,1,1,1,1,0,0
860 DATA 0,0,1,1,2,1,1,2,1,1,0,0
870 DATA 0,0,1,2,1,2,1,2,1,1,0,0
880 DATA 0,0,1,1,1,1,1,1,1,1,0,0
890 DATA 0,0,0,0,0,0,0,0,0,0,0,0
900 DATA 0,0,0,0,0,0,0,0,0,0,0,0
910 L1=(Y-3)*20+45
920 L2=(X-3)*20+25
930 IF CB(X,Y)=2 THEN C2=4 ELSE
C2=C1
940 HPAINT(L1,L2),C2,0
950 RETURN
960 REM GET NEW SQUARES
970 T1=0
980 K1=N1+2:K2=N2+2
990 IE CB(K1-2,K2-1)=1 THEN SL(T
1,1)=LO(K1-4,K2-3):SL(T1,2)=LO
(K1-4,K2-3,2):SX(T1,1)=K1-4:SX(T
1,2)=K2-3:T1=T1+1
1000 IF CB(K1-2,K2+1)=1 THEN SL(
T1,1)=LO(K1-4,K2+1,1):SL(T1,2)=L
O(K1-4,K2+1,2):SX(T1,1)=K1-4:SX(
T1,2)=K2-1:T1=T1+1
1010 IF CB(K1-1,K2+2)=1 THEN SL(
T1,1)=LO(K1-3,K2,1):SL(T1,2)=LO(
K1-3,K2,2):SX(T1,1)=K1-3:SX(T1,2
)=K2:T1=T1+1
1020 IF CB(K1+1,K2+2)=1 THEN SL(
T1,1)=LO(K1-1,K2,1):SL(T1,2)=LO(
K1-1,K2,2):SX(T1,1)=K1-1:SX(T1,2
)=K2:T1=T1+1
1030 IF CB(K1+2,K2+1)=1 THEN SL(
T1,1)=LO(K1,K2-1,1):SL(T1,2)=LO(
K1,K2-1,2):SX(T1,1)=K1:SX(T1,2)=
K2-1:T1=T1+1
1040 IF CB(K1+2,K2-1)=1 THEN SL(
T1,1)=LO(K1,K2-3,1):SL(T1,2)=LO(
K1,K2-3,2):SX(T1,1)=K1:SX(T1,2)=
K2-3:T1=T1+1
1050 IF CB(K1+1,K2-2)=1 THEN SL(
T1,1)=LO(K1-1,K2-4,1):SL(T1,2)=L
O(K1-1,K2-4,2):SX(T1,1)=K1-1:SX(
T1,2)=K2-4:T1=T1+1
1060 IF CB(K1-1,K2-2)=1 THEN SL(
T1,1)=LO(K1-3,K2-4,1):SL(T1,2)=L

```

```

O(K1-3,K2-4,2):SX(T1,1)=K1-3:SX(
T1,2)=K2-4:T1=T1+1
1070 IF MD>0 THEN 1130
1080 FOR J=0 TO T1-1
1090 HGET(SL(J,1),SL(J,2))-(SL(J
,1)+20,SL(J,2)+20),3+J
1100 IF HPOINT(SL(J,1)+2,SL(J,2)
+2)=3 THEN C3=1 ELSE C3=0
1110 HPUT(SL(J,1)+4,SL(J,2)+4)-(
SL(J,1)+12,SL(J,2)+12),J+11
1120 NEXT J
1130 RETURN
1140 REM MOVE KNIGHT
1150 IF MD>0 THEN RETURN
1160 FOR J=0 TO T1-1
1170 HPUT(SL(J,1),SL(J,2))-(SL(J
,1)+20,SL(J,2)+20),3+J
1180 NEXT J
1190 RETURN
1200 HPUT(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+20,LO(N1,N2,2)+2
0),2
1210 HPAINT(LO(N1,N2,1)+2,LO(N1,
N2,2)+2),2,0
1220 HGET(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+20,LO(N1,N2,2)+2
0),2
1230 HPUT(LO(N1,N2,1),LO(N1,N2,2)
)-(LO(N1,N2,1)+18,LO(N1,N2,2)+2
0),1
1240 IF DI=1 THEN Y=Y+1 ELSE Y=Y
-1
1250 IE DI=1 AND Y=9 THEN DI=2:Y
=B:X=X-1
1260 IF DI=2 AND Y=0 THEN DI=1:Y
=1:X=X-1
1270 IF HPOINT(LO(X,Y,1)+4,LO(X,
Y,2)+4)=4 THEN 1240
1280 IF X=0 THEN 1310
1290 SOUND RNO(50)+30,1
1300 RETURN
1310 IF MD=2 THEN 190
1320 FOR X=1 TO 4
1330 PALETTE X,RNO(64)-1
1340 NEXT X
1350 MD=0
1360 IF INKEY$="" THEN 1310
1370 HCOLOR 1,0:HPRINT(30,16),"M
OVES"
1380 HPRINT(30,18),MO$
1390 HCOLOR 0,1:HPRINT(26,16),"A
) RECORD DEMO"
1400 HPRINT(26,17),"B) MAIN MENU
"
1410 HPRINT(26,18),"C) QUIT"
1420 I$=INKEY$:IE I$="" THEN 142
0
1430 IF I$="A" THEN MO=1:GOTO 14
70
1440 IF I$="B" THEN MD=0:GOTO 14
70
1450 IF I$="C" THEN 1480
1460 GOTO 1420
1470 GOTO 200
1480 POKE &HFF0B,0
1490 RGB
1500 END
1510 DATA BECAEACOBCEAEBCCAAFBC
CAABOACACFFCAOACFAECBEFCCAEBDC
BCBCBFBAFDAOGOABBEDBAACGADEACCE
BBAABCDAAACGABACAACAACBOABGCCGC
BABAADBCBCBAABBAEABBACCOCBACBAC
CDBBD

```

The Year Ahead

Once again, the time has come to make plans for the upcoming calendar year. During the past year we received quite a bit of mail with readers' personal wish lists. And we have done our best to make sure all readers will benefit. Without further ado, we now present THE RAINBOW's editorial calendar for 1991.

January - Foundations

Laying the groundwork with can't-live-without utilities that make your computing habit easier.
Submission deadline: 10/8/90

February - All in a Day's Work

Exploring software for managing small businesses and in-home organization.
Submission deadline: 11/8/90

March - Hard Wares

A look at the latest add-on products, projects and ideas for your computer.
Submission deadline: 12/8/90

April - Tuning Up

A compendium of sound (making) ideas and music software.
Submission deadline: 1/8/91

May - The Printed Word

An in-depth examination of printers, their features and the software that makes them work.
Submission deadline: 2/8/91

June - Binary Blueprints

Expert tips, techniques and other tools for the program builder.
Submission deadline: 3/8/91

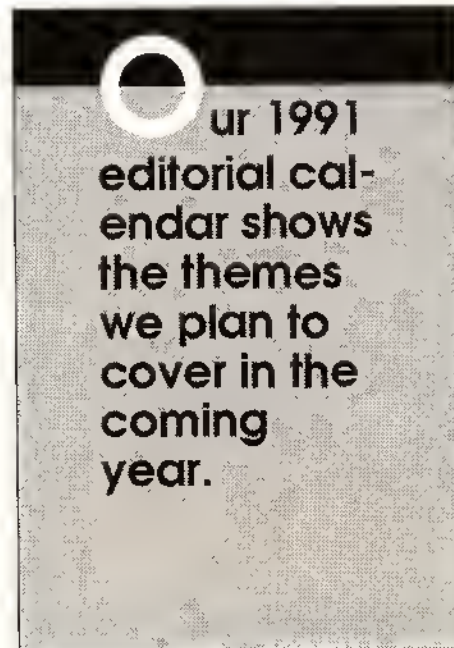
July - 10th Anniversary Jubilee

A potpourri of programs in celebration of

THE RAINBOW's 10th birthday.
Submission deadline: 4/8/91

August - At Ease!

Canvassing the world of graphics software and its many applications.
Submission deadline: 5/8/91



September - Back to School

A locker-full of educational programs for the '91-'92 school year.
Submission deadline: 6/8/91

October - The Shell Game

Taking the guesswork out of software that puts the OS-9 system to work.
Submission deadline: 7/8/91

November - On the Line

A guide to telecommunications: getting started and where to go from there.
Submission deadline: 8/8/91

December - 'Tis the Season

Great games and entertainment ideas for family and friends to enjoy throughout the holidays.
Submission deadline: 9/8/91

For those of you who are unfamiliar with it, the editorial calendar shows the monthly themes, or topics of interest, we plan to cover in the coming year. Our main purpose in providing this calendar here is to help you gear any programs you are writing to specific months in the year. Any programs/articles in our offices by the submission deadline dates shown above will be considered for publication in the issue for which that topic is appropriate.

Careful readers will notice we have re-introduced the Music/Sound and Games issues (April and December). And if you look closely, you'll find the main thrust of the January issue is utilities. Consider their return a result of numerous reader requests.

As always, we endeavor to provide technical "meat" as well as lots of fun things to help you gain the most from your Color Computing habit. And we work to furnish this information in a non-technical manner so all readers can learn from it. After all, we are all beginners in the big picture of life.

Take time to read the 1991 calendar for THE RAINBOW and plan your programs and articles around it. We look forward to seeing what you have to offer.

Join us next month for our annual Communications issue. We'll provide a discussion of Disk BASIC terminal programs and you can find out "all you ever wanted to know about modems but were afraid to ask."

— Cray Augsburg

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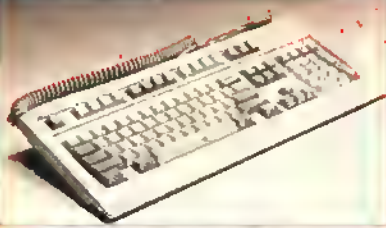
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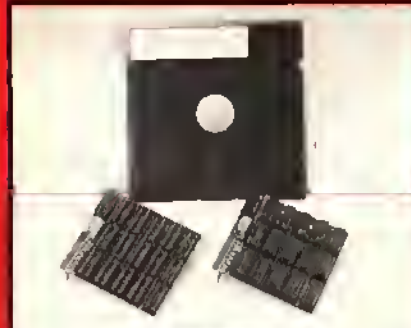
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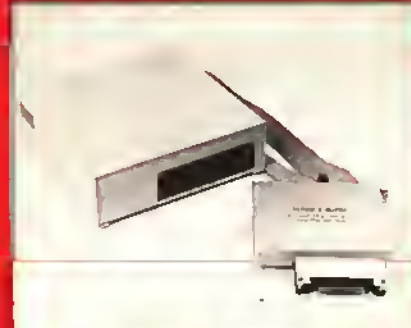
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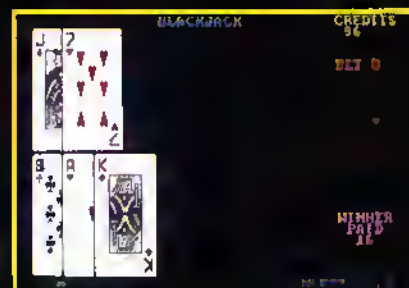
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