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## An update to a sports card collection program and tips about writing your own game programs

## Cursor SYS for 128

SYS 52591 will turn on a cursor on the 128 in 80 -column mode. But what is the SYS number to release the cursor? ROBERT NELLIST
BROCKPORT, NY
A SYS to address 52591 (\$CD6F) will turn the cursor on in either 40 - or 80 -column display mode. To disable the cursor in either mode, enter SYS 52639 (\$CD9F).

If you do any programming in 64 mode, you might be interested in reading Randy Thompson's "Programmer's Page" this month. His column contains a handy reference table for 64 programmers that lists dozens of interesting and unusual SYS calls, POKEs, and WAIT commands.

Most of these items were submitted by our readers. We encourage-and pay for-programming tips used on the "Programmer's Page."

## Sports Card Update

I have just started collecting trading cards, so Kevin Davis's Sports Card Collector (November 1991) is a blessing. One thing that I felt was missing was an indication of when you had last updated the prices. So I added the following to the program, and it works great.

## 195 PRINT" 112 SPACES|UPDATE: ";DAS <br> 390 INPUT\#8,YT:INPUT\#8,DAS: INPUT\#8,GC <br> 615 INPUT" "K8기ENTER DATE: <br> MO. DA. YR.[wht]";DAS <br> 1240 PRINT\#8,YT:PRINT\#8,DA\$: PRINT\#8,GC <br> douglas Jeffery <br> TELKWA, BC <br> canada

## Writing Games

1 am writing a game on my 64 in BASIC. It's getting a little complicated, and I'm beginning to think that maybe I
should be writing it in machine language. How can I have a sound track running, sprites moving, and the computer awaiting input all at the same time?
BRYAN PEASE
LIVERPOOL. NY
Computer games may seem to do many things at once, but they're actually doing only one thing at a time. Computers follow instructions sequentially. A system that does several different things at once is possible, but you would need more than one computer or microprocessor (each operating sequentially). To give your program the appearance of simultaneous action, you need to plan. Separate the actions into subroutines. IF-THEN can decide whether or not you want to gosub to the appropriate routine. It might help to write, in plain English, the game conditions and their consequences.

For example, if the fire button is pressed, then launch missile and set missile flag. If the joystick moves, then move ship sprite. If one second has passed, then play another note of the song. If the missile flag is set, then move missile sprite again. Repeat the above loop.

First, you check for the joystick button. If it's pressed, then gosub to the appropriate routine. If it's not, forget about launching the missile until the next time through the loop. Once you've launched the missile, you want it to continue moving, which is the reason for the missile flag. Whether or not the button was down, you next peek the joystick to see if the player wants to move and update the ship's position. Third, you check the jiffy clock by reading variable TI or TI\$ to see how much time has gone by. If a second (or whatever time
period you've chosen) has passed, play the next note of the song.
Next, move the missile sprite if the flag is set, and go back. The program loops around, checking the joystick twice, checking the time, checking a variable, and taking any necessary action.
The computer works quickly, so individual actions seem to happen simultaneously.

To convert the above outline into a playable game, you'd need a few more subroutines. One would check the collision register in case the missile has hit something. Another would erase the sprite and reset the flag as soon as the missile has reached the top of the screen. And, of course, you'd have to translate the outline into BASIC code.

There's another technique that's even closer to simultaneous action, but it requires from an intermediate to an advanced knowledge of machine language. Sixty times a second the computer stops what it's doing and takes some time to redraw the image on the screen. The main program is being constantly interrupted. Using a wedge, you can divert the interrupt to your own machine language program, which could play music, move sprites, or whatever you choose. Such interruptdriven routines are sometimes difficult to implement, but they can be very effective.

Do you have a question or problem? Have you discovered something that could help other 64/128 users? Do you have a comment about something you've read in Gazette? We want to hear from you. Send your questions and comments to Gazette Feedback, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

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## RELATVEEY SIMPIE

PROGRAMMERS OFTEN SHY AWAY FROM RELATIVE FILES, BUT MAYBE IT'S TIME TO TAKE ANOTHER LOOK AT THIS ALTERNATE METHOD OF DATA STORAGE.

Relative files are the black sheep of the data storage family. Programmers may try them once, have a few problems, and then give up on them. Then they spread the word to their friends to stay away from relative files. The reputation spreads. Unlike sequential files, relative files get no respect, but maybe it's time for a change.

Relative files do have good points and advantages. For one thing, they offer far more speed and efficiency than other methods of data storage. Since they can access data without reading through every file that precedes the desired information, relative files offer almost random access. If you have a large sequential file, you must first load the entire file into the computer's memory for processing. Then to retrieve data, you may have to read every file before you find the information you want. With sequential files, if you want a

piece of information that's stored in record number 100, you'll have to plow through records 1-99 first.

Suppose you have a CD collection of 500 titles and you want to catalogue it on index cards. If you put the titles in alphabetical order and read them as a sequential file reads data, you'd have to flip through the whole stack before you came to anything by ZZ Top or Pia Zadora.

With relative files, you can go directly to the data you want and read only that data. Just as with index cards, you can home in on the information you want without starting from the beginning and flipping sequentially through every file.

Since a relative file program uses only enough memory to read desired data, very little computer memory is actually used at one time. A small program can access 163 K of information that could be stored on a single-sided disk.

## Follow the Rules

Creating and using relative files is fairly easy, providing you follow a few simple rules. First, let's get some terminology straight. With relative files, information is stored in records, and each record contains various fields. In the following example, we'll create a mailing list. This whole list is our file. Each person on our list will be a record, and the various pieces of data about each person will be our fields.

For example, each record on our list will contain a person's first and last names, street address or post office box number, city, state, ZIP or postal code, and telephone number. These are the fields we'll set up for each record. We'll begin by calculating the total size of each record. This is done by adding the number of characters in each field. With our mailing list, we'll estimate how many characters each field should contain.

| Field\# Field name | Number of <br> Characters |  |
| :--- | :--- | :--- |
| 1 | Last name | 15 |
| 2 | First name | 15 |
| 3 | Address1 | 20 |
| 4 | Address2 | 20 |
| 5 | Address3 | 20 |
| 6 | State | 10 |
| 7 | Zip Code | 09 |
| 8 | Phone \# | 12 |

Total 121

The record size for this file would be 121. Since the PRINT\# statement used with relative files adds a carriage return to the end of each string, you should add one extra character to each field. So make it 129. If you try to write 15 characters plus a CHR\$(13) (carriage return) to a record set up for 15 , you'd get an ERROR 51, OVERFLOW IN RECORD.

DOS uses a single ASCII character to represent the record length. This means that the largest single record could be 254 characters. This is very important to remember. If you want more information stored in each record, you'll have to split them in two. For example, a 500-character record could be split into two 250-character records. You could use odd and even numbers to identify each data pair.

The largest number of records you can have is 65,535, but you'll never use this many because of space limitations on a floppy disk. A freshly formatted disk should show 644 blocks free. Blocks, or sectors, are the areas on a disk that can hold up to 256 characters of information. DOS uses 2 of these characters, so that leaves 254 bytes available for data.

Relative files use side sectors as an index to keep track of which sectors contain data. Each side sector has room for 120 two-block pointers that let DOS quickly locate the various blocks assigned to the file.

As many as six side sectors can be assigned to a file since each can deal with 120 disk sectors (not records) for a total of 720 , more than the number of blocks on a disk. Filling a 664-block disk would use 6 blocks for side sectors, leaving 658 blocks for data. Each block can hold 254 characters, giving you 167,132 characters in the largest possible relative file. You can split this up any way that is convenient for your data. You could have 1671 records of 100 characters each or 658 records of 254 characters each.

## Create a File

We have to create a file before records can be stored or read. This is done by opening a data channel with the de-
sired filename and record length. You should note that DOS won't let you create relative files with record lengths of 42,58 , or 63 . These numbers represent ASCII values that have special meaning to DOS. The format for creating a relative file is as follows.

OPEN file\#, device\#, channel\#, "filename,L," + CHR\$(record length)

Let's start writing a program and call our file MAILLIST. We previously counted the number of characters we'd need in each record and decided on 129. Type in the following OPEN command, but don't run the program until we complete it.

## 1000 REM OPEN MAILLIST FILE 1005 OPEN 1,8,2,"MAILLIST,L,"+CHR\$(129)

Remember not to run it yet. It's now possible for us to put information into the file. In DOS, there's no command to check the number of records in a relative file; however, it's possible to store this number manually within the first record. Let's do this by positioning the record pointer to the first record and storing the number 1 . To do this, we must open the command channel.

## 1010 OPEN 15,8,15

The POSITION command for record 1 , position 1 is

```
1015 PRINT#15,"P"+ CHR$(2) + CHR$(1) +
    CHR$(0) + CHR$(1)
```

The $P$ is our pointer, and it tells the drive to look for a certain record. In CHRS(2) above, 2 is the channel we opened when we created the file in line 1005 (OPEN1,8,2,). Next, put the number 1 into the record, because all we have now is one record in our file.

## 1020 PRINT\#1,1

Print to the file number we assigned when we opened the file. (Remember OPEN 1,8,2.) Then, close the file and the command channel, and the file is ready to use.

## 1030 CLOSE1:CLOSE15

Run the program now, and a file called "MAILLIST" will be created and placed in the disk's directory.

## Writing and Reading

To read from or write to any record in our file, we open two channels, the DOS command channel and a file channel. Now we can position the record pointer to any record and field in the
file with the DOS POSITION command.

## PRINT\#15,"P" + CHR\$(channel number) + <br> CHR\$(rec\# lo) + CHR\$(rec\# hi) + CHR\$(position within record)

Notice that in the above line there are two characters that represent the record number (rec\# lo and rec\# hi). The formula for calculating these two numbers is as follows.

## RECORD \# = REC HI * 256 + REC LO

The record number can also be determined in other ways.

## REC $\mathrm{HI}=\operatorname{INT}($ RECORD \#/256 $)$ <br> REC LO = RECORD \# - REC HI*256

Translated, the command sequence would be as follows. (You don't have to

## TIPS ON USING RELATIVE FILES

Relative files are good ways to store data for quick and easy access, but many programmers avoid using them. Here are a few things to remember to avoid problems.

1. Always initialize the disk drive at the beginning of your program to reset all drive channels.
2. Always set the file pointer to the first byte in a record. The last parameter in the P command should be CHR\$(1).
3. Never write an empty string to the disk. This will cause the disk drive to lock in a continuous loop.
4. Never leave a file open after entering or editing data. Be sure to open, read/ write, and close the file in the same command sequence.

If you attempt to create a file that's too large for the space remaining on your disk, you'll get ERROR 52, FILE TOO LARGE. If you plan to store a lot of data, it's a good idea to devote a whole disk to a relative file.

Here's a short BASIC program to determine the maximum number of records you can have on a disk. To use the program, you must know how many free blocks remain on your disk and the total number of characters allotted for each record.

10 INPUT"NUMBER OF FREE BLOCKS ON DISK";FB
20 INPUT"TOTAL CHARACTERS IN RECORD";RL: IF RL<1 OR RL>254 THEN 20
30 IF RL=42 OR RL=58 OR RL=63 THEN PRINT"'DO NOT USE";RL; "CHARACTERS": GOTO 20
$40 \mathrm{SS} \%=((\mathrm{FB} / 120)+.99): \mathrm{BA}=\mathrm{FB}-\mathrm{SS} \%$
50 RP=(INT(BA*254/RL): IF RP465536 THEN $\mathrm{RP}=65535$
60 PRINT"THERE'S SPACE FOR";RP;"RECORDS"

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enter NEW before typing this next section. It and the remainder of the code are meant to be added to the previous program lines.)

10 OPEN15,8,15
15 OPEN1,8,2,"MAILLIST": REM WE ARE OPENING, NOT CREATING THE FILE
$40 \mathrm{R}=1$ : $\mathrm{P}=1$ : REM RECORD NUMBER 1 POSITION 1
45 GOSUB 500
90 CLOSE1: CLOSE15: END
500 REM POSITION RECORD POINTER
510 RC = R + 1: REM ADD 1 TO RECORD (REC1 IS ALREADY USED TO HOLD FILE LENGTH)
520 RH\% = RC/256: RL = RC-RH\% * 256:
REM TWO-BYTE ADDRESS; RH\% IS AN INTEGER
530 PRINT\#15, "P" + CHR\$(2) + CHR\$(RL) + CHR\$(RH\%) + CHR\$(P)
540 RETURN
999 END
Don't run the program yet.

## Record Contents

Each record is actually a string of information in itself. To read each field separately, we must calculate where it begins within the record. Here are the record sizes we established earlier. We can use these figures to determine
where to look for each field.

| Last name | $1-15$ |
| :--- | ---: |
| First name | $16-30$ |
| Address1 | $31-50$ |
| Address2 | $51-70$ |
| Address3 | $71-90$ |
| State | $91-100$ |
| Zip Code | $101-109$ |
| Phone \# | $110-121$ |

Now let's make a list of pointers for each field.

5000 DATA 1, LNAME, 16, FNAME, 31, AD1, 51, AD2, 71, AD3, 91, STATE, 101, ZIP, 110, PHNO

As you can see, this translates into Last name at position 1, First name at position 16, Address1 at position 31, and so on.

## Writing Data

Let's enter some information into a sample record. As we do, we'll write over line 45 in the earlier subroutine.

35 REM STORE RECORD
45 F\$(1)="JOHN": F\$(2)="DOE"
$50 \mathrm{~F}(3)=" 15$ HOLLYWOOD AVENUE"
55 F (4) $=$ " $\{$ SPACE $\}$
60 F\$(5)="HOLLYWOOD"

65 F\$(6)="CALIF."
70 F\$(7)="90135"
75 F ( 8 )=" $555-964-6652 "$
80 RESTORE: REM RESET DATA POINTER
85 FORLP=1T08: READP,X\$: GOSUB500: PRINT\#1, F\$(LP): NEXTLP

When you have this final block of code entered, you may run the program typed in so far. You may also want to save it to disk.

## Reading Data

Reading information is just the opposite. You set the pointer and use INPUT\# to read the information instead of PRINT\#, which is used to write it.

20 GOT0100
100 REM READ RECORD
110 R=1: REM RECORD 1
115 RESTORE: RESET BASIC DATA POINTER
120 FORLP=1T08: READP,X\$: GOSUB500: INPUT\#1,F\$(LP): NEXTLP
125 CLOSE1: CLOSE15
130 PRINT'"LAST NAME: ";FS(1)
135 PRINT"FIRST NAME: ";F\$(2)
140 PRINT"ADDRESS: "
145 PRINTF\$(3)
150 PRINTF $\$(4)$
155 PRINTF\$(5);", ";F\$(6),F\$(7)
160 PRINT'"PHONE\#: ";F\$(8)
175 END


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## REVIEWS

## TIE BREAK

Tennis anyone? You don't have to be a top seed tennis professional at Wimbledon to enjoy playing DigiTek Software's Tie Break. This computerized tennis game is for tennis lovers of all levels.

Tie Break offers three modes of play: world tournament, tournament, and training. World tournament is for those who want a real challenge. Here, you select up to 16 players (human or computer), and you must defeat all of them to win the championship. You then select the world tournament that you want to enter. These vary in level of difficulty and include Wimbledon, the French Open, the Masters, the U.S. Open, the Davis Cup, and the Australian Open. For extra realism, each player is assigned a racket of a certain tension and weight.

Perhaps you don't feel ready for world tournament play just yet. If you just want to compete against a few of your friends, select tournament play. Once again, each player is assigned racket weight and tension. You also select the surface type and color that you want to play on. Court types vary in difficulty since the ball may move faster or bounce differently on certain surfaces. For example, the ball will move faster on an asphalt or a PVC court than it will on clay.

Let's say that you haven't played for a while and are a little rusty. If you feel like practicing either before entering a world tournament or playing against your best friend who happens to be a tennis pro, then select training. Here, you can practice with a variety of computer players of varying skill levels.

If your friend wants to practice as well, you both can
play against each other or play doubles with two computer players. (To play against a friend, one person must use the joystick, and the other must use the 64's arrow keys and space bar to control the onscreen players.) This training mode also will let you experiment with dif-

Tie Break is easy to learn. In no time, you'll have a racket in your hand, be ready to compete in a world tournament, or be ready to play against the computer in the training mode. The level of difficulty depends on such factors as the number of players you must beat in a tourna-


This player on a clay court has just hit a high lob to his singles opponent in Tie Break, DigiTek's new tennis game.
ferent rackets and surfaces. Being able to practice with other players is a nice feature of this game, since some of the other computerized tennis games let you practice only by hitting balls tossed by a ball machine.

No matter what mode you select, you don't have to worry about moving your player to the appropriate court position to hit the ball. Tie Break automatically positions the player for return shots. You simply decide how you're going to complete your return shot. Some of the options are volley, lob, slice, topspin, and smash. The computer will decide if your shot will be forehand or backhand. You control your shot's speed, direction, type, and length. It's also possible to pause during the action or slow the game down.
ment, the tension and weight of your racket, the opponent you select, and the court surface. This game's challenging to play, but it would be even more challenging if there were an option to position your player yourself for return shots as opposed to having the computer do it for you.

The manual provides you with enough information to get you started quickly. All types of shots are explained in enough detail so that you'll soon learn how to perform each one. There are even diagrams to show you in more detail exactly how to hit certain shots. The manual also includes useful information on how to use trick shots to defeat an opponent.

Tie Break's graphics and sound effects are great on the 64. You watch the
games as though you were looking down from above. You see the ball, players, court, and net in a three-dimensional view. You can hear the sound each time someone hits the ball or the ball bounces off the court. Tie Break lets you know visually when the ball hits the net or is out of bounds. You can see just what type of shots the players are taking, and the scores appear on the screen after each point is scored.

Overall, Tie Break is fun and challenging, and it'll give you hours of entertainment. So if tennis is your racket, I think you'll love playing this game, especially if the weather is too nasty to go outside on the courts. Bring the true-to-life action and excitement of tennis to your 64 and give this game your best shot. See you at Wimbledon! CHRIS SAUCIER

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## CALC II

Years ago, I typed in a spreadsheet called SpeedCalc that I saw in Gazette. Since it has always loaded quickly, has been easy to use, and has provided correct answers with its calculations, I couldn't see any reason for switching to another spreadsheet. That was before I tried Calc II from Pankhurst Programming.

I'll have to admit that, at first glance, I wasn't impressed. I mean-a spreadsheet is a spreadsheet is a spreadsheet. They're made up of letters along the left side of the screen that identify rows and numbers run-

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ning across the top that identify columns. The intersection where a row and column meet is called a cell, and Calc II has plenty of those. In fact, it has 240 rows and 240 columns. A 64 doesn't have enough memory to use that many cells, but it does have room for about 20 K of data. The actual number of free bytes remaining is displayed at the top of the Calc II screen.

I'm going to assume that everyone knows what a spreadsheet is and jump right into Calc II's strong points and improvements over its earlier version. One feature that's almost worth the price alone is Calc Il's ability to split the screen into two, three, or four windows. This lets you see one part of the sheet while working in another section.

Many times I've been entering data in a budget with dates running across the top of the page and with income and expense categories running down the left. Things are fine as long as all the information is on one screen. By the time you've entered enough data to scroll across and down the page, however, you can no longer see the dates and the categories. After a while, you have to scroll back to the beginning to make sure you're entering data in the correct cells.

With Calc II you don't have this problem. You can open a couple of windows, lock the categories and dates in place, and then move anywhere on the sheet and still be sure you're not entering November's electric bill in the cell reserved for December's rent payment. You can divide the screen into any size windows you like.

Printing can also be a problem if your spreadsheet is larger than your printer can
handle. Calc II automatically splits at the end of a page, printing the rightmost sections on later pages. Other spreadsheets may wrap and print on the next line, destroying the row and column order. You can print just a portion of the sheet if you don't need all of it. You can also use embedded printer codes in Calc II to utilize your printer's compressed print modes.

Once you have data entered, you can manipulate it with Calc II's sorting routine. You can sort in ascending or descending order by row or column. This is the only area where I experienced any difficulty. I entered a group of names running down the page in a column. When I defined this block of data and asked the program to sort the column in ascending order, nothing happened. After several unsuccessful attempts, I asked it to sort the row, and then it worked. The same held true with data across the page. I call that a row, but the sort routine apparently considers that a column. Numbers sort with no problem, but text sorts according to word length unless cells are left-justified.

Data in cells can be justified left, right, or center, depending on your preference. Columns can be adjusted globally or individually to fit data of any width, from 3 to 38 characters. Other options include number of decimal places, auto or manual calculate, tape or disk, device number for printing, and screen and text colors. You can make these changes manually after a spreadsheet loads, but Calc II provides a separate program that lets you customize the program to fit your preferences. Then, anytime you run Calc II, it'll default to your cus-
tomized choices.
Another program that comes with Calc II is a merger program. Use it to combine different spreadsheet templates onto one larger spreadsheet. The resulting file can be a merger of any number of previously saved templates. Text and formulas must use different cells, however, or the second spreadsheet will overwrite those cells already in memory.

Speaking of templates, Calc II provides about 40 of them that are ready to load and run. Some of them help you calculate break-even points, business budgets, depreciation, loans, mortgages, standard deviations, and future worth of investments. Others will help balance your checkbook, keep a grade book, write sales slips, and figure factorials. One will even take room measurements and calculate how much wallpaper, paint, or carpeting you'll need for the job.

Several of the templates have borders and lines to set off data. In the past, I had to be content with a series of equal signs or dashes to create such effects. With Calc II, however, it's possible to use many of the Commodore keyboard graphics to create design elements that make your spreadsheet easier to read and more appealing to the eye.

Calc II treats mathematical calculations in the same fashion as Commodore BASIC, so you shouldn't have any problems entering your own formulas. It even accepts the Boolean operators And, Or, and Not.

Calc II also has a number of powerful built-in functions that can make your calculating chores easier. In addition to the usual Sums, Square Roots, Tangents, and Loga-
rithms-functions found in most spreadsheets-Calc II offers Rnd for random numbers, Peek to return a value of a memory byte, and Exp for exponents. Additional functions include Average, Minimum and Maximum values, and Number of Items in a block of data. Lookup and Index are functions used to find data in tables. Fix truncates remainders in calculations, and Round rounds the value up or down. An If function lets you make a choice between two options. How to use these and other functions is carefully explained in the manual.

A spreadsheet is a very powerful yet flexible tool that lets you perform a wide range of mathematical calculations. It's a productivity package you'll use again and again. If you don't have a spreadsheet, I recommend that you get one. Once you decide to get one, I heartily recommend Calc II. TOM NETSEL

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## BAD BLOOD

Mutants get no respect! In most computer games, mutant creatures are monsters or enemies. Found roaming in dungeons or forests, these creatures are simply a source of experience points and useful objects left behind after termination. Bad Blood, from Origin, is an adventure game that takes place in a postapocalyptic world in which the mutants are the good guys and the humans are corrupt and vindictive. There's a lot of bad

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## REVIEWS

blood here. Your goal is to bring peace to the Plains and prevent war between the mutant races and the humans who want to control and enslave them.

You start Bad Blood in the mutant town of Mardok. After watching an introduction, you choose a character for the game. The choices are Varigg, Jakka, and Dekker. Varigg is a green male, full mutant. Jakka is a female mutant, almost human except for her eye blasts. Dekker is a male human. All the characters have qualities that make them attractive alter egos. Their weaknesses make the game a different challenge with each character.

Bad Blood takes place on the Plains, a land laid to waste long ago by a nuclear bomb. The inhabitants managed to survive, but not without mutations. The humans tried to ignore the mutants and enslaved them. As time wore on, the mutants rebelled and formed their own communities. In addition to mountains and open spaces, the Plains consists of mutant towns Mardok, Okkarn, Nivvik, and Kitrum; human cities Xantinium and Yvrium; and a dangerous shell of a city called Zero City.

Bad Blood's game screen features an overhead view of your character's surroundings in a mock television cabinet. Below this window on the left is a list of five commands; a jar of brown fluid on the right marks the character's life level. The commands are Inventory, Examine, Use, Talk, and Options (Pause game, Save game, Load game, and Music on/off). To play Bad Blood, move the character around in the top window with joystick or keyboard and select commands with the joystick button or space bar. The first three commands bring up an inventory window for further choices.

It's necessary to carry on a lot of conversations with people you meet in Bad Blood. They'll provide clues and other necessary information. Selecting the Use command brings up another menu with options to chat, ask a character about a specific topic from another list, or say goodbye.

Finally, in combat, you use a weapon or bare hands to attack by pressing the joystick button or space bar. That's all there is to Bad Blood. You'll be playing the game in no time.

Bad Blood possesses the right difficulty for beginners, and seasoned adventurers will enjoy the atmosphere of the game and the strange characters. The well-written manual details the history of the Plains and also explains the slang of the region, such as tuff (warrior or soldier), hume (human), and mute
(mutant). It's a fresh perspective to see the entire game on one scale, as is not the case in a lot of other role-playing games. You only see the interiors of buildings when you enter the doors. Bad Blood takes advantage of its game world and contains a lot of interesting mutants, not all of whom are friendly. Just remember to watch out for the reptilian Kejek creatures; they capture other mutants as slaves for the humans in exchange for big rewards.

The graphics in Bad Blood are topnotch. The overhead view is particularly impressive because of the detail it provides. Scrolling is smooth and fast. The only time the game halts and accesses the disk is when you enter a building or move into a new area of the Plains. Fortunately, this access time is short. Bad Blood's graphics bring the mutants to life and offer a rich environment for exploration. The catchy music is constant throughout the game and adds a lot to the enjoyment. Sound effects are not as prevalent.

Bad Blood is a fine example of how much more enjoyable a game can be with a simple control system. Bad Blood's interesting land and inhabitants make this game an ideal choice for adventure fans.
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Larry Cotton

## Here's an interesting way to turn keytboard characters into sprites, and move them about with cursor keys.

## ALPHABET SPRITES

Let's transfer data from the 64's built-in character set to an interesting sprite format.

Lines 10-110 contain familiar sprite code, except for constant definitions in lines 50 and 60, which we'll look at in a moment. Line 120 begins a FOR-NEXT loop to copy three groups of character data.

Lines 130 and 170 access

RJ $1 \varnothing$ PRINTCHRS(147): POK E646,7\{10 SPACES $\}$
JD $2 \varnothing$ PRINTTAB (10) "PLEAS E WAIT 3 SEC.
RC $36 \mathrm{~V}=53248$ :REM 1 ST SP R CTRL REGISTER
HD $4 \varnothing$ POKEV $+21, \varnothing$ :REM TUR N SPR 1 OFF
HG 50 X $\$=$ "ABCDEFGHIJKLMN OPQRSTUVWXYZ": REM \{SPACE\}SEE LINE 33 g

RA $60 \mathrm{~S}=6656: \mathrm{E}=8$ : REM SEE LINE 146
BD 76 POKE $2 ø 40,192:$ REM $P$ OINT TO DATA
PC $8 \emptyset$ REM POKEV +23 , 1 : POK EV $+29,1$ : REM ENLARG E
EP 90 POKEV $+39,7$ :REM YEL LOW SPRITE
PX $100 \mathrm{X}=160: \mathrm{Y}=130:$ POKEV , X : POKEV $+1, \mathrm{Y}:$ REM \{SPACE\}LOCATE
HM 110 FORB $=12288 \mathrm{TO} 12350$ : POKEB, 6 : NEXT:B=1 2288: REM CLEAR SP RITE DATA AREA
FG $12 \square$ FORG=1TO3:GOSUB32 $\emptyset$

SM 130 POKE56334, $6:$ POKE1 ,51:REM KBD OFF
DR 140 FORI=øTO21STEP3:2 $=(T+S) * E: P O K E B+I$, PEEK $(Z+A):$ REM COP Y CHARACTER DATA
XK $150 \mathrm{~A}=\mathrm{A}+\mathrm{l}:$ NEXT: $\mathrm{A}=\varnothing: \mathrm{B}=$ B+1
GA 160 NEXT: $\mathrm{B}=\mathrm{B}+21:$ GOTO1 $2 \varnothing$
SB 176 POKE1,55:POKE5633 4,1: REM KBD ON
AM $18 \emptyset$ PRINTCHRS(147)
FB 190 POKE214,9:PRINT:P OKE211,17:PRINT" \{3 SPACES\}SS":REM 3 SPACES BEFORE \{SPACE\}SS
MQ 200 POKE $214,10:$ PRINT: POKE 211,17 :PRINT" \{3 SPACES\}SOR":RE M 3 SPACES BEFORE SOR
XB $21 \varnothing$ POKE $214,11:$ PRINT:

POKE211,17:PRINT" KEYS"
XB $22 \varnothing$ POKEV $+21,1:$ REM SP RITE ON
AA $230 \mathrm{~KB}=197: \mathrm{SH}=653: \mathrm{NK}=$ $64: M X=255$
CG $24 \varnothing$ K=PEEK (KB) + PEEK ( $S$ H) : IFK=NKTHEN24 6

MB 250 IFK=7THENY=Y+1
SE 260 IFK $=8$ THENY $=Y-1$
SC $27 \varnothing$ IFK $=2$ THENX $=\mathrm{X}+1$
CB 280 IFK=3THENX=X-1
EQ $290 \mathrm{Xl}=\mathrm{INT}(\mathrm{X} / \mathrm{MX}): \mathrm{X} 2=\mathrm{X}$ -xl*MX
QF 300 POKEV, X2: POKEV +16 , Xl: POKEV $+1, \mathrm{Y}:$ REM MOVE SPRITE
KG 310 GOTO24ø
JE $32 \emptyset$ READAS:IFA\$="*"TH EN176
HP 33ø FORT=1TO26:IFAS=M ID $\$(X \$, T, 1)$ THENRE TURN
FG 346 NEXT
HD 350 DATA $P, R, E, C, U, R$, *
the character ROM located from 53256 through 53463. POKE56334,0 turns off the keyboard, while POKE 1,51 switches the character ROM in. When the copying is complete, the two memory registers must be restored to normal with POKE 1,55 and POKE 56334,1. The order of poking in line 170 must be reversed from that of line 130 .

Between lines 130 and 170, the ROM-to-sprite data copying occurs. We set up the sprite's shape data in memory registers 12288 through 12350; B is 12288. Recall that each sprite shape is defined by 63 bytes (three columns of 21 bytes). The first letter whose 8 bytes of data we'll transfer will appear in the upper left corner of the sprite, controlled by addresses 12288, 12291, 12294, and so on.

A FOR-NEXT loop from 0 to 21 in line 140 begins copying the eight bytes of character data. STEP 3 ensures that the data bytes fall under each other in the sprite so the character will be readable. $Z$ is the ROM location of the character data. Its value is calculated by adding constant $S$ and variable $T$ and then multiplying by con-
stant E . (S and E are defined in line 60.) T comes from a subroutine in lines 320-350, which is called from line 120. Let's look at that subroutine.
$\mathrm{A} \$$ is a letter of the alphabet. $\mathrm{X} \$$ (the alphabet, defined in line 50 ) is scanned for a match. T indicates A\$'s place in the alphabet. Thus, if $A \$$ is the letter C, T will equal 3 . The subroutine returns control to line $130 . \mathrm{T}$ is then added to S in line 140, which determines Z's value-the place to begin peeking for character data.

In line 140, the first time through the loop, B is poked with whatever's in Z. However, line 150 increments $A$ (which starts as 0 ) by 1 , so the next time through the loop, $\mathrm{B}+3$ is poked with whatever's in $\mathrm{Z}+1$. Thus, as the sprite data registers are increased by three, the character data registers are increased by one.

After the loop is finished in line $150, A$ is reset to 0 , and $B$ is increased by 1 . The next two characters will be placed to the right of the first one in the sprite; the FOR-NEXT loop is finished in line 160. Finally, $B$ is increased by 21, and another loop begins in line 120. This places three more characters under the first three.

Lines 180-310 print a message and illustrate a spritemoving technique via the cursor keys. Line 230 looks at memory locations 197 and 653, which track keyboard presses. The sum of their peeked values equals $7,8,2$, or 3 , corresponding to down, up, right, and left cursor movements. Line 290 converts the sprite's horizontal position to pokable values for the two horizontal-positionmemoryregisters 53248 and 53264. Line 300 does the actual poking.

Experiment by deleting the first REM in line 80 and the printing in lines 190-210. Try other values for $S$ in line 60, X\$ in line 50, and 26 in line 330. $\square$

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## Hive.



# MACHINE LANGUAGE 

Jim Butterfield

## ROTATING BUFFERS

You may recall an earlier expedition into hexadecimal number printing. In this column, we'll expand on that subject.

Here's what this program will do. The user names a program file. Our program examines that file and reports two things: the load address and whether or not the last three bytes of the file are 0 . The load address of a program gives you a hint as to whether this is a normal program (generated with a SAVE command) or an unusual one that will need to be brought in with a LOAD "filename", 8,1 command. Normal load addresses vary from computer to computer, but these addresses almost always end with hexadecimal digits 01.

If the load address ends with digits 01, our program will read the rest of the file to catch the last three bytes. If each of the three are 0 , the program will print ALL BASIC.

For example, a program with a load address of \$0801 that ends with three binary 0s is more than likely a BASIC language program that was probably saved on a 64. That means it can be loaded with the normal ,8 extension.
The program must read all the bytes of the file in order to catch the last three, but it doesn't need to save all those bytes that it encounters first. A buffer large enough to hold three bytes is all that's required. As the data bytes come from the file, they'll be stored in one of these three addresses. A pointer will move across the three locations, looping around as needed. In other words, we have a rotary buffer. When we finally see the END OF FILE signal, the contents of those three locations will be the pieces of informa-
tion that we want to know.
The BASIC program first pokes the machine language code in place. Then it asks for a filename and opens logical file 1. The machine language program is called in to do the main job. When control returns to BASIC, the file is closed, and the program is finished.

Note that the file is opened and closed from BASIC. AIthough we could do the same job from machine language, we'd save little time or memory. It's nice to have BASIC on hand for such jobs. On other computers, BASIC wouldn't be there, and you'd lose this easy and flexible option. Since it's built into the Commodores, why not use it?

The machine language program is situated at addresses $\$ 2000$ to $\$ 2081$. When called, it connects to logical file 1 and reads the first two bytes into addresses \$2200 and \$2201. Those bytes are converted to hexadecimal and printed.

At address \$2021 we check to see that the last two digits of the load address are 01. To do this, simply examine the contents of $\$ 2200$. If you don't find value 1 there, skip to the end of the program.

Our rotary pointer is held in X; the value is temporarily stored in location \$2202 when we read in a new byte from the file. The data byte is stored in one of three locations in the range $\$ 2203$ to $\$ 2205$.

| 2027 | 8 E | 02 | 22 | STX | \$2202 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| 202A | 20 | E4 | FF | JSR | \$FFE4 |
| 202D | AE | 02 | 22 | LDX | $\$ 2202$ |
| 2030 | 9D | 03 | 22 | STA | $\$ 2203, X$ |
| 2033 | E8 |  |  | INX |  |
| 2034 | EO | 03 |  | CPX | $\# \$ 03$ |
| 2036 | DO | 02 |  | BNE | $\$ 203 A$ |
| 2038 | A2 | 00 | LDX | $\# \$ 00$ |  |
| 203A | A5 | 90 | LDA | $\$ 90$ |  |
| 203C | FO | E9 |  | BEQ | $\$ 2027$ |

Note that ST, the status byte, is at $\$ 90$ for Commodore computers from the VIC-20 on.

For early PET/CBM machines, substitute address \$96.

Once the file is completely read, it's easy to examine the three bytes of the buffer to see if they're all 0.

If the file does end with three 0 bytes, the program prints its ALL BASIC message. The loop to do this is at locations \$204B to \$2057.

The machine language program disconnects from the file by calling Kernal subroutine \$FFCC, prints a Return, and then passes control back to BASIC.

Full coding isn't given here, but you can disassemble it to see the details. Note the changes for older PETs on lines 110 and 270.

10 DATA 162,1,32,198,255,32,
20 DATA $228,255,141,0,34,32$
30 DATA $228,255,141,1,34,169$
40 DATA $36,32,210,255,162,1$
50 DATA 189,0,34,32,96,32
60 DATA 202,16,247,174,0,34
70 DATA 202,208,49,142,2,34,
80 DATA $32,228,255,174,2,34$
90 DATA $157,3,34,232,224,3$
100 DATA 208,2,162,0,165
110 DATA 144:REM 150 FOR PET
120 DATA $240,233,169,0,162,2$
130 DATA 29,3,34,202,16,250
140 DATA 170,208,13,162,0
150 DATA 189,119,32,32,210
160 DATA 255,232,224,11,208
170 DATA 245,32,204,255
180 DATA 169,13,76,210,255
190 DATA 72,74,74,74,74,32
200 DATA 107,32,104,41,15
210 DATA 120,248,24,105,144
220 DATA 105,64,216,88,76,210
230 DATA $255,32,65,76,76,32$
240 DATA $66,65,83,73,67,13$
250 FOR J=8192 TO 8321:READ X
260 POKE J,X:T=T+X:NEXT J
270 IF T<>14512 THEN STOP:
REM 14518 FOR PET
300 INPUT "NAME OF PROGRAM FILE";F\$
310 OPEN 15,8,15:OPEN 1,8,3,F\$
330 INPUT\#15,E,E\$,E1,E2
340 IF E<>0 THEN PRINT E;E\$;E1;E2:END
350 SYS 8192
360 CLOSE 1

## VIEW FROM CZECHOSLOVAKIA

Don't worry if you hear us talking favorably about Commies
in Czechoslovakia these days. The Communist party hasn't ruled in our country since November 1989. When we talk about Commies now, we're talking about our Commodore computers.

Czechoslovakia is a free country in the heart of Europe; its population slightly exceeds 15 million. It's a mountainous country with a colorful history.

Now back to the Commies. Thanks to the Communist regime, the value of the Czechoslovak crown has fallen drastically in comparison to its preWorld War II value. The present exchange rate is about 30 crowns to the U.S. dollar.

Now hold your breath. The average monthly salary of a Czechoslovak citizen today is 2,700 crowns. That's about \$90. During the Communist rule, a 64 was available only through special shops for almost 10,000 crowns (\$330). A 1541 disk drive unit cost about the same amount.

At that time, though, the average salary was much lower, and the exchange rate was absurd. The only rational way to get a computer was to import it from Germany or another West European country. Thanks to bureaucratic Communist formalities, this was never an easy process. Nowadays, a 64 costs about 5000 crowns (\$165). Since it's now easy to travel throughout Europe and the formalities are minimal, most people prefer to buy their 64 s in Germany.

Compared with other 8-bitters, 64 s are probably the most widespread machines here; Sinclair Spectrums formerly held that distinction. There are also some Atari, Sord, and Sharp computers
around. As for 16-bit machines, the Amiga 500 is very popular, as is the Atari line. IBM compatibles are purchased by business people, but Apples and Macs are seldom seen.

Commodore software isn't available in stores here. As far as I know, there has never been any means of buying software for our beloved computers. As a result, 90 percent of all programs around here are pirated.

Here's another reason why pirating is so widespread: A standard game costs about 750 crowns (\$25), which is about one-third of an average monthly salary. Only a madman would consider buying software at that price. All over Europe there are teams of software crackers providing copies of pirated software, and programs without copy protection spread quickly.

The most common way to get software on disk or tape, which is still popular here, is to swap programs with your friends. Another method is to pick up a bunch of disks or a couple of tapes and head for a Commodore club. There are two of them here in Prague, and trading is popular. Members might swap Bard's Tale 3 for Last Ninja 3 or Boulder Dash for Maniac Mansion, or possibly buy a 1541 brochure. One club publishes instruction manuals for programs and peripherals as well as for computers. The club is combined with an Amiga group, which has a bad effect on weaker individuals, who, instead of squeezing bytes out of their 64 s , bounce off to Amigaland.

Club meetings usually take place twice a month in a rented hall. Some tables are put together to form a counter for selling books and brochures; other tables are used for trading and copying. Copying is performed on 64 s or 128 s with
disk drive units or Datasette tape recorders, which often have some kind of homemade adapter for smooth copying. Members or visitors bring equipment from home, since the club doesn't provide computers. Once a month, lectures on computer topics are held. Most of the people you meet at a club are young.

I've noticed recently that the number of Commodore owners is slowly decreasing. I'll try to explain why. The 64 and 128 are generally considered to be affordable game machines. A person who wants to do word processing or some other "serious" application thinks of buying an IBM or compatible. Amigas are bought by wealthier game players (or serious users). Because some people have never learned to use their Commies fully, they don't think much of them, and they want to get rid of them.

Modems are almost unknown here. This is due partly to our rotting telecommunication system and also to public ignorance of electronic bulletin boards and E-mail. Moreover, long-distance calls are extremely expensive. Just a normal chat with an overseas friend can swallow and digest your salary in a jiffy.

Many new computer magazines are showing up on our newsstands, but several of them are just translations of German or other imported publications. Unfortunately, we don't get COMPUTE, and there isn't a good magazine available here that's dedicated to the 8 -bit Commodores. That's too bad because, as I said, many Commodore owners in Czechoslovakia often never really learn what great machines they have.

Emil Heyrovsky lives in Prague. He is the coauthor of Padlock (January 1992).

## The more graphics you collect, the more you wish for a way to access and organize them hetter.

## GRAPHIC SCRAPS

Since desktop publishing and writing are what I do most with GEOS, I collect graphics, along with utilities to handle them as efficiently as possible. In earlier columns l've mentioned some of the better sources for GEOS graphics-Lamb Art \& Design, for exampleand suggested ways to convert graphic images from other formats into GEOS.

After you've collected all these terrific graphics, you still have to get them into your documents. Back in the August 1991 column I mentioned Scrap It, a utility which clips photo scraps out of geoPaint documents. Since many collections of artwork for GEOS come in that form, Scrap It is essential. Other collections come in prepared photo albums, such as the clip art files from Susan Lamb (3575 East County 18th Street, Yuma, Arizona 85365) and those from GeoWorks itself (GEOS Clip Art Disk, 2150 Shattuck Avenue, Berkeley, California 94704). Graphics have to make it into photo scrap form, if they're going to be of any use, because photo scraps are the way GEOS moves images between applications.
A photo scrap is simply a small chunk of bitmap, the dot pattern that makes up a graphic image. The GEOS operating system tags photo scraps as system files and handles them in a special way. You can't rename a photo scrap, for example, since applications are designed to look for the filename PHOTO SCRAP when you select a tool to import a graphic into your document. There can be only one such file with that filename on any given disk at a time. Photo albums are collections of such scraps, and the key to using photo scraps efficiently is to handle albums efficiently.

The primary tool for handling photo albums is the photo manager desk accessory (currently in version 2.1, which works in 40 - and 80 -column modes). Since the photo manager can access any of the photo albums on the disk, you use it to find the image you want and copy or cut it into an individual scrap. That scrap can then be imported using the Edit menu functions.

So far that's basic GEOS operation, and you've likely mastered it already. But the more graphics you collect, the more you wish for a way to access and organize them better. The photo manager performs its job admirably, but it can't access scraps on another drive. This means your photo albums, which are tremendous disk-space eaters, must be specially prepared for each project, with only the images you'll require, or copied in and out as needed. But then if you want to create an album of only the clips you're likely to need, there's no easy way to move them from one album to another without opening and closing each album to make a transfer.

Now if you've read this column before, you know that I only pose dilemmas if I have a solution in mind. In the case of photo scraps, there are several excellent utilities available which can make all this shuffling of graphics a breeze. The program AlbumCopy by Michael Myers presents you with a control panel which allows you to select source and destination albums and then flip through the clips to choose which ones you'd like to transfer. It can't get much easier than that! To download it from Q-Link, request ALBUMCOPY, which was uploaded by GeoLib PH.

This utility is also handy for reducing the size of any oversize photo albums you've creat-
ed with earlier versions of GEOS that the GEOS 2.0 photo manager can't handle. This happens because the version 2.0 albums hold only half as many clips as those of the older model-60 as compared to 120. If you'd rather just revert to the old version so you can work with the old photo manager, get a copy of Album Reverter, written by Joe Buckley (ALBREV.SFX on Q-Link, uploaded by Red Storm). This utility reverses the update process that the new photo manager automatically performs when you try to open an olderstyle album.

But the single most helpful program you can get for using photo scraps comes in two incarnations, one a desk accessory and the other an application. Scrapgrab, the desk accessory version, lets you select a photo from an album or a scrap on a disk in a different drive. The application version, identical except that it handles larger scraps, is called Photograb. To download from QLink, look for SCRAPGRAB and PHOTOGRAB. GeoLib PH uploaded both of these.

With these utilities you can finally keep your photo collection where it belongs-on a graphics collection disk-and access your clip art when you need it from within geoPublish or other applications without those albums taking up every inch of disk space on your main work disk. The addition of these two files will let you effortlessly use your clip art, not be strapped down by it.

Imagine a disk of photo albums, all sorted into categories, which you can access, browse through, and select from at will as you geoPublish along. You'll never again have to drop out of your document to track down a graphic when you keep your graphics on a library disk and Scrapgrab on your work disk.

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# PROGRAMMER'S PAGE 

Randy Thompson

## POKE, WAIT, AND SYS

Use this handy reference sheet when you want to get your hands dirty mucking around in your 64's RAM, interrogating and manipulating memory, and making unconventional (and often unauthorized) direct calls to ROM.

Some commands will not work in immediate mode and must be run from within a program. Tips with an asterisk have been known to cause side ef-fects-but sometimes you need to break a few rules to get the job done.

WAIT is probably the least utilized of these three commands, so l'll use the rest of this column for a mini lesson in its use. WAIT halts the execution of a BASIC program until the contents of the memory address meet the conditions specified.

What all this means is that WAIT is a great statement to simplify key fetches and delays. Here are a few ways it can be used in your programs.

## 10 WAIT 198,15:GET A\$

This line waits for a key to be pressed.

## 10 WAIT 197,63:KEY=PEEK(197) 20 WAIT 197,64

Line 10 waits for a key to be pressed, and line 20 waits for it to be released.

10 WAIT 653,1
20 WAIT $643,1,1$
Line 10 waits for Shift to be pressed, and line 20 waits for it to be released. Change the 1 in each line to 2 , and the program waits for the press and release of the Commodore key. Substitute a 4 to wait for the Ctrl key.

Contributors to this list of coding voodoo are Michael Hall of De Soto, Texas; Jerry Krebs of Taylor, Texas; Stacy Olivas of Graham, Washington; and HeIen Roth of Los Angeles, California.
"Programmer's Page" is interested in your programming tips and tricks. Send them to Programmer's Page, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408. We'll pay \$25$\$ 50$ for each tip we publish.

## Screen Command

POKE 646,C
POKE 53280,C
POKE 53281,C
POKE 53272,21
POKE 53272,23
POKE 53265,PEEK(53265) AND 239
POKE 53265,PEEK(53265) OR 16
POKE 211, C
POKE 214,R
SYS 59296
SYS 58726
SYS 59516
SYS 59626
SYS 59848
SYS 59749

## Keyboard Command

POKE 198,0
POKE 650,128
POKE 650,127
POKE 650,0
POKE 649,1
POKE 649,0
POKE 649,10
POKE 808,239
POKE 792,193
POKE 808,234
POKE 808,237:POKE 792,71
WAIT 653,1
WAIT 653,2
WAIT 653,4

## BASIC Command

POKE 818,32
POKE 818,237
POKE 775,200
POKE 775,167
POKE 774,0
POKE 774,24
POKE 204,0
POKE 204,255
POKE 19,65
POKE 19,0

## System Command

SYS 58266
SYS 65126
SYS 64738

## Miscellaneous Command

POKE 56325,R
POKE 54296, 15:POKE 54296,0
WAIT 56320,16,16
WAIT 56321,16,16
SYS 62913

## Function

changes cursor color ( $0-15$ )
changes border color (0-15)
changes background color (0-15)
switches to uppercase mode
switches to lowercase mode
turns off the screen display
turns on the screen display
moves cursor to specified column (0-79)
moves cursor to specified row (0-24)
clears the screen and prints READY
homes the cursor
moves the cursor down
scrolls the screen up
scrolls the screen down*
inserts a line

## Function

clears keyboard buffer enables autorepeat for all keys disables autorepeat for all keys enables autorepeat for only the cursor keys, space bar, and Inst/Del key (computer's default)
disables keyboard buffer disables keyboard
returns keyboard to normal
disables Run/Stop key*
disables Restore key
disables Run/Stop-Restore and LIST*
reenables Run/Stop-Restore and LIST
waits for Shift to be pressed
waits for Commodore key to be pressed
waits for Ctrl to be pressed

## Function

disables SAVE
enables SAVE
disables LIST
enables LIST
prevents line numbers from listing
resurrects lines numbers
turns on cursor during GET*
turns off cursor during GET
turns off question mark during INPUT*
turns on question mark during INPUT

## Function

prints startup message and erases BASIC program
warm reboot (erases screen)
cold reboot (erases program)

## Function

changes cursor blink rate ( $0-255,58$ is normal) makes a click sound
waits for fire button of joystick in port 2 to be pressed waits for fire button of joystick in port 1 to be pressed prints the name of the latest loaded or opened file

## FILE LOGGER

By Roger Bachelder
File Logger is a short two-part program that will list all the files that you have on a disk. It presents you with the disk's BAM title, the disk ID, and each file's starting track and sector. File Logger's unique feature is that it also gives you each file's starting and ending address.

## Typing if in

The first part of File Logger is written entirely in BASIC. To help avoid typing errors, use The Automatic Proofreader to enter the program. See "Typing Aids" elsewhere in this section. After entering the first part of the program, be sure to save it to disk before exiting.

The second part of File Logger is written in machine language. Use MLX, our machine language entry program, to type it in. Again, see "Typing Aids." When MLX prompts, respond with the following values.

## Starting address: 6AAO

Ending address: 6E07
Save this machine language program as LOG.ML on the same disk as the BASIC program. File Logger will automatically load and run LOG.ML, so be sure to save it with this filename.

## Reading Disks

After the program runs, you'll see a menu giving you the option to LOG DISK or EXIT TO BASIC. Insert the disk you want to check and enter 1. You'll then be asked whether or not you want the output sent to a printer.

File Logger will then read the directory and present you with the disk name, ID, file type, track, sector, and blocks. It will then ask you if you want to see the starting and ending addresses. It prints this information in hexadecimal notation.

## FILE LOGGER

HE $10 \operatorname{IFPEEK}(83 \theta)=1$ THEN $72 \theta$
CQ 15 IFPEEK (27296) <>169THENLO AD"LOG.ML" , 8, 1
QJ 17 POKE8Ø8,225: POKE146, $\varnothing$
XS 20 POKE 53281,6: POKE53280,6 :CLR
JR 25 DIMF $(1 \sigma \theta): T P \$(\theta)=" X X X ":$ TPS(2) = "PRG":TPS(1)="SEQ

HG $36 \mathrm{TPS}(3)=$ "USR": $\operatorname{TPS}(4)=$ "REL
QD $40 \mathrm{H} \$=" \emptyset 123456789 \mathrm{ABCDEF} "$
RH 50 PRINTCHRS(142);"\{CLR\} \{DOWN\} \{BLK\} (C) 1992 COM pUTE PUBLICATIONS INTL L TD"
RA 51 PRINT"\{1 $\varnothing$ SPACES $\} A L L$ RIG HTS RESERVED"
JE 55 PRINT"\{DOWN\} \{WHT\} \{9 SPACES\}F I L E \{3 SPACES\}L O G G E R"
DH 60 PRINT"\{3 SPACES\}\{35 T\}"
DQ $8 \emptyset$ PRINT"\{DOWN\}\{28 SPACES\}"
AJ $9 \varnothing$ PRINT"\{3 DOWN\} 1 -\{YEL\}LOG DISK"
CD 100 PRINT"\{DOWN\} \{WHT\} 2 -\{SPACE\}\{YEL\}EXIT TO BAS IC"
PH 126 PRINT"\{2 DOWN\} \{WHT\}PLEA SE SELECT (1 - 2):";:PO KE $2 \varnothing 4, \sigma$
FX 130 GETAS
QG 140 IFA $\$=" 1$ "THEN 180
KP 150 IFA $\$=$ "2"THENPOKE $204,1:$ P RINTAS:END
KR 176 GOTOl3
QK 180 PRINT"\{CLR\}\{5 DOWN \} \{WHT\} SEND OUTPUT TO PR INTER (Y/N):";:POKE2ø4, $\theta$

QE 190 GETAS
RE 200 IFAS="Y"THENPOKE 204,1:P RINTA\$: Z=4: GOTO23ø
PQ 210 IFAS="N"THENPOKE $204,1: P$ RINTAS: Z=3: GOTO23ø
RD 220 GOTO19ø
MR 230 PRINT"\{CLR\}\{4 DOWN\} \{WHT\}LOOKING AT DIRECTO RY...";:BMS="":OPEN15,8 ,15,"I": OPEN3,8,3,"\$"
DK 240 CLOSE4:OPEN4,Z:DN=Z-3:T $B=10$ * $D N$
CE $25 \emptyset$ FORX=1TOl42:GET\#3,A\$:NE XT: PRINT".";
ES 260 FORX=1TO16:GET\#3,B\$:BMS =BMS+BS:NEXT:PRINT".";
KX $27 \varnothing$ GET\#3,A\$,A\$:GET\#3,Il\$,I 2\$
EP 275 IFZ $=4$ THENPRINT\#4, CHR\$ (1 3); CHRS(13)

CC 28 Ø PRINT"\{CLR\}";:PRINT\#4,T AB (TB);"\{8 SPACES\}BAM T ITLE $\{13$ SPACES\}ID"
CA 290 IFZ=3THENPRINT" $\{$ WHT \} \{8 SPACES\}\{24 T\}"
GG 295 IFZ $=4$ THENPRINT\#4,TAB (TB


RF $3 \emptyset \emptyset$ IDS=I1\$+I2\$: PRINT"\{WHT \} ";:PRINT\#4,TAB(TB);" \{8 SPACES\}";:PRINT\#4,BM \$;"\{6 SPACES\}";ID\$
FJ 365 IFZ $=4$ THENPRINT\#4,CHR\$(1 3) ; CHR\$(13)

GP $31 \varnothing$ PRINT" $\{2$ DOWN $\}$ \{WHT \}"; : P RINT\#4, TAB (TB);" \{3 SPACES\}TRK SEC BLKS
\{4 SPACES\}FILENAME
\{5 SPACES\}TYPE"
KA $32 \emptyset$ IFZ $=3$ THENPRINT" $\{$ WHT $\}$
\{3 SPACES \} $\{33$ T\}"
SP 325 IFZ $=4$ THENPRINT \#4,TAB (TB
);"\{3 SPACES\}-…-....-
"
BG 330 FORJ $=1 \mathrm{TO} 92:$ GET\#3,AS:NEX TJ
BS $340 \mathrm{M}=\mathrm{M}+1: \mathrm{GET} \# 3, \mathrm{~K} \$, T \$, \mathrm{~S} \$: \mathrm{IF}$ S $\$=$ " "THENS $\$=C H R \$(\sigma)$
PJ $350 \mathrm{~F} \$=" \mathrm{~F}: \mathrm{FORJ}=1 \mathrm{TO} 16: \mathrm{GET} \# 3$, AS: F =FS F AS: NEXTJ
MR 360 FORJ $=1$ TOI $0:$ GET\#3,AS:NEX TJ
JH 370 L=ø:IFAS〈>""THENL=ASC (A \$)
DX 38@ PRINT\#4,TAB(TB);"
\{3 SPACES ${ }^{\prime \prime}$;: PRINT" \{WHT \}";
KR 390 L $\$=$ RIGHT $\$($ STR $\$(\mathrm{~L}), 2):$ IF LEFT (L\$,1)=" "THENL\$="
"+RIGHT (LS,1)
BP $40 \varnothing$ IFASC $(T \$+C H R \$(\sigma))=\emptyset$ THEN IFL=ØTHEN56
KH 410 T\$=RIGHT (STRS(ASC (T\$)) , 2): IFLEFT\$(T\$,1)=" "TH ENT $\$=$ " $\emptyset "+$ RIGHT $\$(T \$, 1)$
GK $42 \emptyset$ S $\$=$ RIGHT $\$($ STRS (ASC (S\$)) ,2): $\operatorname{IFLEFT}(S \$, 1)="$ "TH ENS $\$=" \varnothing "+$ RIGHT $\$(S \$, 1)$
AH $43 \varnothing \mathrm{~K}=\mathrm{ASC}(\mathrm{K} \$+\mathrm{CHR} \$(\varnothing))-128$
EQ 440 IFK<1ORK>5THENK $=\emptyset$
SP $45 \emptyset$ PRINT\#4,T\$;"\{2 SPACES $\} "$ ;:PRINT"\{WHT\}";
SP 460 PRINT\#4, S\$;"\{2 SPACES $\} "$ ;:PRINT"\{WHT\}";
BS $47 \varnothing$ PRINT\#4,L\$;"\{3 SPACES $\} "$ ;:PRINT"\{WHT\}";
BH $480 \mathrm{~K}=\mathrm{TP} \$(\mathrm{~K}):$ PRINT\#4,F\$;"
\{SPACE\}";:PRINT"\{WHT\}";
DE 490 IFK= ØTHENPRINT" $^{\text {\{WHT }\} " ; ~}$
EA 500 PRINT\#4,K\$:IFKく>2THEN52 $\sigma$
QJ $510 \mathrm{~F} \$(\mathrm{Q})=\mathrm{F} \$: \mathrm{Q}=\mathrm{Q}+1$
PM 520 GET\#3,AS:IEM<8THENGET\#3 ,A\$,A\$:GOTO54ø
EQ $530 \mathrm{M}=\varnothing$
RC 540 IFST $=$ ØTHEN $34 \varnothing$
CS 55ø CLOSE3
ES 560 PRINT: PRINT" ${ }^{\text {\{DOWN }\} \text { \{YEL }\}}$ DISPLAY \{WHT\}START \{YEL\}\& \{WHT\}END \{YEL\}AD DRESSES (\{WHT\}Y\{YEL\}/ \{WHT\}N\{YEL\}) \{WHT\}:";:PO KE264, $\sigma$
PQ $57 \varnothing$ GETA\$
MJ 580 IFAS="Y"THENPOKE 204,1:P RINTAS: GOTO61ø
PJ 590 IFAS="N"THENPOKE204,1:P RINTA\$: POKE83ø, $\varnothing$ : GOSUB9 00: RUN
CP 600 GOTO57ø
JX 610 SYS 27296
XP 620 PRINT\#4, CHRS (13);CHR\$(1 3) : PRINT"\{CLR\}"

HA 630 CLOSE3: $\mathrm{X}=-1$

AX 640 PRINT＂\｛WHT\}"; :PRINT\#4,T AB（TB）；＂\｛5 SPACES\}FILEN AME $\{9$ SPACES $\}$ START \｛3 SPACES\}END"
CK 645 IFZ $=4$ THENPRINT\＃4，TAB（TB

－
CA 650 IFZ $=3$ THENPRINT＂$\{W H T\}$ \｛5 SPACES\}$\{29 \mathrm{~T}\}^{\prime \prime}$
FE $660 \mathrm{X}=\mathrm{X}+1: \operatorname{IFF} \$(\mathrm{X})=$＂＂THENPOK E83 $\varnothing, \emptyset:$ GOSUB $9 \varnothing \sigma$ ：RUN
RC 670 PRINT＂\｛WHT ${ }^{\prime \prime}$ ；：PRINT\＃4，T AB（TB）；＂\｛5 SPACES\}";F\$( X）；＂＂；
DC 680 FORV＝16TOlSTEP－1：P\＄＝MID $\$(\mathrm{~F} \$(\mathrm{X}), \mathrm{V}, \mathrm{I})$
PC 69 IFPS＝CHR\＄（160）THENNEXTV
KH $700 \mathrm{~F} \$=\mathrm{LEFT}(\mathrm{ES}(\mathrm{X}), \mathrm{V})$
JF $71 \emptyset$ POKE $830,1: L O A D E \$, 8,1$
GP 720 A＝PEEK（828）：B＝PEEK（829）
AH $73 \emptyset$ PRINT＂$\{$ WHT $\}$＂；：GOSUB78
XC 740 PRINT\＃4，＂$\{2$ SPACES $\} " ;$
JH 750 A＝PEEK（175）：B＝PEEK（174）
EF 760 PRINT＂$\{W H T\} " ;$ GOSUB78 0
SB 770 PRINT\＃4：GOT066
FP 780 PRINT\＃4，＂\＄＂；：W＝A：GOSUB7 $90: W=B$ ：GOSUB790：RETURN
XP $790 \mathrm{~J}=\mathrm{INT}(\mathrm{W} / 16): \mathrm{I}=\mathrm{W}-\mathrm{J} * 16$
XA $8 \emptyset \emptyset$ A $\$=M I D S(H \$, J+1,1): B \$=M I$ DS（HS，I＋1，1）
XA $81 \emptyset$ PRINT\＃4，AS；BS；：RETURN
PJ $9 \emptyset \emptyset$ PRINT：PRINT
PC 905 PRINT＂\｛HOME $\}$ \｛ 23 DOWN \} \｛BLU\} \{7 SPACES\}PRESS AN Y KEY TO CONTINUE＂
SB $91 \emptyset$ FORDE＝1TO1ø 0 ：GETAS：IFAS ＜＞＂＂THEN95б
KP 920 NEXT
ME 936 PRINT＂\｛HOME $\}$ \｛ 23 DOWN \} \｛WHT $\}\{7$ SPACES $\}$ PRESS AN Y KEY TO CONTINUE＂
CH 940 FORDE＝1TOI $\varnothing$ ：GETAS：IFAS ＜＞＂＂THEN95の
ER 945 NEXT
GF 946 GOTO9Ø5
CD 950 RETURN

## LOG．ML

6AA ：A9 C C 8D $3 \emptyset$ Ø3 A9 6A 8D 50
 6AB $0: 3 \emptyset \quad 63$ A9 548 D 31 03 60 7A 6AB8： $0 \emptyset \quad 8 \mathrm{C} \quad 3 \mathrm{C} \quad \emptyset 3 \quad 8 \mathrm{E} \quad 3 \mathrm{D} \quad \emptyset 3 \quad 60 \quad 38$ 6ACØ：85 93 A8 D 13 8C EF 6D 77 6AC8：B1 BB C9 24 FG ØA A6 BA 98
 6AD8：A5 93 4C A5 F4 B1 BB 99 C8 6AED：Fの 6D C8 C9 3A D 93 8C E6 6AE8：EF 6D C4 B7 9ø EF 8C EE 71 6AF ：6D $2 \emptyset$ AF 55 A5 11 8D 1278 6AF8：6C AD 90 DD 8D 13 6C AD 8C 6B Øø：15 D 0 8D 14 6C A9 59 Ag E5 6B68：6C $85 \mathrm{AE} 84 \mathrm{AF} A 9$ Øø A 95 6B10：03 8D ØF 6C 8C 10 6C A9 9B 6B18：57 20 E7 6B Aø Øø B1 AE 6D 6B20：20 A8 FF C8 C 020 9 20 F6 5C 6B28：20 AE FE $18 \quad 98 \quad 65 \mathrm{AE} 85 \quad 79$ 6B30：AE 9ø 93 E 6 AF 1898 6D CD 6B38： 0 F 6C 8D 0 F 6C $9 \emptyset \quad 93 \mathrm{EE} \mathrm{EE}$

6B40：10 6C C9 A7 AD 10 6C E9 5E 6B48： 04 9ø CC A9 Ø2 Aの Ø3 8D 9F 6B50：日F 6C $8 \mathrm{C} \quad 10$ 6C A9 45 6B58：E7 6B 2ø AE FF $78 \mathrm{AD} \quad \emptyset 0 \quad 2 \mathrm{~A}$ 6B60：DD $29 \begin{array}{llllllll} & 63 & 85 & 11 & \emptyset 9 & 2 \emptyset & 8 D & \text { A3 }\end{array}$ 6B68： $0 \emptyset$ DD 2C $\quad \emptyset \emptyset$ DD $7 \emptyset$ FB 18 FC 6B70：AD 11 D $\begin{array}{llllllll}29 & 07 & 69 & 2 F & 8 D & D 8\end{array}$ 6B78：24 6C A9 gØ 8D 15 DØ 85 99 6B80：AF 2015 6C AC $\quad 0 \emptyset$ 6E 3013 6B88：3C F $\emptyset \quad 05$ A9 FF 8D 01 6E 9B 6B90：A2 01 A5 AF D 17 AE Ø2 EA
 6BAØ：B9 D $\emptyset \emptyset 4$ A6 C3 A4 C4 8634 6BA8：AE $84 \mathrm{AF} A 2$ g3 AØ 00 E8 9B 6BB $: \mathrm{BD}$ ØØ 6E B1 AE E6 AE D D 8E 6BB8： 02 E 6 AF EC 01 6E $9 \emptyset$ EF E1 6BC $: A D \quad \emptyset \emptyset \quad 6 E \quad D \emptyset \quad B C \quad 2 \emptyset \quad D 4 \quad 6 B \quad C 4$ 6BC8：98 30 96 A6 AE A4 AF 18 A2 6BD $: 60$ 4C 30 F5 AD 12 6C 8564 6BD8： 11 AD 13 6C 8D 90 DD AD A2 6BED：14 6C 8D 15 Dg 58 60 8D 16 6BE8：$\emptyset E \quad 6 \mathrm{C}$ A5 BA $2 \emptyset$ Bl FF $24 \quad 2 \mathrm{E}$ 6BF $0: 903013 \mathrm{~A} 9 \mathrm{FF} 2093 \mathrm{FF} \mathrm{C} \emptyset$ 6BF8：A Ø øØ B9 ØC 6C $2 \emptyset$ A8 FF 4D 6C冋日：C8 C $\quad 66$ 9の F5 60 2の D4 7D 6C $08: 6 \mathrm{~B} \quad 4 \mathrm{C} \quad 67 \mathrm{E7} 4 \mathrm{D}$ 2D 45 日2 $\quad \mathrm{B} 5$
 6C18：5 5 FB A $\emptyset$ Øø 38 A6 11 EA 95
 6C28： $67 \mathrm{~F} \emptyset \mathrm{~F} 5$ 8E 60 DD 8A 09 FD 6C30：20 AA EA EA 2480 AD Ø 0 4E 6C38：DD 4A 4A EA 4D Øø DD 4A FA 6C40：4A EA EA EA 4D $\emptyset \emptyset$ DD 4A 75
 6C50：DD EA 99 ØØ 6E C8 DØ C4 03 6C58：6Ø F 6C60：A2 Ø1 A5 22 Dø Ø2 A9 1295 6C68：85 $06 \quad 86 \quad 97$ A9 $\mathrm{B} \emptyset \quad 2 \emptyset \quad 25 \quad 3 \mathrm{C}$ 6C70：Ø3 A9 EØ $2 \emptyset 25$ Ø3 C9 Ø2 1E 6C78：B $\emptyset \quad \mathrm{F} 2$ 8D $9018 \quad 6 \emptyset \mathrm{~A} 2 \mathrm{~g} \quad 9 \mathrm{~F}$ 6C80：86 F9 8D 98 62 9D 5B 0295 6C88：4C C6 D5 $85 \quad \emptyset 6 \quad 86 \quad 97 \quad 18 \quad \mathrm{BC}$ 6C90：68 69 Ø1 8D 76 Ø3 68 8D 0 F 6C98：77 63 A5 66 26 Dl 03 A9 FA 6CAØ： $06 \quad 85 \quad 31 \quad 2 \emptyset \quad 0 A$ F5 50 FE CD 6CA8：B8 AD 01 1C 9130 C8 D $\quad 30$ DA 6CBØ：F5 AØ BA 50 FE B8 AD 0140 6CB8：1C 99 Øø Ø1 C8 D 6420 A9 6CCØ：E F8 2б E9 F5 C5 3A FØ 17 6CC8： 65 A9 65 4C 69 F9 4C 1E DD
 6CD8： 01 ØE 06 ØC 04 ØA 02 Ø8 8 B

 6CF $0: \emptyset 629$ ØF AA BD 78 Ø3 AA 24
 6Dø日：D FB 8E gの 18 8A ØA 29 3C 6Dø8：$\emptyset \mathrm{F}$ 8D Øø $18 \quad 68$ AA BD 7831 6D1Ø： 03 8D ØØ 18 ØA 29 日F EA 4 F 6D18：8D 90 18 C8 D 0 C8 A9 08 4E
 6D28：1C $6038 \quad 85$ Ø6 E5 $22 \mathrm{~F} \emptyset 85$ 6D30：41 $49 \mathrm{FF} 18 \quad 69 \quad 61$ ØA AE 91 6D38：$\emptyset \emptyset$ 1C A8 $3 \emptyset \quad$ Ø3 CA 88 2C B2 6D40：E8 C8 8A 29 Ø3 8544 AD 6A 6D48：Øด 1C 29 FC 0544 8D $0 \emptyset \quad 73$ 6D50：1C A9 8F 8D 05 18 $2 \mathrm{2C} 05054$ 6D58：18 30 FB 98 D 18 D9 A5 9693 6D60：85 22 20 4 B F2 8543 AD 21 6D68： $0 \emptyset 1 C \quad 29 \quad 9 \mathrm{~F}$ 1D 1A 64 8D 50

6D7Ø：Øø 1C 6Ø Øø $2 \emptyset 4 \emptyset$ 6Ø A9 CA 6D78：12 A2 01 6D80：A9 Ø2 85 ØA A8 B9 Øø 0634 6D88：29 87 C9 82 D 21 AE 96 3A 6D90： 04 BD 97 04 D9 $03 \quad 66$ F 9 E7 6D98： 08 C9 2A $\mathrm{F} \emptyset 23$ C9 3 F D $\quad \mathrm{CD}$ 6DAØ：0E C8 E8 EC 95 Ø4 9Ø E9 68 6DA8：A9 AØ D9 $03 \quad 96 \mathrm{Fg} 1118$ 1A 6DBの：A5 日A 69 2の 90 CC AE 6126 6DB8：$\varnothing 6 \mathrm{AD}$ Ø $\emptyset \emptyset 6 \mathrm{D} \emptyset \mathrm{BD} \mathrm{F} \emptyset$ 1A DB 6DCØ：A4 ØA C8 8C 5 0 Ø1 D 0 日3 7D 6DC8： $2 \emptyset \quad 88 \quad \emptyset 3 \mathrm{BE} \quad \emptyset 1 \quad \emptyset 6 \mathrm{~B} 9 \quad 90 \mathrm{~B} 5$
 6DD8：10 EE 8C $50 \quad \emptyset 1$ A9 FF 8D 4A 6DEØ：ØØ Ø6 3Ø E4 A9 12 $2 \emptyset$ D1 39 6DE8： 03 A9 01 4C 69 F9 08 Ø0 D7 6DE ： 31 39 $39 \begin{array}{lllllll} & 31 & 2 \emptyset & 4 \mathrm{C} & 4 \mathrm{~F} & 47 & \emptyset 5\end{array}$ 6DF8：2D 4D 2F 4C Aø AØ Aø Aø Dl


Roger Bachelder does his program－ ming in Salem，Oregon．

## DEMO MAKER

## By Danny English

Creating a colorful，eye－catching demon－ stration can be a difficult task，but it＇s a snap with Demo Maker．You can create and edit rasters，text，scrolling effects， and many other options with the touch of a key．When you save your finished de－ mo on disk，it can be loaded and run like a BASIC program．

You can use Demo Maker as a loader with instructions to load and execute an－ other program，or you can use it to make an exciting title to your own creation．The vivid raster display will add luster to the dullest program．

## Typing it in

Demo Maker consists of two programs． The first part is written entirely in ma－ chine language．You must enter this pro－ gram with MLX，our machine language entry program．See＂Typing Aids＂else－ where in this section．When MLX prompts you，respond with the values given below．

## Starting address：3F7B Ending address：4A7A

When you＇ve finished typing，be sure to save the program to disk with the name DEMO．CODE．The second part of Demo Maker will load this program by that name．

Demo Maker＇s editor is written en－ tirely in BASIC．To help avoid typing er－
rors，use The Automatic Proofreader to enter this program．See＂Typing Aids＂ again．

## Raster Magic

When both programs are saved on disk，load the BASIC Demo Maker and type RUN．The demo code will be load－ ed，followed by the menu screen．

Creating a demo with the editor is very simple．Use the cursor keys to move the pointer up and down the op－ tions．To change colors，move the point－ er to the color you wish to change and press the + or－keys．The colors will cy－ cle forward or backward to the color you desire．

The raster colors are all coded by shades．For example，shades of red in－ clude brown，pink，and orange． Shades of yellow are actually a rain－ bow of colors．For effect，the large scrolling raster is split in half，allowing two shades to be seen at once．

## Text Options

The demo screen has a scrolling text display in the lower screen，fading or flashing text in the middle，and large ti－ tle text at the top．There are options on the menu to edit all of these．To select one of the options，move the pointer and press Return．

Because of the way the text is stored，a special text－entry routine is used that doesn＇t allow you to use the cursor keys．You simply type from left to right，however，and the cursor will wrap around normally．The Delete key does work in its normal fashion．Press Return when you＇ve finished entering， and the text will be stored in the demo．

The large title letters were created us－ ing a special character set．This char－ acter set doesn＇t contain punctuation marks or numbers；therefore，use only letters $A$ to $Z$ when entering the title．

In the center of the screen is a large section of text that＇s fading or flashing．The menu has options to con－ trol the color and speed of the fading． Notice that the top and bottom lines of this text appear on rasters in the demo． The color of these lines is specified in the menu by the text on raster color．

## Saving the Demo

You can preview your demo at any time by pressing the space bar．Press－
ing the space bar again will return to the menu．When the demo looks the way you want it，move the pointer to the save option and press Return． You＇ll then be asked if it should boot an－ other file．If you enter $Y$ ，you＇ll be prompted for the filename and SYS ad－ dress if it＇s a machine language pro－ gram．If you enter $N$ ，the program will tell the demo to return to BASIC after viewing．

The next prompt is the filename for the actual demo．Saving the program takes more than a minute，but then it can be loaded and run like a BASIC pro－ gram．If the demo is to boot another file，be sure to save it on the same disk．After watching the demo，press the space bar to continue．

Feel free to experiment with color combinations and creative text dis－ plays．Whether you＇re making the title to a game or just an attractive display， Demo Maker will amaze you．

## DEMO．CODE $\vee$ should be $\varnothing B$

3F7B：00 0B 08 ØA 00 9E 3230 6D 3F83：36 34 ø0 ø0 ø0 49 00 8C DB 3F8B：EA EA EA EA EA EA EA EA gA 3F93：EA EA EA EA EA EA EA EA 12 3F9B：EA EA EA EA EA EA EA EA 1A 3FA3：18 A9 7885 FB 69858516 3FAB： 25 A9 gA $85 \mathrm{FC} 69 \quad 0885 \mathrm{E} 3$ 3FB3：26 18 A9 0665 FB 8527 CD 3FBB：A9 4065 FC 8528 A 2 FF AD 3FC3：A 068 C FE CF 8C FF CF 94 3FCB：F6 64 B1 259127 C6 2528 3FD3：E4 25 D $\emptyset \quad 62$ C6 26 C6 27 CB 3FDB：E4 27 D $\emptyset 02$ C6 28 C6 FB 31 3FE3：E4 FB D $\emptyset$ E6 C6 FC E4 FC 4D 3FEB：DØ E $\emptyset$ A5 28 C9 AØ Bø 0A 7E 3FF3：85 $34 \quad 85 \quad 38$ A5 278533 7E 3FFB： $85 \quad 374 \mathrm{C}$ B2 46 20 20 20 D2

 4013：20 $20 \quad 20202020202093$ 401B： $20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 2 \sigma \quad 20 \quad 20 \quad 9 B$ 4023：20 2ø 2020202005014 E 402B：13 $19 \begin{array}{lllllll}\text { 40 } & 14 & \text { 日F } & 20 & 03 & 15 & \text { D } 4\end{array}$ 4033：13 14 GF ØD 99 1A 95 20 CF 403B： 09 ØE 14 ØF 2019 ØF 15 CF 4043：12 20 ØF 17 ØE 206405026 404B：就 ØF 2121202020202 E

 4063：20 20 20 20 20 2020 20 20 E3

 407B：20 $2012 \quad 01 \quad 1314 \quad 6512 \quad 20$ DA 4083：Ø3 ØF ØC ØF 1213 20 20 F8
 4093：18 14 20 03 日F 日C ØF 1232 409B： $13 \quad 20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 2095$ 40A3： $20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 20 \quad 24$






 4のE3：14 øC 65 2ø ØC 651414 C4 4बEB： $\begin{array}{lllllllll}5 & 12 & 13 & 2 \varnothing & 2 \emptyset & 2 \emptyset & 2 \emptyset & 2 \varnothing & \text { B9 }\end{array}$




 411B：20 $14 \quad 0518142013 \quad 031 F$
 412B：2の $2 \varnothing$ 2の $2 \varnothing$ 2A $2 \varnothing$ Ø1 ØE AD









 4183：Ø1 ØE ØF 14 Ø8 $6512 \quad 20$ C5
 4193：20 20 20 20 20 20 20 20 20 2016




 41C3：20 $20 \quad 20101205131341$ 41CB： $20131061010305 \quad 20 \quad 20$ Cl

 41E3： $65 \quad 2 \emptyset \quad 63$ ØF $\begin{array}{lllllll} & 10 & 15 & 14 & 29\end{array}$ 41EB： $05 \quad 20 \quad 94 \quad 95$ 日D $9 F 20$ ØD BB
 41FB：ØE ØF $17 \begin{array}{lllllll}17 & 20 & \text { Ø2 } & \text { ØC } & 01 & 13 & 83\end{array}$ 4203：14 69 日E $97 \quad 20 \quad 81 \quad 9312 \quad 23$


 4223：Ø1 日E 20 Ø3 15 13 14 ØF ØC 422B： $0 \mathrm{D} \quad 99$ 1A $\quad 95 \quad 2 \varnothing 1498 \quad 9976$

 4243：20 ØF 17 ØE $2017 \quad 9914$ E2 424B： $\begin{array}{llllllllll} & 20 & 14 & \boxed{ } 8 & 65 & 20 & 13 & 69 & \mathrm{~B} 6\end{array}$ 4253：ØD 10 ØC 05 20 ØD 65 ØE 81 425B：15 2D $0412 \quad 129916 \quad 65$ 日E 10 4263：2の $05 \quad \emptyset 4 \quad 99 \quad 14$ ØF 12 2E 79 426B：2の $2 \varnothing \quad 65 \quad \emptyset 4 \quad 99 \quad 1420 \quad 03$ C4
 427B： $05 \quad 18 \quad 14 \quad 2 \mathrm{C} \quad 2014 \quad 0914 \quad 45$ 4283：øC 05 13 2 C 2066610493
 4293：2の 0 D ØF $12065 \quad 2120 \quad 2 \varnothing 7 B$ 429B： $14 \quad 68 \quad 65 \quad 2064 \quad 61$ 1A 1A 41 42A3：ØC 09 ØE $07 \quad 20120113 \quad 61$ 42AB： $14 \quad 65 \quad 12 \quad 26 \quad 64 \quad 991316$ 3A 42B3：ØC Ø1 1920 Ø3 Ø1 ØE 20 FB 42BB： $02 \quad 65 \quad 20 \quad 15 \begin{array}{llllll}13 & 65 & 64 & 20 & \text { AC }\end{array}$

 42D3： 05 ØE $2 \emptyset$ Ø1 20 Ø2 ØF ØF A8 $42 \mathrm{DB}: 142014$ ØF 26 Ø1 ØE $\quad$ ØF 16

42E3：14 08 Ø5 12 2Ø 06 日9 0C 6D 42EB： 05 2E $20 \quad 201408 \quad 65 \quad 206 \mathrm{~F}$ 42F3：10 ØF 13 13 13 Ø9 02 Ø9 日C 46 42FB： 09140996513200112 A8 4303： 05 20 65 ØЕ Ø4 ØС 0513 Ø3 43øB：13 21 2ø $2 \varnothing 15$ ØE ดC 9567 4313：ø1 13 Ø8 2014 Ø8 05 2ø CC 431B： $07 \quad 12061 \quad 1098 \quad 9903 \quad 20 \quad 55$ 4323：10 ØF 17 Ø5 12 2 の ØF 06 DD
 4333：2E $2 \mathrm{E} \quad 2 \mathrm{E} \quad 2 \varnothing \quad 2 \mathrm{~A} 2 \mathrm{AA} 2814 \quad 72$ 433B：ø8 Ø5 2の 03 ØF ØD 10 15 1D 4343：14 $05 \quad 20 \quad 94 \quad 65$ gD gF $2 \varnothing$ F3 434B： 0 D 01 ØB 0512 2の 2A 2A D9
 435B：ØE 19 20 05 ØE 07 ØC 09 31 4363：13 $08 \quad 20 \quad 20 \quad 20202020$ 5D
 4373：1F 3C $78 \mathrm{~F} 0 \mathrm{~F} \emptyset \quad 60 \mathrm{FF} 7 \mathrm{~F}$ BD 437B：707070707F 日0 0F 3F C4 4383：7870 Eの Eø Eの Ø0 FF 7F 13 438B： $7070707870 \quad 00 \mathrm{FF} 7 \mathrm{~F}$ 7E 4393：78 7878787 F 00 FF 7 F 86 439B： $78 \quad 78 \quad 78 \quad 78 \quad 7 \mathrm{~F} \quad 06 \quad 0 \mathrm{~F} \quad 3 \mathrm{~F} \quad 6 \mathrm{C}$ 43A3：7870 Eの Eø Eの Ø0 FC 7826 43AB：78 $7878787 \mathrm{~F} \quad 90 \quad 1 \mathrm{~F} \quad 9360$
 43BB： 00 ØØ $0 \varnothing$ ØØ Øの Øø FC 78 B4 43C3：78 $78 \quad 78 \quad 797 \mathrm{~F}$ Ø0 FC 78 B9 $43 \mathrm{CB}: 787878787800 \mathrm{Fg} 78 \quad 61$
 43DB：7C 7E 777371 日0 0F 3F 4F 43E3：7870 E 6 Eの E $\emptyset 00$ FF 7F 73 43EB： $707070707 \mathrm{~F} \quad 00$ ØF $3 \mathrm{~F} \quad 35$

 4403：787678 3E 0F 00 FF FF 4F
 4413：7076767070 70 F8 70 EA 441B：70 3838 1C 1C 06 F8 70 F5 4423：7070 787871 90 F8 $78 \quad 93$ 442B：38 1C $0 \mathrm{E} \quad 67$ Ø3 00 F8 7083 4433：38 1C 0 E $\quad 97$ 03 00 FF FF 29
 4443：Fの 78 3C 1E 1E 00 EØ F8 77 444B：3E ØE ØE 1C F8 ø日 Cø F8 3C 4453：3C 1C Ø0 Ø0 Ø0 00 Fの FC DF


 4473：3C 1C 00 Ø0 00 00 7E 3C 5A 447B：3C 3C 3C 3C FC 06 F8 C 017 4483：C $\varnothing$ C $\varnothing$ C $\varnothing$ C $\varnothing$ C $\varnothing$ クの FE 78 3D 448B：78 78787878 øø 3E 1C 61

 44A3：7C FC DC 9C 1C øø 1E 1C 48 $44 \mathrm{AB}: 1 \mathrm{C} 1 \mathrm{C} 1 \mathrm{C} 9 \mathrm{C}$ DC $\emptyset 0 \mathrm{C} 0 \mathrm{~F} 8 \mathrm{~F} 7$ 44B3：3C 1C ØE ØE OE Ø0 Eの F8 2F 44BB：3C 1C 1C 3C F8 $\emptyset 0$ C 0 F8 F2 44C3：3C 1C ØE ØE ØE ØØ EØ F8 3F $44 \mathrm{CB}: 3 \mathrm{C} 1 \mathrm{C} 1 \mathrm{C} 3 \mathrm{C} 8 \mathrm{~F} 8 \mathrm{E} 0 \mathrm{~F} 843$ 44D3：3C 3E Øб øの C $\varnothing$ Øの FE FE ØD 44DB： $8280808080 \quad 00$ 3E 1C 7A $44 \mathrm{E} 3: 1 \mathrm{C} 1 \mathrm{C} 1 \mathrm{C} 1 \mathrm{C} 1 \mathrm{C}$ Øø 3 E 1 C 40
 44F3：1C 1C 1C 1C 1C 00 3E 1C 50
 4503：3870 E C C 080 g 0 FE FE EE 450B：3C $78 \mathrm{~F} \emptyset \mathrm{E} \emptyset \mathrm{C} \emptyset \mathrm{F} \emptyset \mathrm{FF} \mathrm{FF} \mathrm{C} 7$
 451B：76 70 7F FF 06 Eの Eの E 10 4523：70 78 3F 日F 06707876 EF 452B：70 $76 \quad 7 \mathrm{~F}$ FF $067 \mathrm{~F} 7878 \quad 61$ 4533：78 78 7F FF $907 \mathrm{~F} 7878 \quad 6 \mathrm{~F}$ 453B：787878 FC 60 Eの EØ EØ 25 4543：70 78 3F 日F $067 \mathrm{~F} 7878 \quad 64$ 454B：78 $78 \quad 78$ FC $60 \quad 63 \quad 03 \quad 63 \quad 24$ 4553：03 63 Ø3 1F 06 Ø0 F8 76 D4 455B：70 $78 \quad 3 \mathrm{~F} \quad 1 \mathrm{~F} \quad 967 \mathrm{~F} 7978 \quad 7 \mathrm{~F}$ 4563：78 $78 \quad 78$ FC $\quad \emptyset 67878 \quad 78 \quad 72$ 456B：78 $78 \quad 7 \mathrm{~F}$ FF 9070707076 4573：707070 F8 ø0 707878 76 457B：7ø 70 76 F8 øの Eø EØ Eø 1E 4583：70 78 3F 0 F Ø日 7 F 7070 8C 458B：707670 F8 ø0 El El Eø 34 4593：70 78 3F 日F øб 7F 7170 9E 459B：707070 F8 ø0 03 ø0 0624 45A3：F8 78 3F 0 F 00 03 03 $03 \mathrm{B6}$ 45AB： $63 \quad 63 \quad 63 \quad 07 \quad 067070705 \mathrm{C}$ 45B3：7ø 38 3F ØF øの ØE ØE 07 B8 45BB： $07 \quad 63 \quad 03 \quad 01 \quad 06 \quad 7377 \quad 7 \mathrm{~F} \quad 37$ 45C3：7E 7C 78 F 6 00 Ø3 07 ØE F 2 45CB：1C $38 \quad 70$ F8 60.03030305 45D 3： $03 \quad 03030700 \quad 07$ 日F 1E C9 45DB：3C 78 FF FF $0 \varnothing$ 1E FE FE 18 45E3：1E 1E 1E 3E gø FC 1E gE EA
 45F3：1C 3C F8 Eの 60 ØE ØE ØE 2B 45FB： 0 E 1C FC FØ ØØ FØ 10 Øø 27 4603：$\varnothing 0$ Ø2 FE FE $\varnothing \varnothing$ Eø 20 Øб A3
 4613：1C 3C F8 Eø 00 FC 3C 3C 92 461B：3C 3C 3C 7E øø Cø Cø Cø 89 4623：Cø Cø Cø F8 øø 78787833

 463B： 00 日8 F8 F8 60 1C 1C 1C 3D $4643: 1 \mathrm{C}$ 1C 1C 3 E g日 FC 7C 3C 75 464B：1C 1C 1C 3E Ø0 OE ØE ØE B6 4653：1C 3C F8 Eの $0 \varnothing$ Eの $\emptyset \varnothing$ Øの AD
 4663：7C 3C FC E6 Øø EØ CØ EØ 31 466B：70 38 1C 3 E øの $\mathrm{F} \emptyset 78$ 1C 76 4673：1C 3C F8 Eの 06808080 CD
 4683：1C 38 F8 Eの $0 \emptyset$ Eの EØ CØ 5F 468B：C $0880 \quad 06$ ø日 9C DC．FC D1 4693：FC 7C 3C 1E Ø0 80 Cø EØ 8B 469B：70 38 1C 3 EE 6080808059
 46AB： $00 \quad 02 \mathrm{FE}$ FE $0 \varnothing 02974 \mathrm{C}$ ØC 46B3：Aø 49 A9 01 8D 19 D6 A9 44 46BB：1D 8D 18 D $\emptyset$ AD CE 47 8D ØF 46C3：16 D $\emptyset$ A9 00204647 A8 16 46CB：A2 3C B9 5847 EC 12 DØ 58 46D3：DØ FB 204647 E8 C8 C 660 46DB：30 D $\varnothing$ EF AD A2 47204646 46E3：47 2Ø 4D 47 Aの $0 \varnothing$ A2 $7 \varnothing$ F4 46EB：B9 8847 EC $12 \mathrm{D} \varnothing \mathrm{D} \varnothing \mathrm{FB}$ A $\varnothing$ 46F3：2ø 4647 E8 C8 C6 99 Dø C5 46FB：EF AD A3 $47204647 \quad 20$ 9D 4703：4D 47 A 00 A2 CA B9 88 5A 47बB： 47 EC 12 Dの D 6 FB $2 \varnothing 46$ C 4 4713：47 E8 C8 C 699 D 6 EF AD BD 471B：CD 47 8D 16 Dø AD A4 4743 4723：20 $46 \quad 47 \mathrm{AE} \quad 58 \quad 47 \mathrm{~A} \varnothing \quad 0149$ 472B：B9 58 47995747 C8 Cø 59 4733：30 D6 E5 8E 8747 AD ØD 77 473B：DC 29 61 FØ 63 4C 31 EA 48

4743：4C BC FE 8D 20 D $\emptyset$ 8D 2160 474B：DØ 6Ø A9 C8 8D 16 Dø A9 2C
 475B：ø8 ø8 08 ø2 Ø2 ø2 øø øø 29

 4773：ØF ØF ØF ØC ØC ØC Øб ØØ 80 477B： $00 \quad 09 \quad 09 \quad 09 \quad 02 \quad 62 \quad 02 \quad 08 \quad 22$ 4783：08 Ø8 6A ØA ØA 0б 06 ØE 64
 4793：ØC ØF Ø1 Ø1 ØF ØC ØB Øø DA 479B： 00 Ø0 05 Ø2 0001 01 ø0 $\mathrm{F} \varnothing$ 47A3：$\varnothing \varnothing \quad 0520202057454 \mathrm{CAE}$ 47AB：43 4F 4D $4520 \quad 544 \mathrm{~F} \quad 2 \sigma \mathrm{BE}$ 47B3：54 $48 \quad 45 \quad 20 \quad 20 \quad 20 \quad 2 \emptyset 43$ 2E 47BB：4F 4D $505554452044 \mathrm{E} \varnothing$ 47C $3: 45 \quad 4 \mathrm{D} \quad 4 \mathrm{~F} \quad 20 \quad 4 \mathrm{D} \quad 41 \quad 4 \mathrm{~B} \quad 45 \quad 7 \mathrm{~F}$ 47CB：52 20 C2 C4 CE CD 47 AD 1A 47D3：CD 47 C9 BF Fø 0160 A9 46 47DB：C7 8D CD $47 \mathrm{~A} \varnothing 00$ B9 71 C9 47E3： $679976 \quad 07$ C8 C0 27 D6 43 47EB：F5 Aø øø Bl FE C9 06 D 0 A8 47F3： 69 A9 E6 85 FE A9 4185 8C 47FB：FF $68 \quad 8 \mathrm{D} 97 \quad 67 \mathrm{~A} 5 \mathrm{FE} \quad 18 \mathrm{~B} 2$ 4803：69 Ø1 85 FE A5 FF 69 ø0 29
 4813：A5 47 C9 20 Dø 05 E8 E8 D8 481B：4C $38 \quad 48 \quad 38$ E9 40 9D 5048 4823： $64 \quad 18 \quad 69 \quad 409 \mathrm{D} 51 \quad 04 \quad 18 \quad 3 \mathrm{~F}$ 482B：69 40 9D 78 04 1869404 F 4833：9D $79 \quad 04$ E8 E8 C8 C 014 FF 483B：Dø D5 A2 00 Aの 00 B9 B9 30 4843：47 C9 2ø Dø 05 E8 E8 4C E4 484B：67 48 38 E9 40 9D A6 0465 4853：18 69 40 9D Al 041869 E2 485B：40 9D C8 $0418 \quad 6940$ 9D 51 4863：C9 Ø4 E8 E8 C8 Cø 14 Dø C7 486B：D5 60 Aø 009970 DB C8 22
 487B：50 D8 C8 Cø Aø D0 F8 60 2A 4883：AØ 009968 D9 99 F8 D9 1F
 4893：99 40 D9 99 F8 DA C8 C $\emptyset$ 5B 489B： 28 D $\emptyset$ F5 60 EE FØ CF AD C1 48A3： $\mathrm{F} \emptyset$ CF CD 9D 47 B ■ 17 AC øC 48AB：Fl CF B9 $9147 \quad 2083 \quad 4883$ 48B3：AD F1 CF C9 0 B B $\emptyset 0160$ AB 48BB：A9 øø 8D Fl CF $6 \emptyset$ EE Fl Cl 48C3：CF A9 60 8D Fø CF 60 AD B4 48CB：A1 47．C9 61 F 06160 EE 83 48D3：F3 CF AD F3 CF C9 03 B $\emptyset$ A3 48DB： 6160 A9 60 8D F3 CF AD C3 48E3：F2 CF C9 01 F 016 CE CE 77 48EB ： 47 AD CE $47 \mathrm{C} 9 \mathrm{BF} \mathrm{F} \varnothing$ Ø1 6 A 48F3：60 A9 C 0 8D CE 47 A9 61 F7 48FB：8D F2 CF 60 EE CE 47 AD FE 4903：CE $47 \mathrm{C} 9 \mathrm{C} 8 \mathrm{~F} 0 \quad 0160$ A9 8A 490B：C7 8D CE 47 A9 00 8D F2 8E 4913：CF 60 A0 øø B9 70439969 491B： $08 \quad 30$ B9 $40449908 \quad 32$ C3 4923：B9 10 $4599 \quad 0834$ B9 Eø 3 E 492B：45 99 ø8 36 C8 Cø D $\varnothing$ D $\varnothing$ E6 4933：E3 AØ Øø A9 0099 Ø0 3112 493B：C8 C $\varnothing$ Ø8 D $\varnothing$ F8 $6 \varnothing$ AD 1126 4943：Dø 29 7F 8D 11 Dø A9 7F EF 494B：8D ØD DC AØ 46 A2 B5 8E 44 4953：14 63 8C 15 03 A9 81 8D E2 495B：1A D6 6078 A9 Fø 8D 1A 99 4963：D $\emptyset$ A9 31 8D 14 Ø3 A9 EA B2 496B：8D 15 Ø3 A9 81 8D ØD DC 3E

4973：20 A3 FD 20 5B FF 58 A9 F5 497B： $06 \quad 2046474 \mathrm{C} 4 \mathrm{D} 47$ A9 23 4983： 62 8D FF CF A2 Øø CA D $\emptyset$ F2 498B：FD CE FF CF D® F8 60 Aø 99 4993： 60 B9 29 4A 99 A7 62 C8 96 499B：Cø 50 D $\varnothing$ F5 6020154913 49A3：A9 61 8D 86 62 A9 932063 49AB：D2 FF A9 68 2ø D2 FF A9 53 49B3：$\varnothing \varnothing$ 8D 15 D $\emptyset$ A $\varnothing$ Ø $\varnothing$ B9 $9 \varnothing$ D1 49BB： $40 \quad 99 \quad 4 \varnothing \quad 05$ B9 EF $40 \quad 99$ D4 49C3：2F 06 C8 C $\varnothing$ EF D 0 EF 2057 49CB： $41 \quad 49 \quad 20$ ØE 48 AD $9 \mathrm{~F} \quad 47 \mathrm{B5}$ 49D3：2の $78 \quad 48$ A9 $002083 \quad 48$ ø8 49DB：AD Aø 47 2の 6D 48 AD 9E DE 49E3：47 $2 \varnothing 9148$ Aø 41 A2 E $\emptyset 69$ 49EB： 86 FE 84 FF A9 00 8D Fø 6B 49F3：CF 8D F1 CF 8D F2 CF 8D 72 49FB：F3 CF 20824920 CF 47 5A 4A $03: 20$ 9F $48 \quad 20$ CA 48 A5 C5 23 $4 \mathrm{~A} 日 \mathrm{~B}: \mathrm{C} 9$ 3C D6 EE 20 5E 49 A9 53 4A13：93 20 D2 FF A9 0685 C6 F2 4A1B：AD 29 4A C9 $02 \mathrm{D} \varnothing 61606 \mathrm{C}$ 4A23：20 $92 \begin{array}{llllllll}49 & 4 \mathrm{C} & \text { B8 } & 62 & 62 & 2 \mathrm{~A} & 56\end{array}$ $4 \mathrm{~A} 2 \mathrm{~B}: 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad \mathrm{BF}$ $4 \mathrm{~A} 33: 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A} \quad 2 \mathrm{~A}$ A9 47 4A3B：$\varnothing \emptyset \quad 8 \mathrm{D} 86 \quad 92$ A9 10 A2 A8 9 F 4A43：A 0220 BD FF A9 06 A2 D1 $4 \mathrm{~A} 4 \mathrm{~B}: \varnothing 8 \mathrm{~A} \varnothing \quad 1 \quad 20 \mathrm{BA} \mathrm{FF} 20 \mathrm{D} 5 \mathrm{AA}$ 4A53：FF AD 29 4A C9 01 F 06034 4A5B：4C $\quad 00$ C 0 A9 52 8D $77 \quad 62 \quad 82$ 4A63：A9 55 8D $78 \quad 62$ A9 4 E 8D 3C 4A6B：79 62 A9 6D 8D 7A 62 A9 47


## DEMO MAKER

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SA $2 \emptyset$ IF $A=\varnothing$ THEN $A=1$ ：LOAD＂DEM O．CODE＂，8，1
HD 30 DIM C $\$(15), \mathrm{V}(9), \mathrm{R}(4)$
SS $4 \varnothing$ FOR $X=\varnothing$ TO 15：READ AS：C （X）＝AS：NEXT
CG $5 \emptyset$ FOR $X=\emptyset$ TO 9：READ A：V（X） ＝A：NEXT
PD 60 FOR $X=\varnothing$ TO 44：READ A：POK E X $+32768, \mathrm{~A}: \mathrm{NEXT}$
AA $7 \emptyset \mathrm{R}(\varnothing)=1: \mathrm{R}(1)=2: \mathrm{R}(2)=5: \mathrm{R}(3$ ）$=6: R(4)=7$
RF $80 \mathrm{~T} \$=$＂YES＂： $\mathrm{S}=1185: \mathrm{K} \$=" \mathrm{~A}$＂： X ＝$\varnothing$
KS 90 B\＄＝＂\｛WHT\} －＂
RD 160 POKE53272，23：POKE53281， 0：POKE 53280，11
PH 110 PRINT＂\｛CLR\}\{DOWN\} $\$ 7\}$ $\{10$ SPACES $\} * *$ DEMO MAKE R＊＊＂
QE $12 \emptyset$ PRINT＂\｛2 DOWN\} \｛3 SPACES $\}$ \｛WHT\} TITLE LE TTERS $\{2$ SPACES $\} \underline{\text { CoLOR }}$ \｛6\}"C\$(V( $\sigma$ ））
AE 130 PRINT＂\｛3 SPACES\} $\{$ WHT $\}$ SC ROLLING TEXT COLOR：$\{\overline{6}\}$ ＂C\＄（V（1））
CE 140 PRINT＂$\{3$ SPACES $\}\{$ WHT $\}$ TE XT ON RASTER COLOR：$\{\overline{6}\}$
＂C\＄（V（2））
CE 150 PRINT＂\｛3 SPACES\}\{YEL\}MI D BACKGROUND COLOR：\｛7\}
＂ C （V（3））
HD 160 PRINT＂\｛3 SPACES\}\{YEL\}LO W BACKGROUND COLOR：\｛7\} ＂ $\mathrm{C} \overline{\mathrm{S}}(\mathrm{V}(4))$
DX 170 PRINT＂$\{3$ SPACES $\}\{G R N\} M A$ IN RASTER\｛2 SPACES \}PA $\bar{R} T$ 1：${ }^{-}\{3\} " \mathrm{C} \$(\mathrm{~V}(5)) " \mathrm{~S} \mathbf{H} A D E$ S＂
FJ $18 \emptyset$ PRINT＂\｛3 SPACES $\}\{G R N\}$ MA IN RASTER\｛2 SPACES\}PART 2：${ }^{-}\{3\} " C \$(\mathrm{~V}(6)) " \mathrm{SH} A D E$ S＂
DG $19 \emptyset$ PRINT＂$\{3$ SPACES $\}$ \｛GRN $\}$ SM ALL RASTER COLORS：
\｛PUR\}"C\$(V(̄))" SHADES"
SG 200 PRINT＂\｛3 SPACES\}\{GRN\}MI
DDLE FADER COLORS：
\｛PUR\}" ${ }^{\bar{c}} \mathrm{C} \$(\mathrm{~V}(\overline{8}))$＂SHADES＂
QR $21 \varnothing$ PRINT＂\｛3 SPACES\}\{CYN\}EA DER SPEED（ $\varnothing$ TO 1 $\varnothing$ ）： \｛PUR\}"V'(9)
PF $22 \varnothing$ PRINT＂\｛3 SPACES\}\{YEL\}AN IMATE TITLE：$\{6\}$＂T
AX 230 PRINT＂$\{3$ SPACES $\}\{$ WHT $\} E N$ TER TITLE TEXT＂
XE 240 PRINT＂$\{3$ SPACES $\}$ ENTER S CROLLING TEXT＂
PD 250 PRINT＂\｛3 SPACES\}ENTER M IDDLE TEXT＂
SP 260 PRINT＂$\{3$ SPACES\} \{CYN\}SA VE THE DEMO＂
RJ 276 PRINT＂\｛2 DOWN\} 46$\}$
\｛4 SPACES\}PRESS SPACE T O PREVIEW THE DEMO＂
BJ $28 \emptyset \overline{\mathrm{~S} C}=\mathrm{S}+\mathrm{X} * 4 \varnothing$ ：$\overline{\text { POKE }} \mathrm{SC}, 62$ ：PO KESC＋54272，1
FD 290 GET CS：IFC\＄＝＂\｛DOWN\}" AN D $\mathrm{X}<14$ THEN POKESC，32： X ＝ $\mathrm{X}+1$
SE $30 \emptyset$ IFC $\$=\|\{U P\}$＂AND $X>\emptyset$ THEN POKESC， 32 ： $\mathrm{X}=\mathrm{X}-1$
GC 310 IF C $\$<>$＂＋＂THEN 350
FJ 32 IF $\mathrm{X}<=4$ THEN IF $\mathrm{V}(\mathrm{X})<15$ THEN $\mathrm{V}(\mathrm{X})=\mathrm{V}(\mathrm{X})+1$ ：GOTO1 $0 \varnothing$
DS $33 \emptyset$ IF $X=9$ THEN IF $V(X)<1 \varnothing$ \｛SPACE\}THEN $\mathrm{V}(\mathrm{X})=\mathrm{V}(\mathrm{X})+1$ ：GOTO10
DJ 340 IF $\mathrm{X}<=8$ THEN IF $\mathrm{V}(\mathrm{X})<7$ \｛SPACE\}THEN 480
EP 350 IF C $\$<>$＂－＂THEN 390
AE $36 \emptyset$ IF $X<=4$ THEN IF $V(X)>\emptyset$ \｛SPACE\}THEN $\mathrm{V}(\mathrm{X})=\mathrm{V}(\mathrm{X})-1$ ：GOTO10
RA 370 IF $X=9$ THEN IF $V(X)>\varnothing$ T HEN $\mathrm{V}(\mathrm{X})=\mathrm{V}(\mathrm{X})-1:$ GOTO1 $\varnothing \varnothing$
XG 380 IF $\mathrm{X}<=8$ THEN IF $\mathrm{V}(\mathrm{X})>1$ \｛SPACE\}THEN 500
JA 390 IF $\mathrm{X}=10$ AND $\mathrm{C} \$=\mathrm{CHR} \$(13)$ THEN $46 \varnothing$
HP 400 IF $\mathrm{X}=11$ AND $\mathrm{C} \$=\mathrm{CHR} \$(13)$ THEN 770
FB 410 IF $X=12$ AND $C \$=C H R \$(13)$ THEN 640
GF $42 \emptyset$ IF $\mathrm{X}=13$ AND $\mathrm{C} \$=\operatorname{CHR} \$(13)$

THEN 700
BS 430 IF $\mathrm{X}=14$ AND $\mathrm{C} \$=\mathrm{CHR} \$(13)$ THEN 1100
FP 440 IF C $\$="$＂THEN POKE 189 85，2：GOSUB 940：SYS 1809 8：GOTO 1ø0
XC 450 GOTO 280
RG 460 IFT $\$=$＂YES＂THEN T $\$=$＂NO＂ ：GOTO1øø
FF 47ø IFT\＄＝＂NO＂THEN T\＄＝＂YES＂ ：GOTOløø
SH $480 \mathrm{~V}(\mathrm{X})=\mathrm{V}(\mathrm{X})+\mathrm{l}: \mathrm{IF} \quad \mathrm{V}(\mathrm{X})=3 \mathrm{TH}$ $\operatorname{ENV}(\mathrm{X})=5$
XA 490 GOTO10 0
KE $500 \quad \mathrm{~V}(\mathrm{X})=\mathrm{V}(\mathrm{X})-1: \mathrm{IF} \quad \mathrm{V}(\mathrm{X})=4 \mathrm{TH}$ $\operatorname{ENV}(\mathrm{X})=2$
MA 510 GOTO1øø
PJ 520 REM＊TEXT INPUT＊
EQ $530 \mathrm{M}=\varnothing$
XS $54 \varnothing$ PRINT＂\｛RVS\}\{WHT\} \{OFF\}"
；${ }^{\text {GET }} \mathrm{C}$ ：IFC $\$="$＂THEN55 ${ }^{\circ}$
KF 550 GET CS：IFC $\$="$＂THEN55 0
EJ 560 PRINT＂\｛LEFT\} \{LEFT\}";:I FC $\$=$ CHR $\$(13)$ THEN RETURN
SB $57 \varnothing$ IFC $\$<>C H R \$(20)$ THEN61 $\varnothing$
XM 58 5 IF $\mathrm{M}=$ ØTHEN54 $\varnothing$
QR $590 \mathrm{M}=\mathrm{M}-1$ ：PRINT＂$\{$ LEFT $\}$
\｛LEFT\}";:IFM<1THEN53 $\emptyset$
RM 600 GOTO54ø
DE 610 IF C $\$="\{F 1\}$＂THEN RETURN
MR $62 \emptyset$ IFM＞＝LE OR（C\＄＜＂＂ORC\＄＞ ＂ Z ＂）THEN540
GJ $636 \mathrm{M}=\mathrm{M}+1$ ：PRINTC\＄；：GOTO54 $\varnothing$
HH 640 REM＊SCROLLING TEXT＊
JF 650 PRINT CHRS（147）B\＄＂
\｛16 DOWN $\}$＂B\＄＂$\{$ YEL \}
\｛DOWN\}ENTER THE SCROLL \｛SPACE\}TEXT NOW."
HX 660 PRINT＂\｛DOWN\}PRESS <RETU RN＞TO STORE，$\{2$ SPACES $\}$〈F1＞TO ABORT \｛HOME \} \｛馬T \} \{DOWN \}";
SP 670 FOR $Y=16864$ TO 17263：PO KE $Y-15800, \operatorname{PEEK}(\mathrm{Y}):$ NEXT ：LE＝398：GOSUB 520
PX $68 \emptyset$ IF CS＜＞＂\｛F1\}"THEN FOR Y $=1064$ TO 1463：POKE Y＋15 $800, \operatorname{PEEK}(\mathrm{Y}):$ POKE Y， $42: \mathrm{N}$ EXT
FQ 690 GOTO1øø
AX 706 REM＊MIDDLE TEXT＊
MB 710 PRINT CHRS（147）B\＄＂
\｛12 DOWN\}"B\$"\{YEL\}
\｛DOWN\}ENTER THE MIDDLE
\｛SPACE\}TEXT NOW.
\｛2 SPACES\}EIRST AND
PR $72 \emptyset$ PRINT＂LAST LINES ARE TE XT ON RASTERS．＂
AD 730 PRINT＂$\{$ DOWN $\}$ PRESS＜RETU RN＞TO STORE，$\{2$ SPACES $\}$〈F1＞TO ABORT \｛HOME \} \｛WैHT\} \{DOWN\}";
PF 740 FOR $Y=16384$ TO 16863：PO KE $Y-1532 \emptyset$ ， $\operatorname{PEEK}(\mathrm{Y}):$ NEXT ：LE＝479：GOSUB 520
FE 750 IF C $\$<>"\{F 1\}$＂THEN FOR Y $=1664$ TO 1543：POKE Y＋15 $320, \operatorname{PEEK}(\mathrm{Y}):$ POKE Y， $42: \mathrm{N}$

```
    EXT Y
PB 760 GOTO10\emptyset
RX 770 REM * TITLE *
CR 780 PRINT CHR$(147)B$"
    {2 DOWN} "BS"{YEL} {DOWN }
    ENTER THE TITLE LETTERS
        NOW."
XD 790 POKE1084,45: POKE1124,45
KX 800 PRINT"{DOWN}18 LETTERS
    {SPACE}PER LINE (SPACES
    INCLUDED)"
QD 810 PRINT"NO PUNCTUATION IS
    ALLOWED IN TITLE."
HH 820 PRINT"{DOWN}PRESS <RETU
    RN> AT END OF EACH \INE
XS 830 FOR Y=18341 TO 18360:P=
    Y-17277:V=PEEK (Y):IF V<
    >32 THEN V=V-64
GK 84\emptyset POKEP,V:NEXT
PQ 850 FOR Y=18361 TO 18380:P=
    Y-17257:V=PEEK (Y):IF V<
    >32 THEN V=V-64
SS 860 POKEP,V:NEXT
GE }870\mathrm{ PRINT" {HOME}{WHT}{DOWN}
    ";:LE=19:GOSUB52\emptyset
JJ 88| PRINT:LE=19:GOSUB52\emptyset
PB 89\emptyset FOR Y=1064 TO 1083:P=Y+
    17277:V=PEEK(Y):IF V<>3
    2 THEN V=V +64
QD 9\emptyset\emptyset POKEP,V:POKE Y,42:NEXT
KC 910 FOR Y=1104 TO 1122:P=Y+
    17257:V=PEEK(Y):IF V <>3
    2 THEN V=V +64
ER 92g POKEP,V:POKE Y,42:NEXT
BM 930 GOTO10\emptyset
PQ 940 REM * CUSTOMIZER *
HP 950 PRINT"{CLR}"
PP 960 AD=18333:POKE AD,V(9):P
    OKE AD+1,V(2):POKE AD+2
    ,V(\sigma): POKE AD+3,V(1)
BG 970 POKE AD+4,0:IF T$="YES"
        THEN POKE AD +4,1
PQ 980 POKE AD+6,V(3):POKE AD+
    7,V (4)
BP 990 REM * RASTERCOL *
FK 1Ø\emptyset\emptyset Y=32768:FOR T=\emptyset TO 3:I
        F R(T)<>V(7) THEN Y=Y+
        9:NEXT
XC 1010 A=18312:GOSUB1090
SR 1020 Y=32768:FOR T=\emptyset TO 3:I
        F R(T)<>V (8) THEN Y = Y+
        9:NEXT
EB 1030 A=18321:GOSUB1090
HM 104\emptyset Y=32768:FOR T=\emptyset TO 3:I
        F R(T)<>V (5) THEN Y=Y+
        9:NEXT
MR 1050 A=18264:FOR T=Y TO Y+7
        :FOR U=\emptyset TO 2:POKE A,P
        EEK(T):A=A+1:NEXT U:NE
        XT T
AS 1060 Y=32768:FOR T=\emptyset TO 3:I
        F R(T)<<V(6) THEN Y=Y +
        9:NEXT
AP 1070 A=18288:FOR T=Y TO Y+7
        :FOR U=\emptyset TO 2:POKE A,P
        EEK(T):A=A+1:NEXT U:NE
        XT T
```

XF 1080 RETURN
AB 1090 FOR $T=Y$ TO $Y+9:$ POKE $A$, $\operatorname{PEEK}(T): A=A+1:$ NEXT $: \operatorname{RET}$ URN
QE $11 \emptyset \emptyset \operatorname{REM}\{2$ SPACES $\}$ * SAVE *
KJ lllø GOSUB 940:INPUT"\{CLR\} \{WHT \} \{DOWN \} SHOULD DEMO BOOT ANOTHER FILE? Y \{3 LEFT ${ }^{\prime \prime}$; AS
AB 1120 IF $A S=" N$ " THEN POKE 18 985,2:GOTO 12gの
EX 1130 PRINT" $\{C L R\}\{2$ DOWN $\}$ "BS "\{YEL\}ENTER THE NAME 0 F FILE TO BOOT"
CF 1140 PRINT" (TYPE '*' AT END OF NAME $)\left\{\right.$ HOME ${ }^{\prime \prime}$ : POKE1 Ø8 $0,45:$ LE=15: GOSUB52の
XM 1150 FOR $Y=1064$ TO $1079: A=Y$ $+17922: \mathrm{V}=\operatorname{PEEK}(\mathrm{Y}): I F \mathrm{~V}$ \{SPACE\} $>$ $\varnothing$ AND $V<27$ \{SPACE\}THEN $\mathrm{V}=\mathrm{V}+64$
AQ 1160 POKE A,V:NEXT:PRINT
XF 1170 INPUT" 44 DOWN $\}$ \{CYN \}ENT
 ;SY
DD $118 \emptyset$ IF $S Y=\emptyset$ THEN POKE18985 ,1:GOTO 12øø
SC $119 \emptyset$ POKE 18985, $\sigma: H=I N T$ (SY/ 256): L=SY-256*H: POKE 1 9036, L: POKE 19037, H
MF $120 \emptyset$ INPUT" \{CLR\} \{2 DOWN \} \{WHT\} FILENAME OF DEMO" ; FS
PK $121 \varnothing$ PRINT" $\{2$ DOWN $\}$ \{GRN $\}$ SAV ING DEMO...";
BG $122 \varnothing$ OPEN $2,8,2, " \varnothing: "+F \$+", P$, $W^{\prime \prime}$
XH 123 Ø PRINT\#2, CHR\$(1);CHR\$( 8);

HB 1240 FOR J=16252 TO 19064: P RINT\#2,CHRS(PEEK(J));
CS 1250 IF $S T>\emptyset$ THEN PRINT" \{SPACE\}ERROR DURING SA VE": PRINT\#2:CLOSE 2:END
PG 1260 NEXT:CLOSE 2:PRINT" NO \{SPACE\}ERRORS": END
AM $127 \emptyset$ DATA BLÄCK,WHITE; RED, C YAN, PURPLE, GREEN, BLUE, YELLOW
HA 1280 DATA ORANGE, BROWN, LT R ED,DK GRAY,MED GRAY,LT GREEN, LT BLUE, LT GRAY
JP 1290 DATA $0,1,11,0,5,1,2,6$, 1,5
BK 1300 DATA $0,11,12,15,1,1,15$ ,12,11
SF $131 \emptyset$ DATA $\emptyset, 9,2,8,10,10,8,2$ , 9
KF $132 \emptyset$ DATA $0,5,3,13,1,1,13,3$ , 5
XD 1330 DATA $0,6,14,3,1,1,3,14$ , 6
FF 1340 DATA $10,7,13,3,14,3,13$ ,7,1б

Danny English is a frequent contributor who lives in Moreno Valley, California.

## F/X PLOT 128

By Kevin Davis
At one time or another, any student of mathematics has had to deal with coordinate plane graphing. Graphing calculators have been recognized by educators as helpful tools for understanding graphs, but these calculators can cost up to $\$ 300$.

While programs such as Arbplot exist for Apple and IBM computers, few are available for 8-bit Commodores. F/X Plot 128 tries to change this. The program itself was designed using the popular TI81 as a benchmark. It's a menu-driven, us-er-friendly, colorful program designed to make good use of the 128's high-resolution graphics in 40 -column mode.

## Entering the Program

F/X Plot 128 consists of a main program and a sprite. The main program is written in BASIC 7.0 and should be entered with The Automatic Proofreader to avoid typing errors. See "Typing Aids" elsewhere in this section.

The sprite data used to create an onscreen pointer or tracer is written in machine language. Enter it with MLX, our machine language entry program. See "Typing Aids" again. When MLX prompts, respond with the following values.

## Starting address: OEOO <br> Ending address: OE3F

Be sure to save the program as F/X PLOT.SPR on the same disk as the main program. The main program loads this data when it runs.

When you first run F/X Plot, the top of the screen will be jumbled. Clear the screen from the Options menu, press Run/Stop-Restore, and then run the program again. This process is required only when you first run the program.
From then on, you'll see a screen divided into quarters with a menu at the bottom. The program is completely menu driven. First, let's look at the Options menu. Press 4.
With this menu, you'll be presented with five numbered options. Press the number in front of the one you want.

Simultaneous/Sequence F/X Plot can hold formulas for up to four graphs.

Simultaneous will graph all selected formulas at the same time. Sequence graphs them one at a time. Always select Sequence when you have only one formula to graph. (Sequence is also a little faster in this case.)

Enable/Disable Formulas You can toggle here to enable or disable certain formulas. Only the enabled ones, denoted by their numbers appearing in reverse mode, will be graphed.

Clear Graphics Screen This will clear the graphics screen and return you to the Main menu.

Set Tracer Speed This option allows you to set the speed at which the tracer moves. A smaller number will move more slowly but will be more accurate. Three is the default.

Connected/Dotted This works in a fashion similar to the Enable/Disable toggle. The formulas set to Connected will draw a line between each plotted point. Experimentation with the program will give you an idea of when it's a good idea to set formulas to Connected. Connected formulas are in reverse.

Use the Esc key to move from the Options screen to the Main menu. Here are the Main menu options.

Set Range Set the X-Minimum (the least $x$ value graphed), X-Maximum (the greatest $x$ value graphed), Y-Minimum, and Y-Maximum. Defaults are 10 to 10 on both axes. The resolution (scaling) of the graph is determined by the distance between the maximum and minimum values. In other words, a range of -1 to 1 will appear much closer in (like a zoom lens) and have a higher resolution than -100 to 100. For trigonometric graphs, use plus or minus 3.14 as pi and plus or minus 6.28 as two pi.

Tracer The Tracer requires a joystick in port 2. When you choose this, you'll see the range values and a gray device somewhat like cross hairs in the upper left corner of the screen. Its speed is controlled from the Options menu. You're shown the $x$-coordinate and $y$ coordinate of the cross hairs as they
move around the screen. This option can be helpful in evaluating certain points along the graph.

In order to zoom into a section of the graph, move to the upper left corner of the rectangular section you want to zoom into and press and release the fire button. There will be a bell tone and a brief pause. Then move the cross hairs to the lower right corner and do likewise. This process sets the next range of values. Use the Esc key to exit, select Clear from the Options menu, and choose Graph from the Main menu to proceed.

Graph This is the most important, and easiest, function of F/X Plot. It graphs the enabled functions on the screen. Each function is graphed in its corresponding color as shown in the Enable/ Disable menu. As each point is graphed, its $x$ and $y$ values are printed at the bottom of the screen. The coordinates of the last five points graphed are visible at the bottom of the screen.
To pause the graphing, use the No Scroll key.

If the program attempts to graph a value that BASIC cannot handle (such as the point on an asymptote in a trigonometric function), a bell tone will sound, and that point won't be graphed. An error-trapping routine prevents the program from stopping. It'll just move on to the next value.

## Plotting Functions

F/X Plot comes with four formulas already entered, but, naturally, you'll want to enter your own. These are stored as DEF DN statements in lines 60-90. The BASIC DEF FN command, however, cannot be implemented from program mode. In order to set or change the formulas, you must exit the program by pressing the Run/StopRestore keys simultaneously. Type LIST 60-90 and press Return.

Then use the cursor keys to edit each line with the formula of your choice for $F N(A), F N(B), F N(C)$, and FN(D). Remember to press Return after entering your formulas. Then run the program again.

All formulas must be entered using BASIC's normal mathematical commands. These include SIN, COS, LOG, TAN, ABS, and operators,,$+-{ }^{\star}$, and /.

Anyone who has ever done any programming should be familiar with these operators and their use. New users may want to check the appendix dealing with mathematical commands in the 128 System Guide for the proper format.

## Helpful Hints

While the program can graph only four functions at once, the graphics screen isn't erased when you stop the program. If you want to graph more than four formulas, graph the first four, exit the program, change the formulas, run the program again, and graph the second group. The graphs will overlap as long as you make sure that the ranges are the same.

Don't wait until the night before your big geometry examination to learn how to use F/X Plot 128 ! It's a powerful and versatile program that can be utilized fully only by thorough use and repeated experimentation.
While the theory is untested, I'd imagine that any program that captures the hi-res split screen and sends it to a printer could be used to make hardcopies of any graphs you create.

## F/X PLOT 128

RP 5 REM COPYRIGHT 1992 COMPUT E PUBLICATIONS INTL LTD \{2 SPACES\}ALL RIGHTS RESE RVED
HX 10 CLR: $\mathrm{XM}=-10: X X=10: Y M=-10$ : $Y X=10: S P=3: E A=1: E B=1: E C=$ 1:ED=1:TRAP 1890
SA $2 \sigma$ DIMJA (8): DIMJB (8):FORKQ $=$ 1T08: READJA (KQ) : NEXT
RK 30 BLOAD (" $F / X$ PLOT.SPR")
PJ $4 \emptyset$ FOR KQ=1TO8: $\operatorname{READJB}(K Q): N$ EXT
MA $5 \emptyset$ POKE $5328 \emptyset, ~ \emptyset:$ POKE $53281, ~ \emptyset$
AQ 60 DEF FN $A(X)=X \uparrow 2$
PF $7 \emptyset$ DEF FN $B(X)=X+4$
EJ $8 \emptyset$ DEF FN $C(X)=((\operatorname{SIN}(X)))$
QK $9 \emptyset$ DEF FN $D(X)=\left(-1^{*}(S Q R(X))\right.$ )
MA $1 \emptyset \emptyset$ GRAPHIC $4, \emptyset$
MM 110 REM DRAW ZEROS
KS $12 \sigma$ IF $X M<\emptyset$ AND $X X>\emptyset$ THEN $X$ $\mathrm{Z}=1$
RP 130 IF $Y M<\emptyset$ AND $Y X>\emptyset$ THEN $Y$ $\mathrm{Z}=1$
RR 150 GOSUB 840
FR 160 SLEEPI:GOT0890
MB 200 GOSUB $77 \emptyset$
CG 210 IF $\mathrm{XZ}\langle>1$ THEN $27 \emptyset$
SM 220 REM DRAW X-ZERO
DG 230 AM $=\mathrm{ABS}(\mathrm{XM}): \mathrm{XL}=\mathrm{AM} / \mathrm{XR}$

DA $240 \mathrm{XL}=160^{*} \mathrm{XL}$
BE 250 COLOR 1,16
GG 260 DRAW $1, X L, \emptyset$ TO XL， 159
FH 270 IF $Y Z\langle>1$ THEN 320
KR $280 \mathrm{YQ}=\mathrm{ABS}(\mathrm{YM}): Y \mathrm{U}=\mathrm{YQ} / \mathrm{YR}$
JK 290 YL＝160＊YU：YL＝160－YL
HB 300 IF YL＞16 OR YLくØ THEN \｛SPACE\} 320
DB $31 \emptyset$ COLOR2，16：DRAW1， 0, YLTO1 59，YL
EG 320 REM PLOT
EE $330 \mathrm{XS}=\mathrm{XR} / 160: Y S=Y R / 160$
MH $34 \emptyset \quad \mathrm{UX}=\emptyset: \mathrm{UY}=\varnothing$
FD 350 FOR TT＝0TO159
JJ $36 \emptyset$ IF EA $=\emptyset$ THEN $46 \emptyset$
JX $37 \emptyset \mathrm{XA}=\mathrm{FNA}((\mathrm{XM}+(\mathrm{TT} * \mathrm{XS})))$
BA $38 \emptyset$ PRINT＂\｛CYN $\}$ X＝＂（ $(X M+(T T$＊ XS））T TAB（2 $\varnothing$ ）＂$Y=$＂XA
RK 390 IF $X A>Y X$ OR XA＜YM THEN \｛SPACE 450
$X X 40 \emptyset Q P=Y X-X A: F P=Q P / Y R: C P=16$ $\sigma^{*} \mathrm{FP}$
EK 416 COLOR 1，4
BD $42 \emptyset$ DRAW 1，TT，CP
RH 430 IF $\mathrm{TT}=\emptyset \quad \mathrm{OR}$ CA $<>1$ THEN 45 $\sigma$
AS 440 DRAW1，TT，CP TO IA，PA：IA $=T T: P A=C P$
KF 450 IF $S S=1$ THEN NEXT TT
AB 460 IF $E B=\varnothing$ THEN $57 \emptyset$
PH $47 \emptyset$ IF $S S=1$ THEN $U X=\varnothing: U Y=\varnothing$ ： FOR TT＝$\quad$ TO 159
MH $48 \emptyset \mathrm{XB}=\mathrm{FNB}((\mathrm{XM}+(\mathrm{TT} * \mathrm{XS})))$
SS 490 PRINT＂\｛GRN \}X=" ( $\mathrm{XM}+(\mathrm{TT}$＊ XS ）））TAB（2Ø）＂Y＝＂XB
MD $50 \emptyset$ IF $X B>Y X$ OR $X B<Y M$ THEN \｛SPACE \} 560
JH $510 \quad \mathrm{QP}=\mathrm{YX}-\mathrm{XB}: \mathrm{FP}=\mathrm{QP} / \mathrm{YR}: C P=16$ $\quad$＊FP
SB 520 COLOR1， 6
AJ 530 DRAW 1，TT，CP
EM 540 IF $\mathrm{TT}=\emptyset$ OR $\mathrm{CB}\langle>1$ THEN 56
RR 550 DRAW1，TT，CP TO IB，PB：IB $=T T: P B=C P$
SS 560 IF SS＝1 THEN NEXT TT
KJ $57 \emptyset$ IF EC＝ 0 THEN $66 \emptyset$
KS 58 IF SS $=1$ THEN $U X=\varnothing: U Y=\varnothing$ ： FORTT $=$ ØTO159
PX $590 \quad \mathrm{XC}=\mathrm{FNC}((\mathrm{XM}+(\mathrm{TT} * \mathrm{XS})))$
DB $6 \emptyset \emptyset$ PRINT＂\｛YEL\}X=" ( $(X M+(T T *$ XS ）））TAB（2 $\sigma$ ）＂ $\mathrm{Y}=$＂ XC
HM $61 \sigma$ IF XC＞YX OR XC＜YM THEN \｛SPACE\}650
EF $620 \mathrm{QP}=\mathrm{YX}-\mathrm{XC}: \mathrm{FP}=\mathrm{QP} / \mathrm{YR}: \mathrm{CP}=16$ の＊FP：COLOR1，8：DRAW1，TT， CP
AA 630 IF $\mathrm{TT}=\emptyset \quad \mathrm{OR} \mathrm{CC}<>1$ THEN65 $\emptyset$
G 640 DRAWI，TT，CP TO IC，PC：IC ＝TT：PC＝CP
GB 650 IF $S S=1$ THEN NEXT TT
KR $66 \emptyset$ IF ED $=\varnothing$ THEN $74 \emptyset$
GD 670 IF $S S=1$ THEN $U X=\varnothing: U Y=\varnothing$ ： FORTT＝ØTO159
PF $680 \mathrm{XD}=\mathrm{FND}((\mathrm{XM}+(\mathrm{TT} * \mathrm{XS})))$
SR 690 PRINT＂$\$ 3 \$ \mathrm{X}=$＂（ $(\mathrm{XM}+$（TT＊XS ）） $\operatorname{TAB}(2 \emptyset)$＂ $\mathrm{Y}=$＂ XD

FD $7 \emptyset \emptyset$ IF $X D>Y X$ OR $X D<Y M ~ T H E N ~$ \｛SPACE\} 740
$\mathrm{DF} 710 \mathrm{QP}=\mathrm{YX}-\mathrm{XD}: \mathrm{FP}=\mathrm{QP} / \mathrm{YR}: \mathrm{CP}=16$ Ø＊FP：COLOR1，11：DRAW1，TT ，CP
$\mathrm{XB} 72 \emptyset$ IF $\mathrm{TT}=\emptyset$ OR $\mathrm{CQ}\langle>1$ THEN74 $\sigma$
JC 730 DRAW1，TT，CP TO ID，PD：ID $=T \mathrm{~T}: \mathrm{PD}=\mathrm{CP}$
AE 740 IF $\mathrm{EA}=1$ OR $\mathrm{EB}=1$ OR $\mathrm{EC}=1$ OR ED＝1 OR $S S=0$ THEN $N$ EXT TT
AP 750 IF $E A=\emptyset$ AND $E B=\emptyset$ AND EC $=\emptyset$ AND ED $=\varnothing$ THEN $76 \emptyset$
EJ 760 GOTO 890
BC 770 IF $\mathrm{XX}<=\varnothing$ AND $\mathrm{XM}<=\varnothing$ THEN $X R=A B S(X M)-A B S(X X)$
BE $78 \emptyset$ IF $X X>\emptyset$ AND $X M<\emptyset$ THEN $X$ $\mathrm{R}=\mathrm{ABS}(\mathrm{XM})+\mathrm{ABS}(\mathrm{XX})$
MG 790 IF $X M>\emptyset$ THEN $X R=X X-X M$
AM $80 \emptyset$ IF $Y X<=\emptyset$ AND $Y M<=\emptyset$ THEN $Y R=A B S(Y M)-A B S(Y X)$
HR 810 IF $Y X>\emptyset$ AND $Y M<\emptyset$ THEN $Y$ $R=A B S(Y M)+A B S(Y X)$
$A D 82 \sigma$ IF $Y M>\sigma$ THEN $Y R=Y X-Y M$
GP 830 RETURN
FP 840 REM PIC
FE 850 PRINT＂\｛CLR\}\{20 DOWN\}";
XP 860 PRINT＂\｛YEL\}$\{40$＠$>"$
DJ $87 \emptyset$ PRINT＂$\{$ YEL $\}\{16$＠$\$\{3 \$ \mathrm{~F}$ \｛CYN\}/\{7\$X \{6\$PLOT \{YEL\} \＄16＠）＂
CX $88 \emptyset$ RETURN
BD 890 GOSUB840：PRINT＂\｛6\}
\｛RVS\}\{H\}1\{N\}\{OFF\} SET R ANGE VALS $\{2$ SPACES $\}$ \｛RVS\}\{H\}2\{N\}\{OFF\} USE T RACER＂
AH $9 \emptyset \emptyset$ PRINT＂\｛RVS\}\{H\} $3\{N\}$ \｛OFF\} GRAPH FUNCTION \｛2 SPACES \} \{RVS\} $\{\mathrm{H}\rangle 4$ \＆N\} \｛OFF\} OPTIONS"
DB 970 GETKEY GK\＄：GK＝VAL（GK\＄）： IF GK＞4 OR GK＜1 THEN 91 $\sigma$
RG 920 ON GK GOTO $930,1450,170$ ， 990
PG 936 REM SET VALUES
MX 940 INPUT＂$\{C L R\}\{20$ DOWN $\}$ X－M INIMUM［XMIN］＂；XM
KB 950 INPUT＂X－MAXIMUM［XMAX］＂ ；XX
MD 960 INPUT＂Y－MINIMUM［YMIN］＂ ；YM
QG 970 INPUT＂Y－MAXIMUM［YMAX］＂ ；YX
GM 98ø PRINT＂\｛CLR\}":GOTO89ø
PD 990 REM OPTIONS MENU
MJ $10 \emptyset \emptyset$ PRINT＂$\{C L R\}\{19$ DOWN \}
$\{8$ SPACES \} $\{7 \$$
$\{2 \sigma$ SPACES $\} "$
QP $1 \emptyset 1 \emptyset$ PRINT＂\｛RVS\}$\{H \$ 1$ §N $\}$ \｛OFF\} SIMULTANEOUS/SEQ UENCE \｛ 3 SPACES $\}$ \｛3\}OPTI ONS $\$ 7$＂＂
XM $102 \emptyset$ PRINT＂$\{$ RVS $\}\{H\} 2$ \＆N $\}$
\｛OFE\} ENABLE/DISABLE $F$ ORMULAS $\{3$ SPACES $\}\{3\} M E$

NU\＆7\}\{2 SPACES\}"
HX 1030 PRINT＂\｛RVS\}\{H\} 3 〔N\}
\｛OFF\} CLEAR GRAPHIC SC REEN＂
EF 1040 PRINT＂$\{$ RVS \}\{H\} 4 〔N\}
\｛OFF\} SET TRACER SPEED
＂
GM 1050 PRINT＂$\{$ RVS \} \{H\}5 $\$ \mathrm{~N}\}$
\｛OFF\} CONNECT/DOTTED";
XX 1060 GETKEY GK\＄：IFGK\＄＝CHRS（
27）THEN 890
PK 1070 GK＝VAL（GK\＄）：IF GK＞50RG Kく1THEN1660
BS 1080 ON GK GOTO $1090,1160,1$ 370，140 1，169
RB 1090 PRINT＂\｛CLR\} \{20 DOWN \}
\｛GRN\}1] SEQUENCE (GRAP
HED IN ORDER）＂
PR 110ø PRINT＂2］SIMULTANEOUS
\｛SPACE\} (GRAPHED AT SAM E TIME）＂
SS $111 \emptyset$ GETKEY GK\＄：GK＝VAL（GK\＄） ： $\mathrm{IFGK}=1$ THENSS $=1$
GQ $112 \emptyset$ IF $G K=2$ THEN $S S=\varnothing$
CF 1130 IF GK\＄＝CHR\＄（27）THEN 8 $9 \varnothing$
FP 1140 IF SS＜ØORSS $>1$ THEN $111 \emptyset$
HM 1150 GOTO89
MR 1160 PRINT＂$\{C L R\}\{2 \emptyset$ DOWN $\}$
\｛1\}PRESS FORMULA TO EN
ABLE（HI－LIGHTED）＂
JS 1170 PRINT＂OR DISABLE．
\｛RVS\} RETURN \{OFF\} EXITS ．＂
KH 118 IF EA＝1THENPRINT＂ 87$\}$ \｛RVS\} $<G \$ 1$ §N\}\{OFF\}";:GO TO12の
JA 1190 IF EA $\langle 1$ THEN PRINT＂ ใ7） 1 ＂；
EX 1200 IF EB＝1THENPRINT＂$\{\mathrm{GRN}\}$
\｛RVS\}\{H\}2 2 N$\}\{O F F\} " ;: G O$ TO122の
PP $121 \varnothing$ IF EB＜＞1 THEN PRINT＂ \｛GRN\} 2 " ；
RS 1220 IF EC＝1THENPRINT＂\｛YEL\} \｛RVS\}\{H\} 3 〔N\}\{OFF\}";:GO TO1240
KH 1230 IF ECく＞1 THEN PRINT＂ \｛YEL\} 3 ＂；
PQ 1240 IF ED＝1THENPRINT＂$\{3\}$ \｛RVS\}\{H\} 4 \｛N\}\{OFF\}";:GO TO1260
CQ 1250 IF ED＜＞1 THEN PRINT＂ \｛3） 4 ＂；
QX 1260 GETKEY $\stackrel{\prime}{C D} \$$ ：IFCDS $=$ CHRS（ 13）THEN89 Ø
JR $1270 \mathrm{CD}=\mathrm{VAL}(\mathrm{CD} \$):$ IFCD $>40 \mathrm{RCD}$ ＜1THEN126も
BB 1280 IF $C D=1$ AND $E A=\emptyset$ THEN \｛SPACE \}EA=1:GOTO13øø
EP 1290 IF $C D=1$ AND $E A=1$ THEN \｛SPACE\} $E A=\emptyset$
BG $13 \emptyset \emptyset$ IF $C D=2$ AND $E B=\emptyset$ THEN \｛SPACE\} EB=1:GOTO132 1
KE 1310 IF $C D=2$ AND $E B=1$ THEN \｛SPACE $\} E B=\varnothing$
SB 1320 IF $C D=3$ AND $E C=\emptyset$ THEN $\{S P A C E\} E C=1:$ GOTO134 0

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DA 1336 IF $C D=3$ AND EC $=1$ THEN \{SPACE $\}$ EC= $\emptyset$
PJ $134 \varnothing$ IF $C D=4$ AND $E D=\varnothing$ THEN \{SPACE \} ED=1: GOTO136
RX 1350 IF $C D=4$ AND ED=1 THEN \{SPACE $\}$ ED $=\varnothing$
JS 1360 PRINT"\{UP\}":GOTO $118 \emptyset$
FP 1370 PRINT"\{CLR\}\{22 DOWN\} \{WHT\}CLEAR SCREEN: ARE YOU SURE?"
SC 1380 GETKEY YN\$:IF YN\$="Y"T HENGRAPHIC4,1
GM 1390 GOTO 896
CG 1400 PRINT"\{CLR\}\{21 DOWN \} \{PUR\}"
CM 1410 PRINT"CURRENT SPEED: \{WHT\}"SP: PRINT"\{PUR\}EN TER NEW VALUE [1-5]"
CD $142 \emptyset$ GETKEY SPS:IF SPS=CHRS (27) THEN898

KH 1430 SP=VAL(SPS):IF SP<1ORS P>5THEN142 6
RQ 1440 GOTO89の
PR 1450 REM TARGET-SCAN
EC $1460 \mathrm{ZX}=\mathrm{XM}: \mathrm{ZY}=\mathrm{YX}$
DM $147 \emptyset$ PX=17: $\mathrm{PY}=-209: \mathrm{PN}=\varnothing$
SX 1480 PRINT"\{CLR\}\{33 DOWN\}"
FK 1490 PRINT"\{YEL\}X-MIN: "XM"" TAB(20) "X-MAX:"XX:PRIN T"Y-MIN: "YM" "TAB(20) "Y -MAX:"YX
HE 1500 SPRITE1,1,2, 0
RK 1516 MOVSPR1,PX,PY
KD 1520 GOSUB77 10
BC $1530 \mathrm{XS}=\mathrm{XR} / 160: Y S=Y R / 160$
PQ 1540 JS $=\emptyset: J S=\mathrm{JOY}(2)$
DH 1550 IF JS> 128 THEN 1540
XP 1560 IF JS $=128$ THEN 1660
PM 1570 PX=PX+(JA(JS)*SP): PY=P $\mathrm{Y}+(\mathrm{JB}(\mathrm{JS}) * S P)$
KD 1580 MOVSPR1,PX,PY
GD $1590 \mathrm{ZX}=\mathrm{XM}+$ (.5* ((PX-17)*XS) $): Z Y=Y X-((P Y+2 \sigma 9) * Y S)$
CM 160ø PRINT"\{6\}\{HOME\}
\{21 DOWN \} $\mathrm{X}=\mathrm{ZZX} \mathrm{X"TAB}(2 \emptyset$ ) " $Y=$ " (ZY)
KF 1610 GETXS:IFX\$ $=$ CHR (27)THE NGOTO163ø
QB $162 \emptyset$ JS= $\quad$ : GOTO154 $\varnothing$
GJ 1630 SPRITE1, $\varnothing$
CP $164 \varnothing$ GOTO89ø
MD 1650 DATA $\varnothing, 1,1,1,0,-1,-1,-$ $1,-1,-1,0,1,1,1,0,-1$
FQ 1660 PN=PN+l:IF PN=1 THEN A $\mathrm{X}=\mathrm{ZX}: \mathrm{AY}=\mathrm{ZY}:$ PRINT CHRS ( 7): SLEEP1:GOTO154

AA 1670 IF $P N=2$ THEN $B X=Z X: B Y=$ ZY: PRINT CHR (7): XM=AX : $\mathrm{XX}=\mathrm{BX}: \mathrm{YX}=\mathrm{AY}: \mathrm{YM}=\mathrm{BY}:$ GOT 01540
FQ 1680 GOTO154@
CS 1690 PRINT"\{CLR\} 20 DOWN $\}$ \{PUR\}SELECT DOTTED OR \{SPACE\}CONNECTED / \{RVS \}RETURN \{OFF\}"
DD 1700 IF CA=1THENPRINT" $\{7\}$ \{RVS\}\{H\}l\{N\}\{OFF\}";:GO TO172б

QD 1710 IF CA<>1 THEN PRINT" \{7\} 1 ";
GX 172 IF CB=1THENPRINT"\{GRN\} \{RVS\}\{H\}2\{N\}\{OFF\}";:GO TO1746
HP 1730 IF CB<>1 THEN PRINT" \{GRN\} 2 ";
KS 1740 IF CC=1THENPRINT"\{YEL $\}$ \{RVS\}\{H\}3\{N\}\{OFF\}";:GO TO1760
BE 1750 IF CC<>1 THEN PRINT" \{YEL\} $3^{\prime \prime}$;
HF 1760 IF CQ=1THENPRINT" $\{3\}$ \{RVS\} \{H \$ 4 \{N\}\{OFF\}";:GO T01786
XH 1770 IF CQ<>1 THEN PRINT" \{3\} 4 ";
FG $178 \emptyset$ GETKEY SQS:IFSQS=CHRS ( 13) THEN890

HC $1790 \mathrm{SQ}=\mathrm{VAL}(\mathrm{SQS}):$ IFSQ $>40 \mathrm{RSQ}$ <1THEN1780
MG 1806 IF $S Q=1$ AND $C A=\varnothing$ THEN \{SPACE \}CA=1: GOTO182ø
FD 1810 IF $S Q=1$ AND CA=1 THEN $\{S P A C E\} C A=\varnothing$
XB $182 \emptyset$ IF $\mathrm{SQ}=2$ AND $\mathrm{CB}=\emptyset$ THEN \{SPACE\}CB=1: GOTO1840
DS 1830 IF $\mathrm{SQ}=2$ AND CB=1 THEN $\{$ SPACE $\} C B=\varnothing$
AK $184 \emptyset$ IF $\mathrm{SQ}=3$ AND $\mathrm{CC}=\varnothing$ THEN \{SPACE \}CC=1: GOTO186
JF 1850 IF $\mathrm{SQ}=3$ AND CC=1 THEN $\{$ SPACE $\} C C=\varnothing$
JC $186 \emptyset$ IF $S Q=4$ AND $C Q=\emptyset$ THEN \{SPACE \}CQ=1: GOTO188
GG 1870 IF $\mathrm{SQ}=4$ AND CQ=1 THEN $\{S P A C E\} C Q=\emptyset$
AR 1880 PRINT"\{UP\}":GOTO 1700
ER 1890 REM ERROR TRAP ROUTINE
XA 1900 IF $E R=11$ OR ER=14 OR E $R=2 \emptyset \quad$ OR $\quad E R=1 \emptyset$ OR $E R=15$ THEN PRINT"\{G\}";:RESU ME NEXT
HH 1916 PRINT"PROGRAMMING ERRO R:"
AC 1926 PRINT"\{RVS\}";:PRINTERR S(ER);:PRINT"\{OFF\}"
AX 1930 PRINT" $\{8\} I N$ LINE"EL
CK 1946 END

## F/X PLOT.SPR





 のE28:00 00 ø0 00 00 00 00 00 44
 ØE38:00 00 Ø0 00 00 00 00 00 54

Kevin Davis is the author of Sport Card Collector (November 1991). F/X Plot 128 helped him survive honors geometry this year at Trinity Preparatory School in Winter Park, Florida.

## SPRINT III

By Farid Ahmad
Commodore BASIC isn't exactly known for its speed. It's not the language itself that's at fault, however; it's the way the computer implements the language. BASIC is interpreted. Most faster languages are compiled.

Before a computer can execute any program, the commands must be converted into the machine language of the computer. Every time a statement in an interpreted language is run, the computer must translate it. This slows execution considerably. A compiler, however, translates the entire program before it runs. This boosts execution speed.

Sprint III is a BASIC compiler that supports a subset of BASIC statements available to the 64. Earlier versions of the program were published in January 1986 and January 1988. Sprint II added several features to its original version, but there was still room for improvement.

## Entering the Program

Sprint III is written entirely in machine language. To enter it, use MLX, our machine language entry program. See "Typing Aids" elsewhere in this section. When MLX prompts, respond with the following values.

## Starting address: 0801

Ending address: 1D40
Be sure to save a copy of Sprint III before exiting MLX.

## Using the Program

A typical session with Sprint III might start with the following commands.

## LOAD "Sprint III",8,1

NEW

## SYS32768

At this point your screen will turn black and BASIC pointers will be adjusted. You'll also see a SYNTAX ERROR message, which you should ignore, and a READY prompt. Now you can load a BASIC program or start to write one from scratch. You may run your program at any time for testing. When you are ready to compile it, use either the SYS32768,E or SYS32768,F command. These and other Sprint III commands
are explained below. When the compilation finishes, you can run your compiled program or save it as usual.

If you want to make some corrections or modifications to your program, use the SYS32768, L command to load your BASIC program from the RAM disk. After it's edited, the program can be compiled as before.

## Commands

All Sprint III commands consist of a SYS statement followed by a comma and a single letter. The following commands are available.

SYS32768,F Saves the BASIC program to the RAM disk and then compiles it. The entire source program is listed during compilation. It also locks the RAM disk.

SYS32768,E Same as above except that Sprint lists only lines containing an error.

SYS32768,L Loads your source program after a compile operation. Unlocks the RAM disk.

SYS32768,U Unlocks the RAM disk.

## A Better Way

One of the advantages of using Sprint II was speed. You could save the source code on disk; run Sprint II; and get a compiled program in memory, ready to run. However, if you wanted to make corrections or modifications to your program, you had to load the source code, modify it, save it back to disk, and compile again. Since a program almost never works perfectly without a debugging session, this procedure soon became tedious.

There's a better way. Sprint III turns Sprint into a RAM-based compiler. Now, when you compile your program, the source code is saved to a RAM disk and is compiled from there. When compilation is finished, you have two versions of your program in memory: the compiled program in the normal BASIC working area and the source program in the RAM disk.

Suppose Sprint III has reported some errors during compilation or you simply want to make some modifications. You issue the load command to
the RAM disk, and within seconds, your BASIC source program is back, ready for editing and recompiling.

## Speed

Apart from the convenience of not having to save and load repeatedly, Sprint III also reduces compilation time by more than half. For even faster compiling, you're given the option of listing the entire BASIC program during compilation or listing only those lines that contain an error. If you choose the error-only option, time for compiling is reduced to less than one-fourth that of Sprint II.

## Other Options

A list pause has been provided. When a BASIC program is being listed to the screen during compilation, hold down any control key to freeze the display. This is useful for writing down any errors reported by Sprint III.

One potential mistake that can occur when using Sprint III is the one of accidentally compiling a program that's already compiled. Suppose that you want to load the source program but give the compile command by mistake. The BASIC program in the RAM disk would be overwritten by the compiled program, and you'd lose your source code. To prevent this, the RAM disk is automatically locked after each compilation. This prevents you from using the compile command. It'll be unlocked automatically when you load your source program, or you can use the unlock command if you wish to start a new program.

## Expressions

Sprint III works much the same as BASIC, but as with Sprint II there are some differences you should keep in mind when programming.

Strings are limited to ten characters unless specified otherwise. If you want to include more characters, dimension the string as if it were an array.

In numeric expressions, parentheses aren't allowed. Unlike interpreted BASIC, expressions are evaluated strictly from left to right; there's no operator precedence. To get around this, you must break up the expression into several smaller expressions and then put the results back together. For example,
the following expression:
$\operatorname{SUM}=A+X^{*} Y+B+I^{\star} J$
becomes
$\mathbf{Q 1}=\mathrm{X}^{\star} \mathrm{Y}: \mathbf{Q 2}=\mathrm{I}^{*} \mathrm{~J}:$
$S U M=A+Q 1+B+Q 2$.
You may get a NOT SUPPORTED error message if the statement is legal in Commodore BASIC but illegal in Sprint III. You may get a SYNTAX ERROR message if a keyword is misspelled or extra parentheses are used.

## Memory Organization

Memory locations \$A000-\$C7FF and \$E000-\$FFFF are used by the RAM disk. Since this is an 18 K area of memory, the BASIC program must fit within this length. You'll be warned if you exceed this limit. A full 30 K , however, is available for the compiled program. Also, if you run your BASIC source program for testing, a full 30K of working area is available for strings, variables, and so on. It's only the BASIC program text that shouldn't exceed 18 K .

Sprint III is designed to stay resident in memory while you edit your BASIC programs. Therefore, it moves down the top of the BASIC area pointer to protect itself. To set this pointer, you can either use a Sprint III command before running a BASIC program or use SYS32768 without a letter. The second method will produce a SYNTAX ERROR message, but the pointer will be adjusted. Also, when the pointer is set, the list pause will become available for BASIC editing.

## Updates from Sprint II

Programmers who may have disassembled Sprint II may be interested in the following changes.

The address $\$ 8000$ now jumps to $\$ A B 00$ where the new routines reside. The interface routine sets some pointers and also the colors. It then looks for a comma followed by a letter. If a valid command is found, the appropriate routines are called to move programs to or from the RAM disk.

In Sprint II, addresses \$825E and $\$ 8042$ called a subroutine to initialize the disk file. They now call a new short
routine at $\$ 802 \mathrm{~B}$ which initializes the new input from the RAM disk routine．

The area \＄8C0D－\＄8C45 contained calls to a Kernal routine to get a byte from disk．These calls have been changed so that the new input from the RAM disk routine is called at $\$ 8815$ ．

The instruction at \＄C800 has been changed from LDA\＃\＄C0 to LDA\＃\＄C8． As a result，Sprint now uses the memo－ ry area \＄C800 onward for line number storage．

When the E command is used，the JSR\＄8AAC instruction at \＄82B6 ad－ dress is bypassed，preventing each line from being listed．Also the instruc－ tion at \＄8A85 is changed from JSR\＄888C to JSR\＄8850．Address $\$ 8850$ contains a short routine to print the current line．

When Sprint III is used for the first time，it places the list freeze subroutine at \＄CFEC－\＄CFFF．I use Sprint III with a multifunction cartridge that causes prob－ lems if the freeze routine is placed be－ tween \＄8000 and \＄A000．

## SPRINT III


 Ø811：20 2Ø $2 \emptyset 2 \emptyset 2 \emptyset$ AØ C4 B9 06 0819：3C $0899 \mathrm{~F} 8 \quad 00 \mathrm{B9} \mathrm{FD} 08 \mathrm{~F} 6$ Ø821：99 $33 \quad \emptyset 388 \mathrm{D} \emptyset \mathrm{Fl}$ Aø 99 4C 6829：B9 ØC $\emptyset 899 \mathrm{FF} \quad 6388 \mathrm{D} \quad \mathrm{Al}$ ஏ831：F7 A9 D1 85 2D A9 248518 Ø839：2E 4C $\quad$ Øø $0116 \quad 6 \emptyset \quad 06$ D1 93 ஏ841：24 B8 1B B9 6E 0999 E8 44 0849： $07 \mathrm{C} 8 \mathrm{D} 0 \quad \mathrm{~F} 7 \mathrm{EE} 02$ Ø1 EE 19 9851： 05 Ø1 C6 F9 D 0 ED A2 0323 ஏ859：2の 34 Ø3 $\mathrm{Fg} 33 \mathrm{C} 9 \quad \emptyset 7 \mathrm{Dg} 95$ Ø861：16 A2 $21 \quad 2 \emptyset \quad 34 \quad \emptyset 3$ D $\emptyset$ ØA A Ø869：A2 $\quad 04 \quad 2 \emptyset \quad 34 \quad 03 \quad 18 \quad 69 \quad 07 \quad 65$
 0879：A8 A5 A7 85 A9 A5 FE 85 FB ஏ881：F7 A5 FF 85 F8 20 6C $63 \quad 73$ Ø889：A5 F8 85 FF A5 F7 85 FE 72 Ø891：E8 $20 \quad 34 \quad 93 \mathrm{D} \emptyset$ 1E A2 $\quad$ Ø8 21 Ø899：2の $34 \quad$ Ø3 $\mathrm{A} \emptyset \quad 92 \quad 84$ A8 85 2A 98Al：A6 18 A5 FC 65 A6 85 F7 58 g8A9：A5 FD 65 A7 85 F8 20 6C EF Ø8B1： 03 4C 13 Ø1 $\mathrm{E} 8 \quad 2 \emptyset \quad 34 \quad \emptyset 3 \mathrm{FB}$ 98B9：Dø 1C Ag 03 84 A8 E8 $20 \quad 36$ Ø8C1：34 Ø3 Fg ø8 A2 98 2ø 34 F 4 ஏ8C9： 03 4C 5C Ø1 A2 ØD $2 \emptyset \quad 34$ C7 Ø8D1： 03 E6 A7 4C 5C 01 E8 20 AF Ø8D9：34 Ø3 D 0 ØA E8 $2 \emptyset \quad 34 \quad$ Ø3 B2 Ø8E1：18 $69 \quad 04$ A8 D 0 D6 88 2ஏ 37 Ø8E9：34 Ø3 DØ ØA A2 02 2Ø 3421 Ø8F1： $0318 \quad 69 \quad 66$ D 18 ED A2 08 A2 Ø8F9：2の 34 Ø3 Dの E6 A9 Øø 85 F7 6901：A7 A4 FB FØ 0C 06 FA 2A 37 ஏ909：26 A7 C6 FB CA D 9 F2 A8 D8

6911：60 48 B1 FE 85 FA A9 08 FE 6919：85 FB 68 A4 FE Dø 02 C6 4A 9921：FF C6 FE C $\emptyset$ E7 Dø DE A4 B5 0929：FF C6 87 D 0 D8 A9 3785 BA 6931：01 58 4C 90 80 A4 A8 F 0 3C 6939：22 A5 F7 38 E5 A8 Bø 03 7E 6941：C6 F8 38 85 F7 A5 FC E5 8A 6949：A8 B $\emptyset \quad 62$ C6 FD 85 FC Bl 3A 6951：F7 88 91 FC 98 D6 F8 C4 42 9959：A9 F6 ØA B1 F7 C6 FD C6 76 6961：F8 C6 A9 10 EC 6078 E6 98
 9971：9A EA 9D C6 3A A9 3A 6962 0979：09 E3 27 A9 81 CA 12 A9 8D 9981：FE 85421943 D6 Cø 4489 6989：34 7C 4C 4F 55 CF C1 18 D8 9991：8D 3288 A9 Aの 8D 3388 CC 6999：60 A9 38 8D 51 EE 8E E5 6F 99A1：60 AD 3A 00 E4 Eø 99 EE 63 69A9：6A 88 4C 57 CF 86 E3 3A AC 69B1： 34 3B 84 F7 A9 6885 F8 2E 99B9：A9 EE Eø 858392 B9 11 BB 69Cl：70 3C ØB 2A 1C BB 8248 3C
 09D1：E9 A9 FF 85 F9 87 D3 A9 DA 69D9：8B FA $85 \quad 9782 \quad 312 \mathrm{EE} 8 \mathrm{D} 54$ 69E1： FF 7D 94 AF 801885 lF 6 F 69E9：3B $12 \quad 38$ A9 C8 $85 \quad 39$ EC 7B の9Fl：Al $20 \quad 768185 \quad 97 \quad 3082$ EE 69F9：A5 17 2A E6 17 E6 5418 6D のA01：34 B3 $4038 \quad 671638$ A5 51 ØА09：38 Eの C9 ØC 38 9С 5E 3995
 ØA19：D3 86 2B $\quad 058682 \quad 251 F 16$ ØA21：C9 83 D $\emptyset$ 5C 58 DF 44 D 676 ØA29：のC E6 44 5C 2D E3 ØB $4 \varnothing$ 9A日A 31： 69 Ø1 E7 06 4F 62 ØC 42 F 5 ØА 39：СВ $7 \emptyset$ C6 ØС 3 C С $\varnothing 4 \mathrm{E} 46$ В $\emptyset$ ØA41：ED 0960 A6 34 D 012 AC BA 9A49：74 68 6C 4F E2 66 ØF 8184 ØA51：60 B9 $61 \quad 04$ C6 10 F2 30 F 6 ØA59：66 ØE ØE 4E 76 Ø6 F7 85 DB
 ØA69：84 $22 \begin{array}{llllllll} & 26 & 6 \mathrm{~F} & \text { CE } & 81 & 50 & 62 & 83\end{array}$ 9A71：C9 8F 9511 D2 08254 D 60 ØA79：38 9F 01 1F DØ 62 BØ 47 DA 9A81： 26 F4 81874 F $40 \quad 06$ C 6 D3 ØA89：0F 49 CE ØF 31 9A 43 1D D9 ØA91： 05 1E DE 08 ØC 7212 F9 54 ØA99：72 60 ØC 85 F9 AD 26 FA A6 ØAAl：E9 ஏø 85 FA F7 06 6A C8 68 ØAA9：BD Dl 9890 E8 446816 6C ØAB1：F5 B $0 \quad 9367 \mathrm{BE} 81 \quad 67 \mathrm{~F} 4 \mathrm{C} 2$ ØAB9： 07 A5 $8 \emptyset 4 \mathrm{~B}$ B $\emptyset \mathrm{F} 012 \quad 06 \mathrm{~F} 2$ gACl： $8 \mathrm{C} 97 \quad 97 \mathrm{~A} \emptyset \quad 62 \mathrm{E} \emptyset 6 \mathrm{~A}$ 8B E $\emptyset$ $\begin{array}{llllllll}\text { gAC9：10 } & \text { A8 } & 66 & 6 \mathrm{D} & 8 \mathrm{E} & 29 & 81 & 73 \\ 37\end{array}$ ØADl：95 ø8 A6 0A C9 22 Cl 6587 gAD9：17 A2 37 D0 F1 8470 Ø0 98 ØAE1：89 A9 30 1A C8 8A 910666 ØAE9：A4 ØF $^{6} 60$ D $606621101 C$
 ØAF9：A5 1F 9491749128 DE 6D
 ØBø9：D1 F2 69 1A A5 1385 øC 24 ØB11：A4 62 B8 $99 \quad 93062 \mathrm{D} 81 \mathrm{AD}$ ØB19：øC 60 E6 3A F2 63 Dø A5 B8 बВ21： $06 \quad 38$ E5 $19 \begin{array}{llllll}17 & 20 & 46 & 85 & \text { E1 }\end{array}$ GB29：19 A5 67 E5 1A 1885 2D DD 6B31：85 80 D1 81 8D 3D 085341 9B39：8D 3E 98 A9 64 D1 F9 2B C7

ØB41：80 $2 \varnothing 108 \mathrm{C}$ Eの 00 ØC BE 48 0B49：4C 00 4A 25 AC 52 1A 1014 ØB51：70 08117298 F7 $72 \quad 98$ F7 ØB59：46 Ø1 2C A5 2C Eの ED 2C 9C ØB61：E6 EC 2D 367145 C7 86 E5 ØB69：94 $15 \quad 60 \quad 92 \quad 16$ 3A 83 Cø A5 ØB71：EØ 134160141 E 1185 AB ØB79：DØ DE FØ A9 Eの 129005 DD ØB81：A9 9988 F1 15 Øø 8A 0A A6 ØB89：AA A9 A7 A9 B1 01 ØD DD 78 ØB91：C8 BD DC 8280 D5 336061 ØB99：A2 07 D6 E8 F6 7E 86 F9 F3 ØBAl： $86 \quad 05$ ØE 5E $85 \mathrm{C} 283 \mathrm{AE} \mathrm{D} \varnothing$ GBA9：85 CF 83 CD $848 \mathrm{FF} 84 \quad 97 \quad 36$ $\begin{array}{lllllllll}\text { ØBB1：} 88 & \text { D } 0 & 84 & 49 & 85 & C 9 & 83 & \text { C2 } & 82\end{array}$ ØBB9：87 Eø B8 Eø 45874 E 85 5B ØBCl： 20 7C $34 \quad 6994 \mathrm{C1}$ A6 F8 10 ØBC9：11 F7 9673 1A C5 18 D0 98 ＠BD1： $6655 \mathrm{C} 517 \mathrm{~B} \emptyset 3341 \mathrm{C} 0 \mathrm{FF}$ ØBD9： 82 F7 $40 \quad 08$ F8 72 Ø8 32 8B ØBE1：3C $131985 \quad 14 \mathrm{C7}$ 0A Aø CA ØBE9： $62 \quad 288060$ E1 A5 19 A5 9E ØBF1：96 19 A3 1A 4C ØE 83 A9 FA ØBF9： 0556 F3 0 F 20 CC 8 A 01 E1 øC $01: 40 \quad 08$ A9 1A BA FF A2 7F AC ØC09：Cø FD 3D 95 øø 2A 7F 10 B9 øCll： 62 2D 32 2E A5 F9 8D 1B E9 ØC19： 68 A5 FA 8D 1F 08 6C 02 CA ØC21：A $\emptyset$ A5 2 E Fø 12 6E 3D B2 3 F øC29：8の ø4 F7 ØC Ø1 6C 621313 ØC31：C6 2E D $\emptyset$ EA 5 C 6017 E 175 ØC 39：3ø 18 4C 13 øø Fl 1869 8B øC41：$\varnothing 2 \quad 04384 \mathrm{DC}$ C $8 \mathrm{BE} 6048 \quad 80$ øC49：34 Ø1 2C 9ø DA 1860 B6 F8

 øC61：A9 B2 7C 996118 3C Fø EC øC69：C2 A5 $33 \quad 48$ BE FD 43 CC 78 øC71：2F ØC 4740 E8 27 04 A9 A6
 ØC81：8A C2 9D 85404 F A7 65 2F ØC89：61 $50709 \mathrm{C} \quad 08 \quad 39$ 2A EA A2 ØC91：28 11 1C A5 40 5E BE 69 El ØC99：A5 FD 2E FC E2 7E 6831 AC ØCA1：F8 8B A5 3 F Fø C5 A9 BD 71 øСА9： $6518 \quad 02$ ø2 8E 58 E6 El $6 \emptyset$ ØCBl：C1 9D D8 C3 9D $98 \quad 23$ 1D 9 ØCB9：Eø 40 D 15 4C 14 C6 1311 $\emptyset C C 1: A B \quad 4 \mathrm{C} \quad 48 \quad 84 \mathrm{E} 62 \mathrm{E} 98 \quad 4 \mathrm{E} 83$ ØCC9：$\varnothing 241$ 9E DC E8 E $\quad$ Ø 9 D $\varnothing 82$ ØCD1：F5 DC 84405818 F7 26 E9 ØCD9：C2 $1 \emptyset$ A8 81 A9 A7 32 C8 9D ØCE1：øC A9 89 7B CD ØE B9 0673 ØCE9：D $\emptyset$ F6 $88 \quad \emptyset 4609269$ A9 43 ØCF1：4C 2C 2752 Ø8 BC CC 4658 ØCF9： $\begin{array}{ll}\text { E } & \mathrm{F} \emptyset \\ 01 & 93 \\ 83 & \mathrm{~B} \emptyset \\ 53 & \mathrm{C9} \\ 7 \mathrm{E}\end{array}$ ØD61：65 2A A9 Cø 85 2B 58 57 7A øDø9：41 18 13 C8 $14 \begin{array}{lllll}68 & \text { C5 } & 14 & 19\end{array}$ ØD11：Fg 1C $\begin{array}{llllllll}95 & 10 & 18 & 69 & 92 & 85 & 4 \mathrm{E}\end{array}$ GD19：2A FA 71 2B A5 2B C5 3986 6D21：58 6D 2A C5 38 9ø DA C2 Eø ØD29：4E 4257 D1 1D 1938 E9 AA ØD31：$\varnothing 48519$ B $\varnothing 02$ C6 1A A5 E1 ØD39：F7 58 4E 90 F8 43 9ø 13131 ØD41：43 A5 $14 \begin{array}{llllll}91 & 19 & 50 & 16 & C 4 & F C\end{array}$ 6D49：C8 B1 65 A3 30 3E 63 D 660 ØD51：$\varnothing 7$ A5 6275 2E A9 605019 9D59：B8 41 ØE 3684 Al 1D C7 F1 ØD61：17 B $\emptyset 12122 \emptyset 6 \mathrm{~F}$ CE 3B 2E


9D71：92 9426 E7 ØE 2D 80 E1 45 ØD79：81 3F D1 001 E Fの ØF C6 F7 ØD81：3F CC 8969 1C B2 A9 0136 ØD89：85 FD 4C 7A FF $67 \quad 61$ BB $\mathrm{F} \emptyset$ ØD91：D5 68 DE 828595 gD 2879 ØD99：AF 85 BC BA 60 E5 ØF 3019 ØDA1：$\sigma \mathrm{B} \quad 80 \mathrm{C} 283 \mathrm{CA} 688417 \mathrm{6A}$ ØDA9：Fg 2E C9 3B Fø 37 5A AE 7C ＠DB1： 26 C9 A3 $\mathrm{F} \emptyset 39 \mathrm{C} 9 \mathrm{~A} 6 \mathrm{~F} \emptyset \quad 64$ ØDB9：45 E2 DE $80 \quad 51 \quad 61$ A5 3 F CD ØDC1：D 6 gD 2B 25 D9 7272 8の 3D øDC9：72 86 5D 36 B3 F3 78 DD 6A ØDD1：61 94 D3 D8 Dø B8 D6 33 E3 ØDD9：3C 6D 34 日F 196386 A9 F1 ØDE1：8ஏ 9E $\quad$ ØF $75 \quad 60649 \mathrm{C} 5944$ ØDE9：34 7B 86 ØE 6583 CD C9 89 ＠DF1：3A F6 C9 4C E1 85 C3 F5 96 ØDF9： 00 1C $69884 \mathrm{C} 2980 \quad 29$ F5 ØE Ø1：2の ED ØF 22 B $\varnothing$ C3 2B D $\emptyset 68$ ØE09：83 51 B8 09 C3 AB Eø A4 16 ØE11：6C D $\varnothing 13$ 1C 4C 1B 0 B 7112 ØE19：Eの A9 Dø 16 DB ØD Cø CD ED QE 21：86 A5 F8 B4 20 F7 38 GA AF ØE 29： 65 77 4C B3 $914190 \quad 01$ 1E ØE31：43 5ø ØC 0222 DØ DF 82 3B ＠E 39：C2 gD 46 3F 84 1B 82 A2 EE QE41：00 79 1F 18 10 07 C3 E3 29 ØE49： 61 7A 61 D6 E9 A2 98 D4 $7 \emptyset$ ØE51：A1 CA D $\varnothing$ FA 60842 A 90 B4 QE59：1C $54 \quad 8421 \quad 30$ AA 76 2E 82
 बE 69：76 $78 \quad 864 \mathrm{C}$ 62 AB 61 00 F5 ＠E 71：41 2 2A 73 3B $2 \mathrm{BB} 70 \quad 22$ 日B 45 ØE79：83 43 E4 1785 3D AC 8A 3B ØE81：8C C5 822658 1E 9A A6 1 F ØE89：7B $48 \quad 2066 \quad 8 \mathrm{E} \quad 89 \quad 3946 \quad 33$ ØE91：8A 96 8C 5C 23639117 D 6 ＠E99：4B $20 \mathrm{AF} 9507565 \mathrm{~F} \quad 8 \mathrm{D} 96$ ØEA1：BD Bl 6067 日F 1104 F 041 ØEA9：39 0419 7D 07 A9 4C $0 B$ E $\emptyset$ ØEBl：CE CD EØ B4 19 8C 9C ØC $5 \emptyset$ बEB9：33 41 F8 4C FA 8660 A5 FB ØEC1：2A 3019 2B $6150 \quad 66$ D1 FE ØEC9：5A A3 8B 4820 D8 8B 68 D5 gED1：34 B8 77 B7 8E 4C FE 8E D4 ØED9：60 69 E6 304470 D 0 0C Fl ØEE1：33 C9 2 C 3C B5 $4454 \quad 22$ DC ØEE9：ØC C1 8261 01 8D F2 87 8E ØEF1：95 45 E8 E 696 D7 6028 CD ØEF9：C7 $81 \quad 02 \begin{array}{lllllll} & 91 & 14 & 20 & \text { Fl } & 25 & \text { DD }\end{array}$ ØF01：$\varnothing 286$ B8 86 Al 0 E 2284 4F
 ØF11：11 41 EE 3288 DØ ØF EE 9D ØF19：49 2F $14 \quad 08$ C9 $72 \quad 05$ A9 76 ØF21：E＠8D 3388 AD ØC AØ A2 83 ØF 29：37 $86 \quad 01 \mathrm{AE} 6 \mathrm{~B} \quad 88 \quad 58 \quad 47 \quad 05$
 ØF39：84 8C 97 Øø 47 60 A2 7F 3Ø ØF41：B5 $\emptyset \varnothing$ 9D 067 FCA 10 F8 2E ØF49：4C ØA 808673 BØ $89 \quad 00$ F9 ØF51： 0137 A9 98 6B A2 06 BD 17
 ØF61：F5 4C 86 Øø 11 日F Bø Cø 45 ØF69：52 83 BA 31 A5 ØC 08 BD 27 ØF71：A6 $88 \quad 850969143106883$ ØF79：F6 EA 34 C8 Dø F6 60 E5 E6 ØF81：88 07891960 Fl 0089 BC ØF89：25 89 ØF91：67 89 7B 89 9＠ 89 A2 E9 A7 ØF99： 8189 A9 89 B7 89 CD 8971

ØFAl：DE 89 EC 89028 A 108 A AC ØFA9：24 8A 36 8A 49 DA 03 8A 32 $\emptyset F B 1: 5 D \quad 8 A \quad 2 C 16$ F3 Eの 2841 BC ØFB9： 07 1C 2560 C8 68 ØD 3443 QFCl：7F D2 C2 $63 \begin{array}{llllll}57 & 41 & \mathrm{~B} & 4 \mathrm{~B} & 5 \mathrm{~B}\end{array}$ ØFC9：C4 B3 Ø8 D9 Bø 2B 88 E2 FB ØFDl：42 Cl 9184 日B $9 \mathrm{C} 48 \quad 22 \quad 79$
 ØFE1：E $\emptyset 20 \quad 22$ 2E 2E 46 ØC B8 FC ØFE9：$\varnothing \varnothing$ DD ØD 46 9F $2 \mathrm{C} 50 \quad$ 501 D4 ØFFl：6D 44 2E 8A $1291 \quad 05$ D $\varnothing$ F7 gFF9：C8 F8 D8 3A $20 \quad 20$ B3 29 8B 1001：D6 $5355 \quad 50503073 \mathrm{C} 3 \mathrm{FE}$ 1009：79 $44 \quad 274 \mathrm{BB} 45$ 9A 33 3C C7 1011：76 EA $46 \quad 55$ 4E $43 \quad 64$ DB 69 1019：EØ D9 $2 \varnothing$ 2D 93 1C 688257 1021：2D $60 \quad 4 \mathrm{C}$ 6B CE $40 \quad 53 \quad 59$ A7 1029：85 $424158 \quad 88 \quad 06$ FC 22 C2 $\begin{array}{lllllllll}1031: 81 & 4 \mathrm{E} & 59 & 43 & 27 & 19 & 6 \mathrm{C} & 90 & \text { øC }\end{array}$ 1039：4C $454763 \mathrm{AB} 5439 \mathrm{E} 0 \quad \mathrm{Fl}$ 1041：91 4D A9 20 55 AA C2 008 F 1ø49：4E 4558 Fg 57498096 6D 1051：4F $55 \quad 28 \quad 46 \quad 4 \mathrm{~F} \quad 3 \mathrm{E} \quad 06 \quad 54 \quad 9 \mathrm{~F}$ 1059：59 50 9ø 日D 3C 日A 13 54 A1 1061：43 48 ø0 日D E5 28 8C 2211 1069：41 5449 C7 $204142 \quad 63$ D2 1071：45 54 45 44 A6 55 E1 51 D5 1079：4D 4D $41 \quad 6213 \quad 504177$ B5 1081：E9 øの 48 8F D8 Cø 00 Eø 43 1089：DC Al 62 2E 43 4F 94 ØF 33 1ø91：$\varnothing \varnothing \quad 9986 \quad 2 \varnothing 492 F 4 F$ D2 63 1099：52 52 84 A 422 2A 2A 2A 8A 10A1：37 $44 \begin{array}{llllllll} & 45 & 56 & 49 & 43 & 45 & 20 & 7 E\end{array}$ 10A9：4E $4 \mathrm{~F} \quad 54 \quad 61 \quad 3 \mathrm{C} 5245 \quad 53 \quad 6 \mathrm{E}$ 16Bl：45 $4 \mathrm{E} \quad 54$ ØD 06 4D 4953 7E 10B9： 66 B9 $4 \mathrm{E} \quad 47$ 2ø $45 \begin{array}{lllllll}51 & 55 & 97\end{array}$ $\begin{array}{lllllllll}10 C 1: 41 & 4 C & 20 & 53 & 49 & 47 & 4 \mathrm{E} & 60 & \mathrm{D} 2\end{array}$ 10C9：A2 FA 9A 48 A9 408512 3D 1øD1：82 77 ØA 31 Cl 6C 20 AC 12 10D9：8A A9 $64 \quad 92 \quad 50 \quad 88 \quad 68$ 5A 26 1ØE1：2F 20 D4 Aø A9 3A 9675 1F 1øE9：C1 $\mathrm{gA}_{\mathrm{A}} 49$ D8 A5 496182 BB 10F1：A5 3A C 056 D3 804 C 94 BE 10F9：82 C 632 2Ø A5 1075 1D 49 1101：11 ØD A2 8884 1F A2 DD 8F 1109：42 2A 4048 2A DD 5167 D5 1111：6ø 8D 2A 38 FD $23 \quad 48 \quad 63 \quad 9 \mathrm{~F}$ 1119：2A A5 2B FD 24 C5 2B C8 56 1121：D 0 E $\varnothing$ C7 $4185 \mathrm{C} \varnothing 53 \mathrm{~A} 46 \mathrm{~B}$ 1129：20 70 9E $98 \quad 99 \quad 304 \mathrm{C}$ Al 18 1131：E6 20 3A 52 C 6 CC 9 B D2 AE 1139：38 $4 \mathrm{FF} 34 \mathrm{CC} 17 \begin{array}{lllllll}10 & \text { 日A A6 } & 52\end{array}$
 1149：8B D8 ØA 06 3ø 56 øø A9 8D 1151：22 EB A5 C8 C4 ØE 9ø DF $2 \varnothing$ 1159：$\varnothing \mathrm{D} 54$ 1A 9889 C2 38 E9 95 1161：7F AA 33 B6 FF CA $\mathrm{F} 6 \quad 98$ D4 $1169: 3 C$ C8 10 FA 30 F5 C8 B9 32
 1179：8B $29 \quad 7 \mathrm{~F}$ ED $85 \quad 22 \quad 5680 \quad 5 \mathrm{C}$ 1181：81 828388586878889 BA 1189：8B 8C 8D 8E 8F 9799 9E DB 1191：A1 B4 B6 B9 BB C2 C3 C4 59 1199：C5 C6 C7 CA Cl C7 CA $\quad$ ©B C3 11A1：43 $12 \begin{array}{llllllll} & 88 & 55 & 91 & 12 & 53 & 51 & 1 D\end{array}$ 11A9：88 A4 $27 \begin{array}{lllllll}88 & C \emptyset & 40 & 69 & 9 A & 1 B\end{array}$ 11Bl：20 E8 $32 \mathrm{Fg} 277^{73} \mathrm{CE}$ 9A 22 11B9：86 $12 \begin{array}{lllllll}86 & 21 & 86 & 12 & \text { AB A2 } & \mathrm{FC}\end{array}$ 11Cl：86 日F A6 27 FC 3A 84 g1 9 D 11C9：A2 $\begin{aligned} & \text { Øも } \\ & \text { 日2 }\end{aligned}$ 日F C6 A9 $86 \quad 27$ 7F

11D1：A6 23828482 AØ 487343 11D9：9ø AD 8241 øø 3A $4 \mathrm{C} \quad 8016$ 11E1：8B 46 90 Al 9620 ØA 19 E9 11E9：$\varnothing 4 \quad 1927$ A3 8 B $34 \quad 668431$ 11F1：98 40 91 F7 E6 F7 44 C2 84 11F9： 08 F8 A5 F8 C9 C $\varnothing 36 \mathrm{AF} 10$ 1201：F7 61 B $\emptyset 63$ A 4 ØF 4123 AE 1209：øD 89 Ø1 18 B6 01 C3 1E 17 1211：AC 6391 FB A2 18 1A 10 F7 1219：8g 8A 8D 1B AA Fø 1D 23 F9 1221：C8 10.318511 A8 20 ØF A6 1229：15 88 B5 25 日A 9D $28 \quad 15 \quad 2 \mathrm{~F}$ 1231：E8 EØ 50 BØ ØB 9Ø EF 8618 1239：$\sigma$ E E2 $\quad$ 3B $45 \quad 34 \mathrm{AC} 80 \quad 65 \quad 33$ 1241：20 8C 88 2E Al $9 \varnothing 8128 \quad 67$ 1249：40 A4 32 C4 日E Bø 1D 77 2E 1251：02 8D 6C C8 $48 \quad 27 \quad 84 \quad 45 \quad 2 \varnothing$ 1259：34 $85 \quad 34 \quad 61 \quad 55 \quad 91 \quad 84$ B3 FF 1261：Fの $\begin{array}{lllllllll} & 6 & 84 & 32 & 84 & 16 & 10 & 93 & \text { 日B }\end{array}$ 1269：62 19 2C F3 E2 90 88 C3 F7 1271： 66 1C $867 \varnothing$ øの 8A 8426 D $\varnothing$ 1279：A4 $31 \quad 72$ C7 $85 \quad 32$ C8 8412 1281：31 A8 B9 FF $0185 \quad 33$ A4 C8 1289：26 $60 \quad 85 \quad 35 \quad 30$ 5D 99 10 F5 1291：82 $80 \quad 99$ C5 35 F 0 0A 8D A3 1299：CB F7 $19 \begin{array}{lllllll} & 93 & 94 & 45 & 34 & \text { D } & 63\end{array}$ 12Al：F2 E6 31 BB 72 ø8 96 5B F5 12A9： $61 \quad 41 \quad 68 \quad 18 \quad 36 \quad 2 \mathrm{C} 3 \mathrm{~A} 9 \mathrm{~A} C E$ 12Bl： $643090616040 \quad 220381$ 12B9： $0085 \quad 36$ 6E 65 5E 60 A3 F2 12C1：33 C9 AB 13 E6 36 A2 4432 12C9：82 $3285 \quad 37 \quad 9795 \quad 2 \mathrm{~F} \quad 29$ 7A 12DI：CF 8516 A5 $1 \mathrm{D} 15 \begin{array}{lllllll}15 & 21 & \mathrm{Fg}\end{array}$ 12D9：2の ØA 265015 Øø 4C A5 41 12E1：15 $65 \quad 67 \quad 06 \quad 13 \quad 26 \quad 14$ A5 2A 12E9：13 6516 D3 7610401449 12F1：6E 6A CE F0 日B A5 32 C5 E9 12F9：37 32 F8 ø日 90 A5 36 Fg DD 1301： 0 D D3 38 E5 13 C 0106125 1309：E5 14 96 ØE 6085 6C 10 DC 1311：23 20 ØA 3094 øø $90 \quad 99$ E3 1319：85 41 E8 1884 Dø ED C9 FD 1321：25 32 1A 18 2A C9 24 Dø BC 1329： $69722120 \quad 04 \mathrm{D} 4 \mathrm{~F} \quad 1 \mathrm{D}$ 109 1331：C9 28 D $\varnothing 19$ A5 1 F 1B 5 E 3 3 1339：50 28 DØ ØB 54 日F Ø1 8E CB 1341：14 1E FØ 04 A9 10 85 1E $\mathrm{gE}_{\mathrm{E}}$ 1349：Eø 10 E2 54 A2 ØF 86 1D 01 1351：28 3E E8 2ø E1 FF 6B 5E 7E 1359：84 88 94 F6 Cø F0 401959 1361：बF 85 20 C5 1D D6 28 E3 31 1369：ø8 $29 \mathrm{~F} \emptyset C 5$ 1E D $\emptyset 2 \emptyset$ 4C 19 1371：90 øC E3 3C 28 A2 øø BC AB 1379：76 87 DD D1 98 Dø 97 E8 74 1381：E4 1D 90 F3 C7 63 A5 20 E9 1389：A8 79 D6 62 E6 234 C A1 9A 1391：8D 4D ØB EC 81 Aの 3F 6D 7C 1399：6C B $\emptyset 25$ 2B AF 19 C9 C4 B3 13A1： F Ø 15 C9 C7 9064 C 9 CB 2 F 13A9：9 9 ØD 4173 6B BØ 7114 A 45 13B1：19 D $\varnothing \quad \emptyset 8 \quad 72$ 1D E6 3 F 4 C 1ø 13B9：86 94 E8 $4143 \quad 32 \mathrm{C} \varnothing 21 \mathrm{FE}$ 13C1：26 4D C9 AE B8 2E $20 \quad 87 \mathrm{~B} 8$ 13C9：99 406020 3C E9 2A 3E Fं6 13D1：78 13 ØF F6 $54 \quad 99 \quad 02$ D1 E6 13D9：AF 18 5ø $6 \mathrm{E} \quad 82 \quad 94$ 1E $91 \mathrm{C} \emptyset$ 13E1：4の C8 99 A6 8E 4A 4E Dø Fø 13E9：7E 5390 BD 7F 35 日E BE BD 13F1：80 2C 8E 60 3D 99 4B 99 E8 13F9：59 $9984 \quad 99$ E4 6 D D3 $\quad 99$ 3C

1401：Eの 6925 ØA 1B 0A 31 0A 8E 1409：45 ØA 3B ØA 4F ØA D2 8D 34 1411：20 061152 C9 AB Fø 0176 1419：25 54 ø1 2C Al 24 Ø1 3D A8 1421：86 3E E7 9A 30 E3 9A El EA 1429：71 94 El CB 8399 El 2492 1431：30 62 E6 1869 Ø1 A6 3E 43 1439：B5 2C 84848 C D 027 D7 ED 1441： 0720 Fl A5 3D Fø B6 34 DC 1449：DC Aø C9 Fø C9 2ø 3A 2B BE 1451：D8 20 B9 $\begin{array}{lllllll} & \text { B2 } & 14 & 5 B & 8 F & 20 & 9 D\end{array}$ 1459：CD 3022 ØE F3 ØD A9 BD 7E 1461：2F $8 \mathrm{~F} \quad 2240$ C $\quad$ Bl 940144 1469：20 2E 72 2ø 9B 8E 362021 1471：DD 8C 6A Al 01 6335 0A 1D 1479：E8 B4 77 E4 F4 AA CA 61 C9 1481：51 1B 40 06 F0 ØE C9 1084 1489：D 6 BC 11 Ø2 1C AC 41 C3 65 1491：4C 6E 8F A2 60 DD 54 8B 43
 14A1：9F ø3 E 612 AD 60 ØE C 63 14A9：C8 62 8A E9 12 6 A AA BD 72 14Bl：D2 82 日F BD D1 8F 484 C 4 B 14B9：74 91 Ø6 ØF $80 \quad 62$ Ø8 ED 7B 14Cl：8F EA 8 F 1B 90 B7 90 3B CF 14C9：90 59 9ø 7F 90 D9 90 FA A2 14DI：Aø $9 E \quad 0159$ Øロ 1D 07 5D 63 14D9：$\varnothing C$ CE 42 El 70 BD 129051 14E1：18 69 63 F7 5013 CE 50 6D 14E9：86 98 4D $08 \quad 68 \quad 98 \quad 76 \quad 98 \quad$ D9 14F1：5A 08 1E F7 0844 4A Aø 13 14F9：63 70 E3 6 6B $23 \begin{array}{lllll}23 & 23 & 27\end{array}$ 1501：4C D5 4B 69 3A 2E A6 28 Cø 1509：BD $54907 C 2 D 615590$ A9 1511：D6 4769 日A 6C 17 Ø0 85 8B 1519：29 $61 \quad 94$ 1B 5 5B 283976 D8 1521：89 C8 2A 92842 D 7 B 2 A AA 1529：09 72 6E EA F8 62 6C 40 D9 1531：$\varnothing 418$ 2D 40 8D D $\varnothing 10$ Ø0 DC 1539：E4 3C 7E E4 50 14 AA Ø0 2B
 1549：08 $1865 \quad 29 \quad 3243$ EA A6 D7 1551：39 8146 F8 67 6A A9 E6 6B 1559：5C C2 E9 3D 7F ØA 397 F 89 1561：19 20 1F 1E 3119 1C 6410 1569：39 1C $75 \begin{array}{lllllll}75 & 94 & \text { A4 } & 54 & 78 & 66\end{array}$ 1571：C8 6C $88 \quad 24$ C2 62 5C 4C 91 1579：44 C8 AE $85 \quad 72$ A5 3285 3A 1581：41 60 A9 $\quad 0285 \quad 28$ A9 ØC E5 1589：E6 AA 80 6D 65 20 C4 4D 32 1591：23 $68 \quad 20 \quad 65$ A9 $8 \mathrm{EE} 20 \quad 18$ 9B 1599：58 8F 8C $4 \mathrm{~A} \quad 4 \mathrm{~A} 4185 \quad 329 \mathrm{E}$
 15A9：FD $2 \emptyset$ Eø 1114 Eの Dø 20 ED 15B1：D6 6840 A9 A5 624 D 8D 46 15B9：48 1A A9 2C Ag 1C 14 A9 CD 15C1：12 F2 A8 28 2C A9 F3 24 5D 15C9：A4 8C 88 A3 13 El 4C 68 D5 15D1：8A 8A A4 62204894 日A F3 15D9：6B 5D C9 AC 906915 61 E8 15E1：CD 9746 B3 C9 AA 904 C 1F 15E9：CC 48 E9 A9 $\mathrm{F} \varnothing \quad 9768 \quad 8962$ 15Fl： 03 3F $13 \quad 61$ CA FE A4 32 AD 15F9：B9 øø 62 C9 B1 90 ØE C9 93 1601：B4 B $\emptyset$ CC 71 E9 B $\emptyset 65 \mathrm{FE} 4 \emptyset$ 1609：85 FE 58 Al A9 61852962 1611：B4 61 FC $\emptyset C 6120$ FF 65 C8 1619：FE 日A AA 63 DE BD F1 55 F9 1621：41 BD F2 9611 D8 8F 91 Cl 1629：60 EC $08 \quad 22$ бA 18 gA 2E D6

1631：ØA 42 0A 38 ØA 4C 0A 54 Al 1639：DD ØC B4 Dø 22 2ø 59104 F 1641：5D 91 A5 D8 D6 $2 \varnothing$ Al A2 DF 1649：49 C8 13 21 A9 Aø A8 68 E9 1651：A5 14 AA 94 4C BD 92 C9 3C 1659：80 90 ø6 2ø A7 8F 4C 7738 1661：91 20 C3 8С Bø AA 37 øø 3E 1669：3C 342047 8D A5 IE C9 42 1671：26 Fø 05 A9 10 4C 76 8A 42 1679：A9 AD 48 EF 20 03 8C E6 FA 1681：13 6B 8514 Dø B7 BB 8B 6C 1689：A2 Al 64 A9 9A 34 91 6A BD 1691：A5 $33 \mathrm{~F} \emptyset$ ØD C9 $22 \mathrm{~F} \emptyset \quad 99$ ØE 1699：9D E2 3770 E8 Dø EF 86 2C 16Al：1D 2ø 4D 8C A5 Ø6 D $\emptyset$ Fl AF 16A9：1A A5 $6785 \quad 23$ A4 3D 22 CD 16Bl：C9 30 Dø 21 AC 41 C 5 1D ØE 16B9：D 18 1899013 C8 Bl 87 2D 16C1：14 Aø FF C8 C4 1D Fø 1841 16C9：B1 13 D9 D1 98 Fg F4 A9 98 16D1：30 29 日F 1869046522 øC 16D9：85 22 9ø CC E6 23 Dø C8 5E 16E1：60 20 5A 91 A6 FC A5 2948 16E9：Dø øC BD DE 8185 5F D8 Eø 16F1：DF 59 C8 BD Eø 9220 2C 17 16F9：BD E1 92 4C E3 8B A8 98 3B
 1799：16 øС 2B øС 31 øС øВ 0843
 1719：$\varnothing \varnothing$ øø C 6 FD DA $\emptyset E$ D4 8D 85 1721： 0 F 9064808 D 12 D 468 4A 1729： 0 F 3ø C4 33 AE 0291 33 8A 1731：00 98 40 A5 63 C9 7E F3 18 1739：18 C9 6の 9ø E9 2ø E2 ØB 8F 1741：4C FF 60 Fl CC 38 F5 4135 1749：71 F5 EC A4 65 Ø2 A7 1625 1751：1E BA AØ D1 Bø A1 C3 1416 1759：88 84 8C EØ ØB D3 1F 95 Ø8 1761：E2 61832062 AD 1B D4 9D 1769：33 A4 18 DD 40 Dø 05 B5 $4 \varnothing$ 1771： 62 Dø 0160 B5 63 3ø 69 1E 1779：40．6E 99 A9 61 B5 A9 FF 63 1781：59 65 Ø3 8С 8B B2 78 2E 25 1789：2E 7E $7 \mathrm{Cl} 2 \mathrm{E} \quad 32$ 80 Eø 2258 1791：8D CA 08 8F 62 FE Ø8 Bl 01 1799：06 BB 13 7F Al $84 \quad 0960$ A5 17Al：86 $66 \quad 84 \quad 07 \quad 2878$ C4 AB ED 17A9：CC $0888 \quad 2991 \quad 66$ Aø 26 EF 17Bl：F4 98 A8 A7 A4 982 A 9A B3 17B9：69 5E 8A A6 E8 C8 D6 F2 EE 17C1：84 C 092 Ø3 E2 6A 78 ØC 21 17C9：61 66 ø8 1C 99 C9 A2 FF Al 17D1：E8 36 EE 13 E4 69 F6 0 F CB 17D9：Cø 26 7E DD 90 Fの EF 01 C8 17El：7D BD 007 F 856035 F 847 17E9： 00 8D $1495 \quad 63$ A5 98 Fø 97 17Fl： 63 AD Øø 7E 95 62 E4 ØD 80 17F9：84 D2 62 CB $106563554 D$ 1801：51 38 EE 9C 1586 C5 5937 1809：71 BB Fl ØB 21 3E 8550 2D 1811：A1 93 90 日D F5 186540 F4 1819：47 65 3B 4745 E6 93 C8 D7 1821：40 56 ØB B3 $55 \quad 2086$ ØA E5 1829：86 59 1A 20 EØ $60 \square 403$ 4A 1831： $0 \mathrm{~B} \quad 69850510648810$ DB 1839：CE A2 ØF Ø6 Ø2 26 Ø3 26 9の 1841： $0 \mathrm{~A} \quad 26 \quad 549 \mathrm{C}$ 日B 49 98 6A 0 D 1849：76 98 90 12 A5 ØA E5 D4 64 1851：日A A5 ØB E5 ø3 3D ØB E6 B9 1859：28 ø2 E6 ø3 CA 10 D7 C $\emptyset \quad 32$

1861：00 F6 05 D6 F8 26 EC 67 7D 1869：30 25 日8 C3 25 ØE C3 0223 1871： $65 \quad 945 \mathrm{E}$ 10 C $\varnothing 05798382$ 1879：11 $38 \quad 30$ ll 2088 日B A5 36 1881： 63 C5 6556 AF 62 C 564 BF 1889：60 38 60 AE 30 EF A9 0184 1891：18 5203 FF 31 D 8 E 06273 1899：85 03602 F 13 E6 EA D $\emptyset 27$ 18Al：EF AB 98 E7 $9 \varnothing$ E5 B $\emptyset$ DC A $\emptyset$ 18A9：37 21 B6 DB 90 D2 CE 8988 18Bl：D1 Dø C8 F9 12 E2 $9 \varnothing$ C7 BC 18B9：Bø BE $2 \varnothing 61 \quad 9920$ ED 99 B3 18Cl：Fø B6 9ø B4 Bø B9 A5 6532 18C9：85 17 4C 3D 89 A5 17 30 1D 18Dl： 63 4C 4F 6A 4C $45 \quad 20$ FC D5 18D9： 06 2C A2 BB 6508 C9 Eø E1 18E1： 62011909850 F 7779 D7 18E9：98 Ø2 $03 \quad 34$ Ø0 85 ØE C4 81 18F1： 0 F F 6 3E B9 62 DC C9 2D 8D 18F9：8A 58 E6 6 E Dø 30 C9 30 4E 1901：90 2F C9 3A Bø 2B E9 2F 59 1909：9D C7 B5 0385 øC $61 \quad 65 \quad 97$ 1911：08 ØA 26 54 65 Ø2 F2 06 E9 1919：8C $75 \quad 0395 \quad 03 \quad 16 \quad 02 \quad 3653$ 1921： 03 B5 0265 ØD 950290 2C 1929： 62 F6 03 C8 Dø BE A5 ØE E1 1931：Fø $03 \quad 3278$ 9E 60 Ø1 Ø0 E2 1939： 1 A Øø 64 ØØ E8 86 9F 27 C4 1941：20 E6 GA A6 2866 Al 5C 63 1949：B4 A9 7E 2C A9 7F 8D 47 80 1951：ØB 38 E9 76 8D 50 ØВ F6 76 1959：1C BD ØC Fl 038482 10 E8 1961：42 2C 2D 45 B1 D8 3F 6C 95 1969：80 A2 65 ØD EC GD A4 DD B8 1971：42 2A D $\emptyset 65$ C8 DD 4ø 0 Ø 66 1979：90 13 88 A9 FD CF 32 ø0 F7 1981：22 Ø3 FD D6 0A 85 Ø3 E6 A5 1989：ØD D $\emptyset$ DF E3 $3 F 4542$ C9 $9 E$ 1991：Ø0 DØ Ø4 A5 ØC 6D A5 ØD 41 1999： 093099 A5 7D E6 ØC CA 54 19A1：5D BF $84 \quad \emptyset 06046$ 3C 32 C9 19A9：28 IE 14 ØA A2 66 A5 D3 E6 19B1：DD $85740590 \quad 66$ CA F6 3C 19B9：4C B3 ØB BD 52 ØB $85 \quad \emptyset 2 \quad 98$ 19C1：20 2E 61 AE D3 AA Eø 00 A5 19C9：F0 BA Ø3 25 CA 10 F4 79 CF 19D1：85 5F 9659 5C 85 E4 FF C9 19D9：Fø 65 8D Al 72 E 6 Ø8 10 Eø 19E1：B8 Fø ØA A9 3 F 9 A 12 A9 BA 19E9：20 54568520 CF FF C9 6E 19Fl： 0 D FØ $\emptyset 6 \quad \emptyset 6 \mathrm{~F} \emptyset 8 \mathrm{~B} 42$ A9 EB 19F9：Cの A9 ØD 4C $3 \varnothing 2 \varnothing$ 6C 62 3A 1Aø1： 00 A4 12 7D 81 Ø6 FØ 0785 1Aø9：9D 7B C8 9118 F5 86 08 CA 1A11：23 Dø ØE A8 0648 C8 Bl EB 1A19：1ø CA $07 \quad 38$ 10 Aø $0 \varnothing 84$ F3 1A21：12 56 6E 85 10 41 C9 09 3C 1A29：11 4C DD 日B A2 60 E4 08 4C 1A31：Fø 99 BD $007 \mathrm{E} 9 \mathrm{~A} 57 \mathrm{l} \quad \mathrm{F} 4$ 1A39：E8 DØ F3 ØE A1 85 14 A5 66 1A41： $038515 \quad 60$ E $06485 \quad 92 \quad 25$ 1A49：70 C0 42 51 90 Al 1C Dl 58 1A51：68 86 1A59：54 78 14 A8 082037 ØC 1E 1A61：E4 IE 68 C6 14 8A 1865 5D 1A69：14 AA 90 Ø1 C8 A5 6260 B5 1A71： 0 F Ø8 ØF $06598 \mathrm{~F} \quad 0490$ B2 1A79：4C C3 2D 0 A E7 41 A8 C9 6A 1A81： $6721 \mathrm{AE} 67 \quad 01 \mathrm{CE}$ FF 4C 8D 1A89：CC 8C $62 \quad 63 \mathrm{AE} 4 \mathrm{~A} \quad 22 \quad 80 \quad 27$


1A91：28 C3 61 4C C0 0B 016056 1A99：20 BA FF F6 64 A5 C3 2A 67 1AAl：01 C4 48 A5 2B 94 A5 2C 0E 1AA9：AØ 65 A9 C3 A6 2D A4 2E 42 1AB1：2ø D8 El 3B 85 C4 6885 Bl 1AB9：C3 6A B7 FF 8D $359760 \quad 32$ 1ACl：2Ø D6 $2 \varnothing$ 5C 324136 Ø1 08 1AC9：AC $33 \begin{array}{lllllll}97 & 20 & B C & 18 & 31 & 97 & 56\end{array}$ 1AD1：A6 2B A4 2C 20 D5 FF 86 5A 1AD9：2D 84 2E 4C C6 97 AD 3474 1AE9：A9 00 2a 4207956868 0 B 9：A9－00 1AF9：00 FF FF CG 7C 7F FE 4C 66 1B61：53 44 AF B2 E5 43 E9 D2 F5 1B69：83 64 C9 43 E2 C4 63 E1 99 1Bll：øE 82 8D Øø BA BA BA AD 84
 1B29：81 EE 1258 GF E9 EE GE AF 1B31：5D AC EC 8D 2646 CF 8D 2F
 1B41：53 14 28 D6 8D 21 D6 B5 7E 1B49：35 $86 \quad 62 \quad 15 \quad 79 \quad 37$ A9 80 C9
 1B59：46 Fb 69 C9 45 Fb 6F C9 82 1B69：A9 8C 8D 86 8A 20 B2 9 A 86 1B71：AD 4C 4E Dø 0344 0F 45 F4 1B79：77 71598850 3D 61 8D 82 1B81：82 6F 9B 4C 8D 9A $2 \varnothing 7397$ ：8D AD 21 CD 42 Fg 1B91：84－B6 6 E 96 8 AD A 64 C 1BA1：D4 0242 日A gA 01 日1 E1 E3 1BA9： 013310 AD 119 C Fg 45 2C 1BBl：13 4E 19 DA F0 0819 CA 7A 1BB9： 09 21 FF 1ø 8E 4F 1C 8E 36
 1BD1：9C 20 91 9A C9 01 E2 84 D6 1BD9：33 ØD 618587 8D 82 Ø8 Fg 1BE1：C2 8D 83 ø8 38 A5 2D E9 6A 1BE9：62 2D 96 8D 68 A5 2E E9 A4 1BF1： 6714 4A 8D $354 \mathrm{C} 48 \quad 3765$ 1C01：97 11 ค9 15 97 57 1Cø9：8D 149797 E2 3B 9B AD 62 1C11：12 590608 AD 13 9C 8D A9 1C19：78 AD 263911 AD 55 4E C8 1C21：ØC A9 42 E7 73 66 AD ØC 15 1C29：1F 2D AD 6D 81 Cl 2E 78 AA 1C39：A9 1C41：18 B1 $6591 \quad 93 \quad 38$ CE 0 FF 51 C49：01 27 1B CE 10 9 CD 16 C6 1C59： 63 A9 9С 850420 F5 9B 91 1C61：A9 $0 \emptyset$ 8D 119 C 60 C 0 Cl DA 1C69：27 ØE E6 04 E6 Ø6 A5 6676 1C71：C9 C8 D6 64 A9 EØ 8566 FC 1C79：4C Bø 9B 0848 AD 8 D 92 gE 1C81：Dø FB 6828 4C CA Fl Aø C2 1C89： 06 A9 ØD 10 E1 ØD B1 0378 1C91：F6 67 26 D2 FF C8 4C FC ED 1C99：9B $602923 \quad 28 \quad 23$ 9A 3E 50 5D 11 $82 \quad 205288$ 1CB1：86 ØB 2C øø 4F 2ø ØE 59 E5

1CC1：42 $85 \quad 67 \quad 205748$ 9F 5D D7 1CC9：3F ø日 12 4C 4 F 43 4B Ø1 C7 $\begin{array}{lllllllll}1 C D 1: 87 & 21 & 21 & 60 & 93 & 57 & 45 & 4 C & \text { 日B }\end{array}$ 1CD9： 82 DE 5268544 F 50 2E 4 A 1CE1：2E $111112 \begin{array}{llllll}12 & 80 & 06 & \text { DD } & 49 & \text { D9 }\end{array}$ 1CE9：92 75 ØD 22 1E 19 3C 20 7A 1CFl：45 5346 2E 4241534993 1CF9：43 $20 \quad 43$ C $\varnothing$ OB 50494 C 4A 1D01：45 76 46 4F 52205448 BB 1D09：45 $203634 \mathrm{C} \varnothing \mathrm{B} 8 \quad 55 \quad 50 \mathrm{DB}$ 1D11：44 $415445 \quad 995 F 465241$ 1D19：4F 4D 26 53 50 Ø0 $674 \mathrm{E} \quad 27$ 1D21：54 2049492042592028 1D29：46 4152494420414823 1D31：4D $41 \quad 44$ gD $9 \mathrm{D} \quad 90 \quad 70$ C1 C6 1D39： ®F $^{6} 64$ Ø4 EA EA EA $06 \quad 0646$

Farid Ahmad programs his 64 in Is－ lamabad，Pakistan．

## PAD DESIGN

By Robert C．Marcus
Impedance matching is an important con－ cept in radio and electronics work．To get the maximum power from your ham radio to your antenna，for example，you＇ll have to match the impedance of your antenna to the impedance of your transmitter．
If you want a filter to pass a desired band of frequencies，you＇ll have to make sure the input and output impedances of the filter match those of your input and out－ put circuits．

If you want to get the most power out of a stereo speaker，then the speaker im－ pedance must match the output imped－ ance of your amplifier．

If you＇re a ham radio operator or an electronics hobbyist，these are just a few of the times when you might find it nec－ essary to design an attenuator network， or what＇s generally referred to as a pad．

Whether you want to insert additional attenuation or merely match impedanc－ es，the math that＇s involved can be intim－ idating．That＇s where Pad Design can help．It does all the number crunching necessary to calculate the resistive ele－ ments necessary to meet the design re－ quirements that you specify．

The program is set up to deal with un－ balanced T and Pi networks，but it can al－ so deal with balanced H and O networks． The minimum－loss pad for impedance matching is included as well．

In many applications，it＇s possible to use commercial standard－value resistors． Their low cost and availability are trade－ offs for a slight compromise in the atten－ uation and impedances being matched．

The advantage of using Pad Design is that it lets you try out various standard val－ ues to produce a network that is closest to the design criteria．

Pad Design is written entirely in BA－ SIC．To help avoid typing errors，enter it with The Automatic Proofreader．See＂Typ－ ing Aids＂elsewhere in this section．

## Using the Program

When the program is run，you can choose the type of network to be used：T，H，Pi，O，or MIN－LOSS．Pad De－ sign then prompts for the input and out－ put impedances that will be used，and if the network is a T／H or Pi／O，the in－ sertion loss in decibels is asked for． The program then displays the network and gives the values required for the re－ sistive arms．

At this point you may select to end the program，return to the menu，or changes resistors to obtain the best choice of standard values．

If you decide to make changes to the resistors，you＇ll be prompted for new values．The program limits the de－ viation of value to plus or minus 20 per－ cent of the actual design value；this is more than adequate when you are us－ ing standard resistors whose values may vary by 10 percent．For more pre－ cise values， 5 －or 1－percent resistors would be items of choice．If the origi－ nal design value is to be retained for a particular resistor，just press Return．

After you make your changes，the network is displayed again．This time it lists two sets of impedances．The first gives the value of ZI ，which results from the new R values when ZO termi－ nates in the originally specified imped－ ance．The second value gives ZO as it appears when Zl terminates in its spec－ ified impedance．The insertion loss－ calculated with the existing changes－ is displayed as well．

## Balanced Nełworks

When dealing with balanced networks， remember that the value of the series arm or arms is halved．Since the values given and entered are on a single－unit basis，you＇ll have to multiply by two when choosing standard values．

## Decimal Places

The calculated values for resistors and impedances are rounded off at two dec－
imal places for values below 1 ohm and one decimal place for values be－ tween 1 and 1000 ohms．Attenuation values are rounded off at two decimal places．

Should you wish to set your own val－ ues for resistors and impedances，you can alter the multiplier．The multiplier is the function FNPM $(x)$ ，which is defined in line 110．It is，in effect，powers of 10 used with the INT（）function to set the number of decimal places，such as INT（FNPM（ $\left.n)^{*} n+.5\right) /$ FNPM（ $n$ ）where $n$ is a floating point number．

The function can be interpreted as $\operatorname{FNPM}(x)=10^{\wedge}($ BASE $-(x<L L+(x>H L))$ ．

Base is the number of places that are to be rounded： 1 sets one decimal place， 2 sets two decimal places，and so on．LL is the lower limit．Below this value the number of places increases by one over the base number．HL is the high limit at which the number of places decreases by one from the base．

To sum up our application，there＇s one decimal place（base）between 1 $(\mathrm{LL})$ and $1000(\mathrm{HL})$ ，there are two deci－ mal places below 1，and there are no decimal places for 1000 and over．

Programmers using this method for rounding off floating point numbers should note that making the base a negative number produces rounding to tenths，hundredths，and so on．

## PAD DESIGN

BA 10 REM COPYRIGHT 1992 COMPU TE PUBLICATIONS INTL LTD －all rights reserved
KQ 100 REM＊＊＊\｛2 SPACES\}INITIA LIZE\｛2 SPACES $\}$＊＊＊
PB 110 HD $=$＂$\{$ RVS $\}\{10$ SPACES $\} P A$ D DESIGN\｛9 SPACES\}":DEF $\operatorname{FNPM}(\mathrm{X})=1 \varnothing \uparrow(1-(\mathrm{X}\langle 1)+(\mathrm{X}\rangle$ 1000））
CM $12 \varnothing \operatorname{ccs}(1)=" \mathrm{n}: \operatorname{ccs}(2)="$ \｛CYN\}RESULTS WITH NEW ' R＇VALUES $\{7$ 7＂
DP 130 LO（1）＝＂INSERTION LOSS＂ ：LOS（2）＝＂MINIMUM－LOSS＂
FE 140 AN $(1)=" T$ OR H＂：ANS（2） $=" 1$ OR O＂：ANS（3）＝＂MIN－ LOSS＂
DE 150 POKE 783 ， $\operatorname{PEEK}(783)$ AND 254 ：POKE53281，6：POKE53280， $\sigma$
JE 160 REM＊＊＊\｛2 SPACES\}MAIN M ENU $\{2$ SPACES $\} * * *$
AC 170 PRINT＂\｛CLR\}";:FORI=1TO4 ø：PRINT＂\｛RVS\} ";:NEXT

RS 180 PRINT＂\｛HOME \}"TAB(5) HDS
KJ 19ø RO＝3：CO＝5：GOSUB1150：PRI NT＂SELECT：＂：CO＝10：FORI＝ 1 TO3
PQ $200 \mathrm{RO}=\mathrm{RO}+2$ ：GOSUBll50：PRINT I＂－＂ANS（I）：NEXT
JG 210 INPUT＂\｛DOWN\}CHOICE:";P\$ ：IFP\＄＜＂1＂ORP\＄＞＂3＂THEN21 $\emptyset$
JG $220 \mathrm{PH}=1$
PC $23 \varnothing$ INPUT＂\｛DOWN\}ENTER INPUT \｛2 SPACES\}IMPEDANCE";ZI ： $\mathrm{IFZI}=\varnothing$ THENGOSUB1260：G OTO23ø
GH 240 INPUT＂ENTER OUTPUT IMPE DANCE＂；ZO：IFZO＝øTHENGOS UB1260：GOTO246
HM 250 IFP\＄＝＂3＂ANDZO＝ZITHENPRI NT＂\｛DOWN \} \{RVS \}MIN-LOSS \｛SPACE\}IS TO MATCH Z'S" ：GOTO1210
KS 260 IFP $\$=" 3$＂THEN 300
SS 270 INPUT＂ENTER ATTENUATION IN DB．＂；AT
BQ 280 IFAT $=\emptyset$ THEN1250
BP $290 \mathrm{~N}=\operatorname{EXP}(\operatorname{LOG}(10) * \operatorname{AT} / 1 \varnothing)$
MJ 300 ONVAL（P\＄）GOTO310，440，57 $\emptyset$
RB $31 \varnothing$ REM＊＊＊\｛2 SPACES $\}$ CALC $F$ OR T OR H\｛3 SPACES\}***
FQ 320 R3＝2＊SQR（ZI＊ZO＊N）／（N－1）
FS $330 \mathrm{Rl}=\mathrm{ZI} \mathrm{F}^{(N+1) /(N-1)-R 3: R 1}$ $=$ INT（FNPM（R1）＊Rl＋．5）／FN PM（R1）
DA $34 \varnothing$ R2 $=20$＊$(N+1) /(N-1)-R 3: R 2$ $=1 N T($ FNPM $($ R 2$)$＊R2＋．5）／FN PM（R2）
KQ 35 Ø R3＝INT（FNPM（R3）＊R3＋．5）／ FNPM（R3）
FK 360 IFSGN $($ R2 $)=-1$ THEN123 0
JP 370 RA $=R 1: R B=R 2: R C=R 3$
HA 380 GOTO690
HM 39 Ø $\mathrm{ZA}=(\mathrm{ZO}+\mathrm{R} 2) * \mathrm{R} 3 /(\mathrm{ZO}+\mathrm{R} 2+\mathrm{R} 3$ ）+Rl ： $\mathrm{ZA}=\mathrm{INT}(\mathrm{FNPM}(\mathrm{ZA})$＊ZA +.5 ）／FNPM（ZA）
SF $400 \mathrm{ZB}=(\mathrm{ZI}+\mathrm{R} 1) * \mathrm{R} 3 /(\mathrm{ZI}+\mathrm{Rl}+\mathrm{R} 3$ ）$+\mathrm{R} 2: \mathrm{ZB}=\mathrm{INT}(\mathrm{FNPM}(\mathrm{ZB}) * \mathrm{ZB}$ $+.5) /$ FNPM（ZB）
KX $41 \varnothing \mathrm{VL}=1 /((\mathrm{ZO}+\mathrm{R} 2) * \mathrm{R} 3 /((\mathrm{ZO}+\mathrm{R}$ $2+\mathrm{R} 3)$＊ ZA ）＊ $\mathrm{ZO} /(\mathrm{ZO}+\mathrm{R} 2))$
GJ 420 AT $=1 N T(160 *(2 \sigma *$ LOG（VL）／ LOG（10）-10 ＊LOG（ZA／ZO）／L $O G(10))+.5) / 1 \sigma \varnothing$
SD 430 GOTO69ø
HD 440 REM＊＊＊\｛2 SPACES $\}$ CALC $F$ OR＇OR O\｛3 SPACES\}***
GR 450 R3 $=(\mathrm{N}-1) / 2 * \mathrm{SQR}(\mathrm{ZI} * \mathrm{ZO} / \mathrm{N})$
PB $460 \mathrm{Rl}=1 /(1 / \mathrm{ZI} *(\mathrm{~N}+1) /(\mathrm{N}-1)$－ （1／R3））：R1＝INT（FNPM（R1） ＊R1＋．5）／FNPM（R1）
AX $476 \mathrm{R} 2=1 /(1 / \mathrm{ZO} *(\mathrm{~N}+1) /(\mathrm{N}-1)$－ （1／R3））：R2＝INT（FNPM（R2） ＊R2＋．5）／FNPM（R2）
CE $48 \emptyset \mathrm{R} 3=\mathrm{INT}($ FNPM（R3）＊R3＋．5）／ FNPM（R3）
AB 490 IFSGN $($ R1 $)=-1$ THEN123 0
RD $500 \mathrm{RA}=\mathrm{R} 1: \mathrm{RB}=\mathrm{R} 2: \mathrm{RC}=\mathrm{R} 3$
DH 510 GOTO876
$\mathrm{XX} 52 \emptyset \mathrm{OZ}=\mathrm{ZO} \mathrm{A}_{\mathrm{R}} 2 /(\mathrm{ZO}+\mathrm{R} 2): \mathrm{IZ}=\mathrm{ZI}$＊ R1／（ZI＋R1）
XP $530 \mathrm{ZA}=(\mathrm{OZ}+\mathrm{R} 3) * \mathrm{Rl} /(\mathrm{OZ}+\mathrm{R} 1+\mathrm{R} 3$ ）：ZA＝INT（FNPM（ZA）＊ZA＋． 5 ）／FNPM（ZA）
BS $540 \mathrm{ZB}=(\mathrm{IZ}+\mathrm{R} 3) * \mathrm{R} 2 /(\mathrm{IZ}+\mathrm{R} 2+\mathrm{R} 3$ ）： $\mathrm{ZB}=\mathrm{INT}(\mathrm{FNPM}(\mathrm{ZB}) * Z B+.5$ ）／FNPM（ZB）
FX 550 AT $=1 N T\left(10 \sigma^{*}(2 \sigma *\right.$ LOG（ $(0 Z+$ R3）／OZ）／LOG（1 $\varnothing$ ）$-1 \varnothing$＊LOG（ $\mathrm{ZA} / \mathrm{ZO}$ ）／LOG（10）+ ＋．5）／10 0
HP 560 GOTO87ø
XD $57 \varnothing$ REM＊＊＊\｛2 SPACES $\} C A L C ~ F$ OR MIN－LOSS $\{2$ SPACES \}** ＊
EP 580 IFZO＞ZITHENZ $=Z I: Z I=Z O: Z$ $0=Z$
PA 590 R3 $=Z 0 / \mathrm{SQR}(1-(Z 0 / Z I)): R 3$ $=I N T($ FNPM（R3）＊R3＋．5）／FN PM（R3）
DM $6 \emptyset \emptyset$ Rl＝ZI＊SQR（1－（ZO／ZI））：R1 $=$ INT（FNPM（R1）＊R1 +.5 ）／FN PM（R1）
XG $610 \mathrm{ZA}=\mathrm{ZI}$
MP $620 \mathrm{RA}=\mathrm{R} 1: \mathrm{RB}=\mathrm{R} 2: \mathrm{RC}=\mathrm{R} 3$
XS 630 GOTO660
GH $64 \emptyset \mathrm{ZA}=\mathrm{ZO} \mathrm{*}_{\mathrm{R}} 3 /(\mathrm{ZO}+\mathrm{R} 3)+\mathrm{R} 1: \mathrm{ZA}=$ INT（FNPM（ZA）＊ZA + ．5）／FNP M（ZA）
BD $650 \mathrm{ZB}=(\mathrm{ZI}+\mathrm{Rl}) * \mathrm{R} 3 /(\mathrm{ZI}+\mathrm{R} 1+\mathrm{R} 3$ ）$: Z B=I N T(F N P M(Z B) * Z B+.5$ ）／FNPM（ZB）
$\mathrm{MX} 660 \mathrm{VL}=\mathrm{ZA} /\left(\mathrm{ZO} \mathrm{A}_{\mathrm{R}} 3 /(\mathrm{ZO}+\mathrm{R} 3)\right)$
XJ $67 \emptyset$ AT＝INT（106＊（2の＊LOG（VL）／ LOG（1 $\sigma$ ）$-1 \sigma$＊LOG（ZA／ZO）／L $O G(1 \varnothing))+.5) / 1 \varnothing \varnothing$
XR 680 GOTOIの日も
MA 690 REM＊｜＊＊\｛2 SPACES\}DISPLA Y T NETWORK $\{2$ SPACES $\}$＊＊ ＊
HD 700 PRINT＂\｛CLR\}"HD\$"
\｛2 SPACES\}"AN\$(1)
MK $71 \varnothing$ PRINTTAB（5）CC $\$(\mathrm{PH})$
SQ 720 PRINTTAB（49）＂CCCC\｛RVS\}
$\{$ WHT \} \{ 3 SPACES\}\{7\}\{OFF\}
CC $\{\mathrm{R}\}$ CC $\{$ RVS $\}\{$ WHT $\}$
\｛3 SPACES $\}$ \｛7\}\{OFF\}CCC"
PF 730 PRINTTAB（ 16 ）$"\{8$ SPACES $\}$ B＂
MR $740 \overline{\mathrm{P}}$ RINTTAB（10）＂\｛3 SPACES $\}$ R1\｛3 SPACES\}\{RVS\}\{WHT\}
\｛SPACE\}$\{7\}$ \｛OFF\}
\｛4 SPACFS\}R2"
ME 750 PRINTTAB（10）＂\｛8 SPACES $\}$
＂\｛RVS\} \{WHT\} $\{7$ ？$\{0 \mathrm{FF}\}$ R3＂
HP 760 PRINTTAB（ 16 ）＂$\{8$ SPACES $\}$ \｛RVS \} \{WHT\} $\{7\}\{0 F F\} "$
KP 770 PRINTTAB（10）＂$\{3$ SPACES $\}$ \｛WHT \} \{ 3 ＠$\}$ \｛ 7 \｛ $\{2$ SPACES \} $\mathrm{B}\{2$ SPACES $\}$ \｛WHT $\}\{3$＠\} §78＂
GS $780 \operatorname{PRINTTAB}(9)$＂ CCCCCCCCC \｛E\}CCCCCCCC"
XJ 790 PRINTTAB（1ø）＂$\{3$ SPACES $\}$ \｛WHT\}\{T\} $\{$ \｛T $\}$ 〔7\} $\{5$ SPACES $\}\{W H T\}\{T\} \uparrow\{T\}$ \｛7\}"
SM $80 \emptyset$ PRINT＂\｛3 nOWN\} $\uparrow$ NOTE：I JUNE 1992 COMPUTE G－39

F BALANCED H THEN RI \& \{SPACE\}R2"
AQ $81 \varnothing$ PRINT" $\{8$ SPACES $\} A R E$ HAL VED."
AJ $82 \sigma$ PRINT"\{DOWN\}R1="RITAB(1 5) "R2="R2TAB(3Ø) "R3="R3

XQ $830 \mathrm{RO}=5$ :CO=3:GOSUB1150:IFP H=1THENPRINT"ZI"ZITAB (3 Ø) "ZO"ZO: GOTO850
FB 840 PRINT"ZI\{CYN\}"ZATAB (30) " 77 Z ZO"ZO: RO=7: GOSUB115 0:PRINT"\{2 SPACES\}"ZITA B(36)"\{2 SPACES\}\{CYN\}"Z B"\{7\}"
XF 850 RO=11:CO=16:GOSUB1150:P RINTLO\$ (INT (VAL (P\$) $/ 2+$. 5));AT" DB"

HR 860 GOTO1160
KA 870 REM ***\{2 SPACES\}DISPLA Y $\ddagger$ NETWORK $\{2$ SPACES $\}$ **
CB 880 PRINT"\{CLR\}"HD\$"
\{2 SPACES $\}$ "AN $\$(2)$
SF 890 PRINTTAB (5) CCS (PH)
KB $9 \emptyset \emptyset$ PRINTTAB (5 $)$ " CCCCC $\{R\} C C$ \{RVS \} \{WHT\} \{3 SPACES \} \{OFF\} 17$\}$ CC $\{R\} C C C C "$
KH 910 PRINTTAB(1 $\varnothing) "\{5$ SPACES $\}$ B\{7 SPACES\}B"
XH $92 \emptyset$ PRINTTAB (1 $\sigma$ )" $\{5$ SPACES $\}$ \{RVS \} \{WHT\} \{OFE\} 47 \} \{3 SPACES\}R3\{2 SPACES $\}$ \{RVS\}\{WHT\} \{OFF\}\{7\}"
BX 930 PRINTTAB(1ø)"\{5 SPACES $\}$ \{RVS\} \{WHT\} \{OFE\} \{7\} R1 \{4 SPACES\}\{RVS\}\{WHT\} \{OFE\} 7 $^{2}$ R2"
AG 940 PRINTTAB(1 $\sigma) "\{5$ SPACES $\}$ \{RVS \} \{WHT\} \{OFF \} 47 \} \{7 SPACES $\}$ \{RVS \} \{WHT \} \{OFE\}\{7\}"
MD 950 PRINTTAB ( 10 ) " $\{5$ SPACES $\}$ B $\{2$ SPACES $\}\{$ WHT $\}\{3$ e $\}$ §7\}\{2 SPACES\}B"
SD 960 PRINTTAB (10) " $\overline{C D C C C C}\{E\} C C$

MK 976 PRINTTAB(1ø)"\{8 SPACES $\}$ \{WHT\} $\{T\} \uparrow\{T\}\{7\} "$
CJ 98ø PRINT"\{3 DOWN\} $\uparrow$ NOTE: I F BALANCED 0 THEN R3 IS HALVED"
CF 990 GOTO82ø
SD $100 \emptyset$ REM ***\{2 SPACES\}DISPL $\underset{\star \star}{A Y} \operatorname{MIN}-L O S S\{2 \text { SPACES }\}^{*}$
** PRINT " $\{$ CLR $\}$ "HDS"
AC 1010 PRINT"\{CLR\}"HDS"
$\quad\{2$ SPACES \}"ANS (3)
QC 1020 PRINTTAB (5) CC $\$(\mathrm{PH})$
PJ 1030 PRINTTAB (49) "CCCC $\{$ RVS \} \{WHT \} \{3 SPACES\} 87 ? \{OFF\}CC\{R\}CCCCCCCC"
MH 1040 PRINTTAB (10)"
\{8 SPACES\}B"
RG $185 \emptyset$ PRINTTAB ( $1 \bar{\varnothing}$ )" \{3 SPACES\}R1\{3 SPACES\} \{RVS\}\{WHT\} $\{7\rangle\{0 \mathrm{FE}\} "$
ES 1060 PRINTTAB(10)" \{ 8 SPACES $\}$ \{RVS \} \{WHT \}
\{7)\{OFF\} R3"
FS 1070 PRINTTAB(10)"
\{8 SPACES \} \{RVS\} \{WHT\}
\{78\{0FF\}"
FJ 1080 PRINTTAB(1ø)"
\{3 SPACES $\}\{$ WHT $\}\{3$ @ $\}$
\{7)\{2 SPACES\}B"
QS 1090 PRINTTAB (9) "C̄̄CCCCCCC \{Е\} $\operatorname{Ccccccc}{ }^{-1}$
CD $110 \emptyset$ PRINTTAB(10)"
\{3 SPACES $\}\{$ WHT \} $\{T\} \uparrow\{T\}$ \{7\}"
BM $111 \varnothing$ PRINT"\{3 DOWN $\} \uparrow$ NOTE:
\{SPACE\} IF BALANCED THE
N RI IS HALVED."
SD 1120 PRINT"\{DOWN\}R1="R1TAB ( 3б) "R3="R3
KE 1130 GOTO83 0
KS 1140 REM *** SUB-RTES ***
PQ 1150 POKE 781, RO: POKE 782,CO: SYS 6552の: RETURN
SH 1160 RO $=22$ : $\mathrm{CO}=\varnothing$ : GOSUB1150: P
RINT"\{CYN\}1-ENTER NEW
\{SPACE\}R VALUES
\{4 SPACES \}2-MENU
\{4 SPACES\}3-QUIT $\{7$ \}"
CK 1170 GETAS:IFAS<>"1"ANDA\$<> "2"ANDAS<>"3"THEN117
RM 1180 IFAS="2"THEN16
XR 1190 IFA $\$=" 3$ "THENPRINT"
\{CLR\}": POKE 53281,6: POK E53280,14:END
AJ 1200 PRINT"\{CLR\}":GOSUB127ø : ONVAL (P\$) GOTO 390,520 , 640
AA $121 \varnothing$ PRINT"\{DOWN\}\{CYN\}HIT S HIFT TO REDO \{7\}":WAIT6 53,1: GOTO16
KH $122 \varnothing$ PRINT"\{RVS\}VALUE ENTER ED IS > OR < THAN 2ø\% \{SPACE\}OF": PRINTTAB (1 $\varnothing$ ) R: RETURN
AD 1230 PRINT"\{DOWN\}\{RVS\}THE I NSERTION LOSS IS < MIN . LOSS -"
MK 1240 PRINT"\{5 SPACES\}\{RVS\}R EDO OR CHOOSE MIN.LOSS ": GOTOl21ø
RR 1250 PRINT" $\{$ DOWN $\}$ \{RVS $\}$ SOME INSERTION LOSS MUST E XIST ": GOTOI21ø
JK 1260 PRINT"\{DOWN\} \{RVS \} SOME IMPEDANCE MUST EXIST \{SPACE\}":RETURN
HP $127 \emptyset$ REM *** GET NEW R VALU ES ***
MP 1280 RO=4:CO=5:GOSUB1150:PR INT" $\{C Y N\}$ \{RVS \}RETURN \{OFE\} ONLY FOR ORIGINA L R VALUE $\{7$ \} \{DOWN\}"
RK $1290 \mathrm{PH}=2: \mathrm{Rl} \$=" \mathrm{n}: \mathrm{R} 2 \$=" \mathrm{l}: \mathrm{R} 3 \$$ =""
CR 1300 INPUT"ENTER NEW R1 VAL UE"; R1\$:R1=VAL (R1\$):IF R1 $\$=$ ""THENR1 = RA: GOTO13 $2 \varnothing$
DK 1310 IFABS (VAL (R1\$)-RA) >.2* RATHENR=RA:R1\$="":GOSU

B1220:GOTO1306
KG 1320 IFP $\$=$ " 3 "THEN1350
CA 1330 INPUT"ENTER NEW R2 VAL UE"; R2\$:R2=VAL (R2\$):IF R2\$=""THENR2=RB:GOTO13 50
SG 1346 IFABS (VAL (R2\$)-RB) >.2* RBTHENR=RB:R2\$="": GOSU B1220: GOTO1330
SS 1350 INPUT"ENTER NEW R3 VAL UE"; R3\$:R3=VAL (R3\$) : IF R3\$=""THENR3=RC:GOTO13 76
XA 1360 IFABS (VAL (R3\$)-RC) >.2* RCTHENR=RC:R3S="": GOSU B1220:GOTO135 0
JR $137 \emptyset$ IFR1=RAANDR2=RBANDR3=R CTHENPH $=1$
JG 1380 RETURN

Robert C. Marcus lives in St. Thomas, Ontario, Canada. He's the author of CoilCalc (June 1991).

## TYPING AIDS

MLX, our machine language entry program for the 64 and 128, and The Automatic Proofreader are utilities that help you type in Gazette programs without making mistakes. To make room for more programs, we no longer include these labor-saving utilities in every issue, but they can be found on each Gazette Disk and are printed in all issues of Gazette through June 1990.

If you don't have access to a back issue or to one of our disks, write to us, and we'll send you free copies of both of these handy programs. We'll also include instructions on how to type in Gazette programs. Please enclose a selfaddressed, stamped envelope. Write to Typing Aids, COMPUTE's Gazette, 324 West Wendover Avenue, Suite 200, Greensboro, North Carolina 27408.

# John Dvorak Brings You Thirty Of The Finest Productivity Packages, All In One Box! <br> World-renowned computer columnist John C. Dvorak has chosen the 

 30 best shareware programs he believes everyone who operates a computer have. And he's put them all together in this single, powerful age. Dvorak's Top $30^{\text {TM }}$ contains essential, $100 \%$ fully functional arams including a database, spreadsheet, word processor, accounting e, communications program for modem access, several fun computer ames and other useful utilities that make your computer more efficient, roductive and friendly.Thirty programs conveniently packaged at one low price. Dvorak's
Top $30^{\mathrm{TM}}$ - the shareware collection no computer should be without.
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The program constantly monitors your progress in easy-to-read graphs, allowing you to track your speed, accuracy, problem keys, and level of improvement. Most importantly, it makes learning an enjoyable experience, with encouraging lessons and games that make practice fun.
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To order Dvorak's Top 30 $0^{\text {TM }}$ or Dvorak On Typing ${ }^{\text {TM }}$, see your local retailer or call 1-800-969-4263. Dvorak's Top $30^{\mathrm{TM}}$ is available on MS-DOS for $\$ 59.95$. Dvorak On Typing ${ }^{T M}$ is available on MS-DOS for $\$ 49.95$. Coming soon on Macintosh. School Edition and Lab Pack available on MS-DOS, coming soon on Macintosh.
 3710 S. Susan, Suite 100
Santa Ana, CA 92704
(714) 549-2411

## STACKER AT/16

I should admit up front that I'm highly prejudiced about this product. I've already called Stacker 1.0 one of the all-time great software programs. Now Stacker 2.0 and Stacker AT/16 come along with even more features. I'll try to restrain myself, but I'm likely to gush with superlatives.

Stacker compresses the data on your hard drive, giving you-on average - twice the available storage space. If you have a crammed 20MB hard drive, Stacker could turn it into a more roomy 40MB drive. Once you install the software, it works in the background. You basically set it and forget it.

Stac Electronics currently offers four different Stacker products: Stacker 2.0 (the software-only version, \$149), Stacker XT/8 (Stacker 2.0 with an 8-bit coprocessor card, \$199), Stacker AT/16 (Stacker 2.0 with a 16-bit coprocessor card, \$249), and Stacker MC/16 (Stacker 2.0 with a microchannel 16bit coprocessor card, \$299). The software-only version is perfect for laptops. The notebook computer I'm writing on right now has a 60MB drive that Stacker 2.0 has converted to a 110MB drive. But don't just take my word for it; both Central Point Software and Symantec license the Stacker software compression technology for their bestselling backup programs: PC Tools Backup and Norton Backup.

So why use Stacker with a coprocessor card if the software works so well by itself? The card offers significantly faster performance. On my $20-\mathrm{MHz} 80386$ computer, the software-only version caused the hard drive to run about 35 percent slower than it did before it was com-
pressed, while Stacker AT/ 16 caused the hard drive to run only about 5 percent slower. The card also offers a slightly better compression ratio. On the same 386, Stacker AT/16 achieved a 2.1: 1 ratio compared to Stacker 2.0's 1.9 : 1 ratio. In addition, the card has no jump-
pends on your computer. If you have a lot of compressed files on your hard drive, such as ZIP or GIF files, your compression ratio could be well below the $2: 1$ average-making Stacker much less of a bargain. And while my 386 ran just 35 percent slower with the Stacker


Stacker's compression capabilities can double the size of some hard drives, but it also slows some down considerably.
ers, switches, or interrupts to worry about-like the software, you basically set it and forget it.

The AT/16 card uses a new compression chip that runs 39 percent faster than the chip used by the Stacker 1.08 -bit card. And the new Stacker 2.0 software is as much as 30 percent faster than version 1.0, can take up as little as 14 K of conventional memory (or can be loaded into high memory with DOS 5.0 or a memory manager program), includes a special disk-optimizing program (regular defragmentation programs won't work), and can compress floppies, RAM disks, and Bernoulli disks, as well as hard drives.

Is Stacker for you? It de-
2.0 software and a mere 5 percent slower with the Stacker AT/16 software-and-card combination, a much slower XT compatible with a $68-\mathrm{ms}$ hard drive could run as much as 500 percent slower with the Stacker 2.0 software and 200 percent slower with the Stacker XT/8 software-and-card combination. To continue the comparisons, you can expect a $10-\mathrm{MHz}$ 286 computer to run about 400 percent slower with Stacker 2.0 and about 50 percent slower with Stacker AT/ 16. Clearly, the faster the processor, the faster Stacker can compress and decompress your files.

If you have a 386 or 486 , Stacker AT/16 is a no-brainer. Not only will it compress
your current hard drive, but it will essentially double any hard drive you buy in the future. If you have a 10- or 12MHz 286 , the decision is tougher, as you'll have to choose between size and speed for your hard drive. DAVID ENGLISH

IBM PC and compatibles, 512 K RAM, hard drive, open 16 -bit slot\$249<br>STAC ELECTRONICS<br>5993 Avenida Encinas<br>Carlsbad, CA 92008<br>(619) 431-7474<br>Circle Reader Service Number 361

## PROCALC 3D

Most spreadsheets are like one big sheet of graph paper divided into numbered rows and lettered columns. ProCalc 3D is like a big cube of graph paper (called a workcube in ProCalc lingo) divided into pages, with each page a separate worksheet.

Each worksheet in a workcube can detail the performance of a corporate division or profits in a year or any other meaningful division, and you can page through these with a keystroke. The paper metaphor ends there, however, because with ProCalc, you can view your data not just from the front but from the sides, back, top, and bottom. For example, you can rotate the workcube to see all the A columns on one page, the B columns on the next, and so on.

This is easier to see than to describe, but it does work. You'll have to stretch your mind to grasp working with data in three dimensions instead of the usual two, but if you can, you can do things that are difficult or impossible with an ordinary spreadsheet. It does take some thought to design worksheet pages that provide co-

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herent information when viewed from various angles. Your best bet is to settle on a layout for the first page and stick to it on every page, although you don't have to.

Being able to examine any slice of data at any time is a real boon for preparing reports that have to provide multiple views of data. For example, you could create two charts, one showing yearly profits by department and a second showing profits in January over a five-year period, simply by changing your view of the cube and making a chart from the selected columns or rows.

Does ProCalc have sufficient capacity to handle those really big jobs? You have access to 512 rows, 512 columns, and 512 pages, yielding 134 million cells. That ought to be enough for any spreadsheetmodeling job short of tracking the federal government. There are also more than 100 built-in math, trig, and statistical functions. Formulas can work on any range or block of cells, even across pages. ProCalc has its own command language, and it can import Lotus files. Several types of charts can be generated from specified cells.

Error tracking is an important concern for any spreadsheet, especially one as potentially data-dense as ProCalc. The program has two audit modes: Trace, which highlights all formulas that apply to the current cell, and Map, which shows a compressed view of the current page with each cell pictured as a symbol that tells you what kind of data it contains. Unfortunately, while in an audit mode, you can't print an error report or have ProCalc change a range of cells.


Expand your spreadsheet consciousness with ProCalc, which allows you to view a spreadsheet as a multisided cube.

ProCalc is certainly a solid implementation-at a good price. If you routinely need to manipulate many related data sets and your company doesn't force you to use Lotus 1-2-3, take a serious look at ProCalc.
STEVEN ANZOVIN

IBM PC and compatibles, 512 K RAM, hard drive- $\$ 89$
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## JUSTWRITE 1.0

Until recently, it would've been easier to convince Bill Gates to sweep floors at IBM than it would've been to find an inexpensive Windows-compatible word processor. Luckily, word processor price wars have been raging, with major titles like Microsoft's Word for Windows (WinWord) being discounted from an appalling $\$ 495.00$ to a more palatable \$129.95. The catch? To get these low prices, you must be "upgrading" from another word processor.

If you can get the $\$ 129$
price on WinWord, Ami Pro, or another high-end package, by all means do so. But if you're not on the upgrade track or if you're looking for a Windows word processor that won't bury you in a lot of fancy features you can't use, you might want to take a gander at Symantec's JustWrite.

Amazingly, JustWrite looks and acts a lot like WinWord. It features a toolbar and ruler similar to WinWord's ribbon and ruler, and while JustWrite lacks macro capabilities, it does include a fullfeatured spelling checker and thesaurus. The spelling checker boasts a 100,000word dictionary, making it only slightly smaller than the 130,000-word dictionary included with WinWord.

JustWrite's toolbar icons provide access to many textformatting functions, including font and font size, text color, text attributes (bold, italic, underline, and strike through), superscript and subscript, justification, line spacing, and paragraph spacing. Any of these icons can be added to or deleted from the toolbar, customizing it to match your needs perfectly.

JustWrite can handle many document layouts, including single- and multiple-column (up to eight columns), as well as documents that mix graphics and text. To help with the page-layout chores, you can create a style library containing frequently applied styles for text elements like titles, subheads, and body text. In addition, you can create section libraries, which define the format of a specific portion of a document, and document libraries, which store document formats.

Moreover, JustWrite has the ability to import and export several text formats, including WordPerfect and WinWord. To handle these types of documents, you don't need to use a special import function. JustWrite imports them automatically.

Fairly sophisticated documents can be created with JustWrite, using text, table, and graphic frames. Text frames allow you to create horizontal or vertical text banners and other special text elements, while graphic frames allow you to import several types of graphics files, including PCX, TIF, and Microsoft Paint files. Graphics also can be copied from Windows' clipboard. You can scale, crop, or move the imported graphics as desired. You can add borders and backgrounds to any type of frame.

Especially nice are the table frames, which present you with a spreadsheet-like entry form, complete with column heads, row heads, and cells. You can easily change column and row sizes with your mouse, and you can insert whatever additional rows and columns you need.

Your text can be viewed in "proof" or "detailed"

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[^2]mode, the latter of which displays invisible characters, such as carriage returns, spaces, and tabs. You can also view your document in several sizes, including normal, enlarged, reduced, and full page. The full-page view is the closest JustWrite comes to a print-preview mode. Unfortunately, on my system, I was unable to get the fullpage representation to resemble closely the final output. The screen always showed the body text about 25 percent too narrow, with a deceptively wide right margin. (Documents printed fine.) Although Symantec's technical support was excellent (the technicians tried to help me fix the problem over the phone; when that didn't work, they sent out a new set of disks), I was never able to get this feature to work properly.

JustWrite supports Windows' Dynamic Data Exchange (DDE), so you can insert data from other applications, such as a spreadsheet chart, and be assured of the data's staying updated. In addition, JustWrite can handle mail merges, using ASCII, Q \& A 3.0, or dBASE III/IV files as the source for the name and address data. It also can easily handle your outlining chores with its built-in outliner. You can even use JustWrite to create a table of contents or an index.

JustWrite isn't perfect. The spelling checker, for instance, takes an annoyingly long time to suggest spellings for suspect words. WinWord is more than twice as fast. Also, you can get a word count only by doing a complete spelling check, which will disappoint professional writers who need to keep close tabs on the size of their documents.

JustWrite's documentation comprises three volumes: a 200-page user's manual, a 290-page reference manual, and a 10page quick-reference guide. Each volume is well organized and generally well written. Few users will have difficulty installing or using the product.

In spite of a few minor flaws, JustWrite is an excellent choice for a first Windows word processor. While professional writers may want to look elsewhere, general users will find almost everything they need to produce attractive and well-designed documents. With a street price of $\$ 140$ to $\$ 160$, it's hard to go wrong with JustWrite.
CLAYTON WALNUM

IBM PC and compatibles (80286 or faster), 2MB RAM, hard drive, Windows 3.0-\$199

SYMANTEC
10201 Torre Ave.
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Circle Reader Service Number 363

## ACERANYWARE 1120NX

With the recent flood of notebook computers, it's harder than ever to find a genuinely unique notebook. The AcerAnyWare 1120NX isn't dramatically different, but it does have a number of small, well-planned features that make it stand out from the crowd.

The first thing you notice is the AnyWare's large VGA screen; it's a full ten inches measured diagonally. The screen isn't as bright as many l've seen, but the size more than makes up for any lack of intensity.

The AnyWare comes with a $20-\mathrm{MHz}$ 386SX processor
(which is pretty much the norm these days for a notebook computer); a sturdy case; and a choice of 20MB, 40 MB , or 60 MB hard drive. The hard drives are especially fast; the average seek time for the 60MB drive we tested was just under 14 milliseconds. The unit uses two batteries which change over automatically, giving it a combined battery life of more than three hours. The twin battery system has the added benefit of letting you trim the AnyWare's 7.4 pounds by 12 ounces when you carry a single battery.

The unit really shines in the area of expandability. Besides the usual VGA, serial, and parallel ports, it has ports for a second serial device, an external floppy drive, an external keyboard/keypad, and a threeslot expansion chassis. While the unit comes with just 1MB of RAM, you can bring it up to 5 MB with userinstallable DRAM cards. You can upgrade the BIOS with a similar user-installable card.
No matter how well a company designs a laptop, it's even better when you can set it up just the way you want it. The AnyWare has the best setup program I've seen. You can configure the second serial port for an external serial device, for a built-in modem, or as a nonworking port in order to extend the life of your batteries. You can set the unit to boot from C : , to boot from A : , or to automatically look for A : and then C:, You can even create two sets of power-saving options to shut down the LCD backlight and hard drive and activate the doze and sleep modes. It's easy to switch between your favorite power-saving battery configuration and an optimized

AC-power setup.
On the downside, I didn't care for the lazy-L arrangement of the cursor keys (I prefer the traditional upsidedown T pattern), the righthand Shift key is too small and therefore too easy to miss, and the unit is a tad on the heavy side.

The many small advantages to the AcerAnyWare 1120NX, when taken together, add up to a very attractive notebook computer.
DAVID ENGLISH

AcerAnyWare 1120 NX with 3MB RAM, 60MB hard drive, and 2400bps modem-\$3,395

ACER AMERICA
2641 Orchard Pkwy.
San Jose, CA 95134
(800) 733-2237

Circle Reader Service Number 364

## SOFTWARE BRIDGE

Moving text between word processing packages consumes time and sometimes seems next to impossible because of embedded controls, wildly different print and layout settings, and proprietary languages. At such times, a good document converter proves vital. Perhaps the best known of such converters, Systems Compatibility's Software Bridge, now goes where no word processing conversion package has gone before, adding translation facilities for 12 spreadsheet and nine database formats (including Excel, Lotus 1-2-3, Quattro Pro, dBASE, and FoxBase).

Function keys handle the transfer of rows, columns, and isolated data. I tried Software Bridge on 13 programs that managed the changeover successfully. Note that these new conversions are strictly one-way-into word processing formats. While

some other programs bidirectionally translate between a much broader range of software, they require considerably more input and knowledge from the user.

Little of this is necessary for Software Bridge, whose primary asset remains its ease of use as it hides translation complexity from the user. Identical font mapping during conversions occurs automatically where formats permit, and the program supports substitute fonts. If you want to see your files before translating them, just indicate their directory; as you scroll through the available file list on the left, they're displayed automatically in their native formats on the right. You can process one file or several, though you're limited to a single format conversion (WordPerfect 5.1 to XyWrite, for instance) per round.

If you need to perform format conversions, Systems Compatibility has a bridge for you. Supporting 60 formats in all, Software Bridge comes strongly recommended.
BARRY BRENESAL
IBM PC and compatibles, 390K RAM, two disk drives-\$149

SYSTEMS COMPATIBILITY
401 N. Wabash, Ste. 600
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(312) 329-0700

Circle Reader Service Number 365

## QUICKAUTHOR

An application development environment for nonprogrammers? You bet. That's the promise of QuickAuthor. With it, you can create stand-alone applications like tutorials, software demos, online help systems, and hypertext systems.

QuickAuthor does have a few limitations. Its applications can use only characterbased displays, and they re-
ceive all input from the keyboard. But until the GUI revolution, almost every DOS program shared these properties. QuickAuthor has only one significant limitation. It can only display information, not process it. You can't write a sort routine using QuickAuthor, for example.
full-featured editor, which can create, modify, and store any type of character-mode screen, whether you design or copy it.

Next, you must specify how to move between screens. Essentially, you tell QuickAuthor, "If you're at screen $X$ and the user press-


Software Bridge, which can translate many spreadsheets and database formats, moves info from spreadsheets to word processors.

Still, it has myriad uses.
For instance, how about implementing an online employee handbook? Maintaining it on a local area network would make it continuously available to all users, and it could be updated without huge printing costs.

QuickAuthor makes designing applications a snap. There are two steps: creating the screens that the user will see when running the application and telling QuickAuthor how to move between them. Applications may contain up to 800 screens, so there are few jobs too large for QuickAuthor to handle.

QuickAuthor contains two screen-design utilities. First, it includes a screen-capture utility, which copies any charac-ter-mode screen displayed in another program, such as in a word processor or spreadsheet. Second, it includes a
es key Y, display screen Z." When finished, simply save the application as an EXE file. It will not require QuickAuthor or any other support files to run, and you may freely distribute it, paying no royalties of any kind. Use of images from other software, however, is an issue to be resolved between you and the copyright holders.

QuickAuthor's power, simplicity, and almost unlimited number of uses make it an excellent program. The program can be a valuable addition to any user's set of tools. RICHARD RAPP

IBM PC and compatibles, 640 K RAM-\$129

## DATACOMPOSE

131 Bloor St. W, Ste. 200-175
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Circle Reader Service Number 366

AVERY PERSONAL LABEL PRINTER

The Avery Personal Label Printer is a secretary's dream. If you're not actually a secretary but you only function as one for your family or some charitable organization, you'll still love this machine.

In my experience, profes-sional-looking printed labels are almost more trouble than they're worth. Setting up those labels (which almost always come off inside the printer) and getting them to print at the right place (before you use up all you have) add up to one big headache. If I only have one label to print, it's often handwritten. Save a headache, sacrifice an impression. But at last there is a low-cost solution to this dilemma: the Avery Personal Label Printer! This little machine (only six inches tall and four inches wide), along with its accompanying software, takes the hassle out of labels. It takes only $31 / 2 \mathrm{sec}$ onds to produce laser-printed labels with a 137-dpi resolution. That makes for goodlooking labels! It's so easy to use that you couldn't get it to jam even if you tried to operate it before that first jolt of morning java. You stick the labels on the spindle, drop the spindle in the machine, and stick the end of the labels in the only possible place to put it. The machine feeds itself. There are only two buttons: power and form feed.

Another groundbreaking simplification by the folks at Avery is the software included in this package: Label Pro and Personal Label Printer. Label Pro lets you design labels and store the formats to use time and time again.

## GET REAL: <br>  <br> MicroLeague Baseball4



## USA TODAY Edition

Here it is: the first product to bring Major League Baseball's past, present, and future to life right on your computer screen.

Never before have graphic realism and statistical accuracy been so effectively combined in one breakthrough package. More Stats! More Action!

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COMPATIBILITY: IBM PC (inquire about C-64, Amiga or MAC availability for Baseball simulations)

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## REVIEWS

It's just detailed enough to give you all the choices you need (scalable fonts, the ability to add PCX clip art or other graphics, and templates for all types of Avery labels) and simple enough to use within ten minutes of booting it up. Personal Label Printer is a hot-key program that lets you print a label from wherever you are in your computer files. Let's say you're typing a letter in WordPerfect or XyWrite and you want to print a label. Just hit the hot key to activate the program, highlight the address, and print. To add icing to the cake, both of these programs give you the option of printing a postal bar code or code 39 on your label.

This is a first-class printer, and it does a first-class job. Paper-shuffling office work is time-consuming enough; anything that makes it simpler rates high in my book. The world needs more simple ideas that work well; it's the simplicity of this machine and these programs that makes me a fan.
DANA STOLL
Avery Personal Label Printer-\$279.95
AVERY-DENNISON
818 Oak Park Rd.
Covina, CA 91724-3624
(818) 915-3851

Circle Reader Service Number 367

## CONAN THE CIMMERIAN

Thirsting for vengeance? Perhaps you should try venting your spleen with Conan the Cimmerian, an adventure game in which you assume the role of a fantasy hero.

When the game begins, Conan, your alter ego and the game's namesake, is a young blacksmith. He finds his town overrun by the evil forces of Thoth Amon, high priest of the snake god Set. Conan's village is raided, and his wife is brutally killed. Conan seeks vengeance: the death of the evil high priest.

Virgin has brought Robert E. Howard's popular hero to the microcomputer with this new adaptation of the game engine used in Excalibur. The four levels of play include a top view world map, an oblique top view city map, a dungeon map, and interior side view scenes. The top view world map and the side view interior scenes are similar to the earlier Virgin efforts of Spirit and Vengeance of Excalibur.

Mouse, keyboard, and joystick work smoothly to control Conan's movement and combat, except when Conan gets stuck on buildings or on the inhabitants who walk the street. When Conan contacts inhabitants, an interior scene pops
up for conversation or combat. Conversation is brief and is terminated quickly unless you bribe for more information. Conan needs to break into homes and steal gold to buy training and equipment. Thievery gets Conan thrown into jail, where all his hard-earned gold-but no equipment-is taken.

Combat and exploration are in realtime, and many of the inhabitants are tougher and faster than Conan. The world of Conan is a very lethal place. As Conan, you'll need all your wits and reflexes in order to survive. You'll need to take notes on conversations and map your surroundings (the game has no automapping). In order to compensate for the difficulty of the game, Conan is reincarnated automatically when he dies.

Whether you're simply a fan of Conan, an adventure gamer who appreciates arcade action, or a bloodthirsty brute looking for a socially acceptable outlet for your aggression, Conan the Cimmerian could be the game for you. ALFRED C. GIOVETTI

IBM PC and compatibles; 640 K RAM: EGA, MCGA, VGA or Tandy; $10-\mathrm{MHz}$ processor recommended; hard drive recommended; Microsoftcompatible mouse recommended; joystick option-al-\$49.99

## VIRGIN GAMES

18061 Fitch Ave.
Irvine, CA 92714
(714) 833-8710

Circle Reader Service Number 368

## HOWTEK PERSONAL COLOR SCANNER

I'm not an expert desktop publisher, a great computer artist, or even a seasoned scanner user. But this flatbed scanner made me look like all three. After I spent several days with it, the sky opened up, and creating professionalquality scanned color images became second nature to me.

The scanner fit on my desk with room to spare. It measures about $12 \times$ 20 inches. A long cable was provided to connect the scanner to the card installed in my computer. Although the card has jumper settings so you can work around equipment conflicts, I didn't need to. Everything worked properly when I first fired it up.

I had my choice of eight software packages and chose Tempra Pro, since I'd used it before. I'm not sure if my results would've differed with a different program, but Tempra Pro worked well. It was fairly easy to figure out without the manual. That's good, because when I did read the manual for advice on the finer points I found it to be poorly written and incomplete. For example, it gave information about how

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to add more light to an image but not why you might want to make such a change. Nor were there any tips on how you could maximize Tempra to get the best picture. That's not the Howtek folks' fault. The manual concerning the hardware was complete, clear, and easy to read.

There aren't many adjustments you can make. That's good for someone like me. The areas I focused on included the color saturation for red, green, and blue; overall light exposure; scan area; and sharpness. Soon I got a feel for which settings were best for different kinds of images. I found it easier and easier to get close on the first scan.

Tempra saves in just about every kind of file format you can imagine, but I was only interested in PCX and GIF. The saved files loaded easily into other programs, a welcome situation after the file-incompatibility problems l've had with some software.

I scanned about 50 official NASA photos and transparencies, among other things. Not only did the scanner work remarkably well with transparencies, but the quality was astounding in $640 \times 480 \mathrm{VGA}$ with 256 colors. I went down to $320 \times 200 \mathrm{VGA}$ with 256 colors to see how it did. Considering the low resolution, it wasn't bad.

All of these images can be found on COMPUTE/NET on GEnie and America Online. If you want to see for yourself what this scanner can do, log on to GEnie or America Online and use the keyword COMPUTE to find COMPUTE/NET. Then, call up a directory of the COMPUTE's Art Gallery section of our software library. Download several images and use


Improved menus are one of many reasons why PC-Write Standard Level 2.0 remains a wonder of a word-processing package.

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## PC-WRITE STANDARD LEVEL 2.0

In an era in which WordPerfect straddles the world like the Colossus at Rhodes, you might wonder why other word-processing companies even make the effort. To its credit, Quicksoft has steadily made the effort since 1983, maintaining PCWrite's position as probably the best piece of word-processing shareware available. Loyal users of PC-Write can now celebrate Quicksoft's re-
lease of PC-Write Standard Level 2.0, a word processor that preserves most of its earlier incarnations' familiar features while adding enough new goodies to make this one definitely worth checking out.

PC-Write Standard is a shareware product rich in the features that most people expect in a retail wordprocessing package: easy-to-learn editing commands, automatic spell checking, plentiful help screens, easily changed document format, a variety of fonts and effects, word counting, automatic pagination, and the like. You'll also appreciate such attractions as automatic placement and numbering of footnotes and endnotes, as well as file merging for personalized form letters, invoices, and mailing labels. Veteran users of PC-Write are already familiar with these features and will find that the essential commands haven't changed in Standard Level 2.0. But they'll be delighted by its addition of pull-down menus which duplicateand in some cases speed up-the familiar PC-Write keystroke commands. Such
things as margins, spacing, and fonts (a lot of the old AltG commands that required recourse to the manual or the help screens) are now quickly altered via the menus. In fact, one of PC-Write's strongest features is its ease of adaptability. Although during installation you're asked to choose which of the three levels you'd like to use (Core, Basic, or Standard), the levels can be changed at any time. Within each level, you can readily choose or reject individual features to configure PC-Write to your particular needs.

Quicksoft knows PC-Write isn't the only word processor you'll deal with. Older versions of PC-Write allowed you to convert files to and from WordStar format; in PCWrite Standard Level 2.0, conversion to and from WordPerfect is available, as is conversion from PC-Write's own earlier versions or any other ASCII file or word processor that supports IBM's Document Content Architecture. The company wants to make sure that you know how to use the program: Besides the PC-Write Tutorial printed out during the installation process, an online tutorial is available, along with a large number of detailed help screens. Registered users of PC-Write will receive the booklet Getting Started, a primer in PC-Write's basic functions, as well as the Reference Manual, which describes how to use all of the program's features. (Warning: Beware of a frustrationcausing misprint in step 3 of "Merging" on page 78; the $S$ doesn't belong in the sequence.) Also available to registered users is Quicksoft's helpful technical support line. As a further inducement to do the right thing and register your copy, Quick-

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On the one hand, it looks like a fax machine, rings like a fax machine, and allows you to transmit and receive physical copies of documents and graphic images like a fax machine. On the other hand, it lets you receive faxes on your hard drive and print them on your computer's printer, modify faxes you're sending or receiving on your monitor screen, and create your own fax documents by typing them yourself or by importing text or graphic images from other programs. So what is it? A fax machine or a fax/modem board with accompanying software?

It's both. With the TEFAX RA-2125, Relisys has captured the best of two worlds. You get the convenience of a full-featured fax machine, eliminating the need to buy a scanner and a fax/ modem board that must be installed inside your PC. But you don't lose the flexibility in editing and printing faxes that a fax/modem board provides. Plus it's easy to install, with the machine connecting to your PC's serial port via a cable included in the package.

Although the TEFAX RA-2125 doesn't completely eliminate physical bulk the way a fax/modem board does, it's still a relatively compact machine. It's also powerful. Even if you don't use the AutoFax software, the TEFAX RA-2125 can still store 100 quick-dial phone numbers and 10 one-button numbers, transmit and receive ready-to-go faxes, send faxes automatically at specified times, poll one or more other machines for faxes needed, and copy documents instantly.

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software helps-in this area as well as others. While not quite as clear and user-friendly as some fax/modem soft-ware-there are many different layers, with varying complementary features accessible only at certain lev-els-AutoFax is a relatively straightforward, efficient communications tool. You need a mouse to take full advantage of its editing capabilities, though.

By choosing items in a series of submenus of a main menu that always stays at the top of the AutoFax screen, you can create your own fax phone book, make a cover sheet, and profoundly alter documents or graphics files by changing their size, position, or contents. AutoFax allows you to print out faxes on either your computer's printer or the fax machine itself and to receive incoming faxes on the machine, your computer's hard drive, or both. You view the faxes on a rectangular box that pops up in the middle of
the screen. Since the box is wider horizontally than vertically, it can be hard getting a clear idea of what a fax looks like as a whole without making a printout, even after using a helpful scaling function to reduce or enlarge it. The manuals for both the hardware and software offer clear guidance, though the booklet for the TEFAX RA2125 lacks an index and the AutoFax manual has no troubleshooting guide.
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It's touted as "the straight answer to scanning," a description that's right on the money. SCAN:ALIGN is a devilishly simple device that makes hand scanning a fast and efficient operation rather than the tedious and frustrating task it usually is when attempted freehand.

The SCAN:ALIGN unit is a plastic scanning "table" measuring about 20 inches long and 10 inches wide. The base table has a grid imprinted on it for aligning the material to be scanned. The document to be scanned is placed under a clear acetate sheet covering the grid table. A second sheet of rigid plastic with the center removed acts as the scanner "track" and is hinged to the bottom plastic table with the acetate sheet sandwiched in between.

Plastic templates which accommodate more than 25 of the most popular hand scanners are provided. These tem-
plates glide along the track like a sled between two rails. The scanner fits into the opening of the appropriate template, which keeps it aligned. The result is a truly ingenious solution that dramatically increases the accuracy of hand scanning.

Using SCAN:ALIGN could not be simpler. The text or art to be scanned is placed on the table and aligned using the handy silkscreened grid markings. Next, the protective acetate sheet is placed over the material to protect it and keep it from shifting position. The track is lowered over the acetate, and the correct scanner template is placed between the two side rails of the track. Then the scanner is placed into the template's receiver opening, and you're ready to scan-that's all there is to it.

I found SCAN:ALIGN to be a terrific aid when scanning text material for OCR (Optical Character Recognition) purposes. Additionally,


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it greatly simplifies doing two-pass scans where the left and right halves of the page must be scanned individually and then "zipped" together. The alignment grid of the SCAN:ALIGN unit makes this a simple operation by providing guides for the left and right edges of the page which precisely center the "overlap" zones of the page. The result is OCR accuracy rivaling that of expensive flatbed scanners.

Scanning photos and line art is also much faster and easier with SCAN: ALIGN, since it makes it possible to do straight, accurate scans the first time. Cleanup of errant pixels is also greatly reduced, so you'll save lots of time in prepping your scanned art for use in desktop publishing or other applications.

SCAN:ALIGN is a must-have accessory for anyone who uses a hand scanner. It's a great tool that actually lives up to its manufacturer's hype.
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At its most basic level, contact-management software serves as a metaRolodex for your PC, with some word processing, electronic communications, and automated calendar functions frequently tossed in for good measure. In addition to keeping track of names and addresses for your clients or business contacts, The Maximizer also allows you to keep up with their birthdays and hobbies, the dates you last talked to them, and how soon you need to make contact again. If you have a Hayes-compatible modem, it dials their numbers for you. The Maximizer prints out letters-individually or personalized in bulk-to people you need to stay in touch with, and it makes a note of both the date and subject of every letter you send. The program has a pop-up calculator, an elementary ledger program, and a feature called MaxMerge for people who need to move their databases around, as from a desktop PC to a

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laptop. All of its features work well, offering no unpleasant surprises either in setup or execution.

This is highly specialized software, geared toward people who have ongoing, complex relationships with many clients. The Maximizer does so much that it's hard to keep up with it all-and hard to remember which sublevel of a sublevel holds a given tidbit of information once you remember to look for it. Navigating The Maximizer necessitates wandering through a maze of choice-filled menus, each of which opens onto another choice-filled menu. You can do a lot with the program, but in the process you have to remember a lot of not-al-ways-obvious keystrokes and


The Maximizer and Maximizer Lite are variations on a powerfuland complex-contact-management software theme.
consult help screens, a quick reference guide, or the manual quite a bit. With so many options, the macro feature offers little relief unless you're using The Maximizer for a very
narrow range of uses. Complexity almost invariably goes hand in hand with greater power. But Maximizer Lite, which reduces the complexity to a modest ex-
tent, retains a surprising amount of The Maximizer's considerable power. The main losses are the personal records feature available in The Maximizer, which includes the income and expense ledger and a diary feature for keeping track of notes. But PC owners without a hard drive gain the ability to run the program on two floppies, and Maximizer Lite also comes with a fine program to print out client information in the form of a phone book, on labels, or on actual Rolodex cards.

Tastes great? Less filling? Let's just say that each has its own attributes, along with a few drawbacks. If you need the kind of features the Maximizer programs offer,

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Circle Reader Service Number 373

## ON THE GOFAX

It sounds strange: faxing documents using neither a fax machine nor a fax/ modem board, just a modem. But if you've got the necessary hardware, On the GoFAX makes faxing documents a snap anywhere you can connect your modem to a phone line, whether it's your office or a hotel room.

Though designed for use on the road from a laptop or notebook computer, the program could even serve as a sendonly substitute for a fax machine or fax/ modem board from your desktop PC. The cost of faxing those pages, though, would add up to the cost of a send-andreceive board in a hurry. At current rates, it costs $\$ 3$ to fax one page and $\$ 2$ for each page thereafter. Local fax stations probably run a bit cheaper. Still, On the GoFAX might come in very handy at odd hours or in unfamiliar places, and your call to the service bureau that does the actual faxing is toll-free.

After a setup procedure in which you assign a credit card number (a password safeguards against fax-charge theft), On the GoFAX presents a menu. Changing the standard information that goes out on each of your fax pages won't pose major difficulties, and creating fax documents with the rudimentary text editor doesn't demand much finesse.

This virtual facsimile machine can also transmit text files in ASCII from your own word processing program, graphics files, and multiple versions of the same file to different recipients. My only real complaint is with the annoying screen blips and silly sound effects that accompany incorrect keystrokes and the conclusions of various GoFAX procedures.

Whether On the GoFAX looks like a bargain largely depends on how desperately you need to fax something at any given moment. For everyday use, the service seems prohibitively expensive, but the software itself does not. As an insurance policy for those times when you may need late-night or on-the-

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## DISCXCHANGE

Daunted by the prospect of installing a hard drive? Interpreter simplifies the process with DiscXchange, an externallymounted hard drive complete with software that assigns drive letters and does your formatting for you.

The unit has several interesting features. It hooks up to your computer through the standard IBM parallel (printer) port. The disks aren't built in butare contained within roughly $51 / 4$-inch square $\times 1 / 2$-inch thick removable cartridges. You can change 44 MB or 88MB cartridges as easily as you might change floppy disks. Though it requires a 120-volt power outlet, the unit itself is easily transportable, weighing seven pounds and measuring $61 / 2 \times 21 / 2 \times 14$ inches. It even has a carrying handle.

The DiscXchange driver software automatically assigns device letters which fall beyond those of the computer system to which the unit is connected. The driver software is completely trans-parent-use these drives like any other drives in your system, because all the DOS commands and routines apply. Disk access is reasonably fast-as much as 127 KBps , with an average seek time of 20 ms . Add to this self-diagnostics, built-in defect management, and automatic error correction, and


Let the software do the hard part for you with DiscXchange, an externally mounted hard drive that's fast and easy to use.
you have a unit that's a real contender!

Unfortunately, getting started can be a problem. I used an XT-compatible desktop clone on my first attempt to install DiscXchange. The software provided (in both $51 / 4$ - and $31 / 2$-inch low-density floppy disk formats) contains a TSR routine, DX44, which automatically assigns drive letters to DiscXchange that follow those of the host computer's resident drives. My XT has the equivalent of six drives, A-F, two of which are hard drive partitions. When the DX44 program was first run, a message appeared indicating that a communications problem existed, something possibly related to my parallel port. But the DiscXchange active light came on during all this, causing me to suspect that the real problem was an unformatted hard disk cartridge.

Because of this suspicion, I loaded another file from the installation disk, SQPREP, to do formatting. (There are two low-density installation disks provided for both $31 / 2$ - and $51 / 4$-inch disk drives.) A message ap-
peared on the screen asking for the non-SCSI drive count. It wasn't asking how many hard drives I had, but whether my partitions would count as one or two hard drives. To play it safe, I decided to use my XT-compatible laptop, which has two floppy drives and no hard drives. After loading the installation program and then the formatting file SQPREP, I chose the No Non-SCSI Drives option and followed the default selections. The 88MB cartridge was correctly formatted with three parti-tions-two of 32 MB and one of 24 MB . The drive letters became C, D, and E, as was appropriate for my two-drive unit.

Reattaching DiscXchange to my desktop, I loaded the driver software. Magic! Not only was DiscXchange recognized and accessible, but the drive letters were automatically assigned after the letters already in use. I now had a $G$, an $H$, and an I drive-just what I was supposed to have. Because operation of the DX44 driver is completely transparent to the user, copying files to DiscXchange and running soft-
ware is a completely natural process with no hitches at all.
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THE SECRET
CODES OF C.Y.P.H.E.R.: OPERATION WILDLIFE
I thought it strange that an undercover agent drove a pickup truck. Now, after he's abandoned me in front of a dilapidated feed store on this deserted street, I'm wondering whether he's a double agent. No matter. All I can do is go into the store. With a little luck l'll find another agent who'll take me to headquarters. Inside, the woman behind the counter gives me a mean stare, then nods toward some shelves filled with jars and boxes. I swallow hard and step toward the shelves. They slide apart, revealing a narrow hallway. My heart races. I remember the pickup truck and fight my instinct to ditch this dive. I've begun this mission, and I have to see it through. I brace myself and step into the hallway. Ahead I see flashing lights. Gadzooks! It's the sign-in computer for Operation Wildlife!

This is where Tanager Software leaves you in its new educational game, The Secret Codes of C.Y.P.H.E.R.: Operation Wildlife. You're a secret

agent, and your mission is to decipher messages for clients. Along the way, you learn about mammals as you collect pieces of code. The fun part is unscrambling the code, especially if you use an alternate alphabet. I like decoding in American Sign Language, but you may find Braille, Morse code, semaphore, or Greek more fun-and English more manageable.

A lot of thought and planning went into Operation Wildlife, evident in its terrific artwork and tiny details. It's delightful: You use a code name, doorknobs turn, sound effects are catchy and appropriate, and mammals are positioned in their correct habitats. A bonus feature lets you send messages to other players, so you can carry on conversations with friends who've signed into the game. Your message is encoded, and your friend has to unscramble it. It's fun to leave silly and sometimes cryptic notes.

You select your client from an extensive list detailing each client's bio. It includes Ruth the Snoop, a gossip columnist who seeks exclusives; Dr. Celeste lal, an astronomer who's secretly studying a quadrant of the galaxy; Heidi N. Tzeeck, an animal tracker who's looking for a lost wolf; and Murray Sackum, a coach whose team is a shoo-in for the Super Bowl. This motley crowd's bound to have someone who piques your interest.

You learn the names of Indian tribes, constellations, trees, and a host of other subjects that serve as the street names where you meet contacts. Successfully identify a mammal from your contacts' clues, and you receive a bit of coded message. Collect all the pieces, and you're ready to decipher.


This wildlife park in The Secret Codes of C.Y.P.H.E.R.: Operation Wildlife features 87 mammals in their natural habitats.

As you play, you also learn all sorts of informationhabitat, range, size, winter color, and so on-about a seemingly endless number of mammals. And don't think this game is just for kids: It includes a tapir, a sugar glider, and other animals most people haven't seen or heard much about. Need help? Tap FunCyclopedia, located on your watch. It's just what you'd guess: an abbreviated encyclopedia full of fun facts about mammals.

Unscramble the puzzle, and your client replies with a message, which in turn elicits a response that you have to collect and decipher. So it goes until you've received all the transmissions and the case is closed.

Although it'd be great to see the animals animated, there's little to complain about in Operation Wildlife. It's a fun way to spend a rainy day and a great way to learn about animals. I'd tell you more, but I think I see Eagle behind that cypress on your right, and l've been waiting for her for an hour . . . something about a scandal involving Mike Robe and the park's water supply.
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## THE LOST ADMIRAL

The Lost Admiral really sizzles in fulfilling its claim to be "the strategy and tactics game of the decade." It makes no claims to realism, but it's still impressive.

The beauty of the game is in its strategy. Every ship has its advantage and its disadvantage, which makes for a very balanced game. The carriers have no planes, and the submerged stealth submarines can be seen by PT boats and destroyers. Carriers can reveal the location of the enemy. Transports can't harm PT boats, subs, or other combat vessels, and they must be in a port for a full turn to accumulate points and win the game. Even if you destroy the entire enemy fleet, you still lose if your trans-
ports aren't docked.
The artificial intelligence algorithms take into account limited or unlimited fuel and ammo, movement and combat weather effects, and the ability to randomize or set home port cities.

The Lost Admiral has a variety of options for the campaign and 11 difficulty levels. Nine basic scenarios, as well as one randomized scenario, provide enough variety and consistency for many hours of play.

Unfortunately, the game lacks a scenario editor for allowing the player to set parameters of intelligence and play conditions. Also, you can't save the game in the middle of a battle and return to try alternative solutions. The game has no replay or VCR function to review your errors and triumphs.

You may be put off by the game's lack of realism, but I feel that this increases the emphasis on strategy and the balance of the game. The game's best attributes are its fun and playability.

The Lost Admiral is no hard-core war game, nor is it a simulator. The game designer claims that the game is more of a cross between chess and a traditional war game. This is an abstract strategy game. The overall result is that The Lost Admiral is fun to play and contains enough optional features to keep most war gamers and other gamers happy playing the game for years.
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## DESKTOP PUBLISHING BY DESIGN, VENTURA PUBLISHER EDITION

I bought this book, for about \$25, a year ago in a previous edition for PageMaker. Even though I didn't have PageMaker, I gladly bought the book because I discovered, after checking every bookstore in town, that it was the only book on design that I could find.

Design is in the neglected corner of desktop publishing. Perhaps it's intentionally neglected because, with all the technological advances in desktop publishing, about the only way to tell a professional from an amateur publisher is by his or her grasp of design concepts. Like an alchemist from the Middle Ages, a designer's most precious possessions are the secrets left out of procedural notebooks. After all, where would we be if anyone could turn dross into gold?

One answer is that we would be surrounded by gold, which is not the way I would describe the situation in desktop publishing today. There's a lot of dross around, and precious little gold. The only thing that's changed since "Lasercrud" (an article in a desktop publishing magazine decrying the terrible look of homemade documents) is that a lot more people have laser printers and an even smaller proportion have any idea how to use them. Hence, more crud.

The fact is that the only way to really learn design is by doing it and by learning to look at designs critically. Desktop Publishing by Design takes the approach of
providing dozens of pictures of exemplary design, completely documented with explanations of why the designs work and how to generalize the ideas you see illustrated. Then there is a section on Ventura Publisher in which you are led through the creation of the layout for various kinds of publications.

Although there are subtle differences in the two editions of Desktop Publishing by Design, the principal difference between the two is the 103-page section on Ventura Publisher projects. If you're already very familiar with Ventura and, like me, you bought the original edition of the book to learn design, there is no overpowering reason to buy the new edition. Furthermore, the new edition only talks about the GEM version of Ventura. Windows isn't even mentioned. For this reason, the book works better as a text on design than as an introduction to Ventura Publisher, even if you're completely new to Ventura Publisher for Windows or the Macintosh version.

Something else is missing, too. I love to read Ad Week's sister publication, Marketing Week, because it takes a critical look at real advertising (in print and on television). I have learned much from its discussion of unsuccessful ads (poor integration of graphics with text is the most common failing, with illegible or unreadable text following close behind). I wish the authors of this book had brought in a sec-tion-even a brief one-on layouts that don't work and layouts that almost work. I would have enjoyed watching a makeover in progress. After all, if you're a beginning designer, you'll most often find yourself fixing up your
own mistakes, trying to get disparate parts of layouts to work (or at least live) together. A section on makeovers would have been more useful than yet another introduction to Ventura Publisher.

All this aside, however, Desktop Publishing by Design is an unparalleled introduction to the field that will be useful to any beginning designer or desktop publisher. ROBERT BIXBY

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## MONTY

PYTHON'S FIYING CIRCUS: THE COMPUTER GAME
Turn the clock back to 1969 and relive the television comedy show that went on to become an international hit and cult classic. Monty Python's Flying Circus: The Computer Game uses the animation and humor of the Monty Python troupe to produce a very silly arcade computer game and even funnier documentation.

The plot sickens as your alter ego, a gumby (the English worker lampooned by Monty Python), loses four pieces of his brain, which merrily hop away. You pursue the brain pieces as a gumby, a fish with a human head, a foot that behaves like a pogo stick, and a bird. In a trip through a landscape inspired by trouper Terry Gilliam, you collect eggs, sausage, beans, and Spam. You're not completely de-
fenseless. You can pilot your gumby around exploding kittens and upper-class twits or throw fish at them to uncover the objects mentioned above and destroy cheese, which also removes points from your score.

Your score starts at 99,999,999 points, and you lose points as you play the game. For every 10,000,000 lost points, you get another life. Throwing fish at silly places also causes you to lose points. If you lose enough points, you'll obtain nine lives, which will regenerate indefinitely, making your gumby invincible.

There's no save-game feature, and non-IBM versions have on-disk copy protection that may damage the disk if you attempt to copy it. Having to identify smelly cheeses from the documentation is an additional and appropriate copy-protection scheme.

The Official Hungarian Phrase Bokk [sic] comes with the game and is composed of 44 pages of hilarious Monty Python-like humor, some of which is copied from the original show. The book is much better than the game itself.

The game is quite difficult, with nothing distinctive beyond the Monty Python theme. It makes me wonder why there's no infinite lives switch for us Monty Python fans over 30 who wish to wax nostalgic but who don't have the arcade reflexes of a 12-year-old.
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## Bills Plus

Southwestern Bell may be onto a future trend: In a fourmonth test run, the phone company is billing a portion of its business customers via floppy disk or modem rather than the U.S. Postal Service. Bills are uploaded and analyzed on the customer's PC using special software developed by Southwestern Bell.

Advantages of the electronic Bill Plus system encompass everything from tracking all your employees' phone usage patterns to detecting fraud on the telephone bill. Paying the bill, however, is still up to the customer.

## Great New BODs

Books on disk (BODs), a relatively new concept that so far has been the exclusive domain of CD-ROM owners, have made the jump to Macintosh format, thanks to Voyager Software. The publisher recently released electronic versions of the New York Times bestseller Jurassic Park, by Michael Crichton; The Complete Annotated Alice, by Martin Gardner; and Hitchhiker's Guide to the Galaxy, a fourvolume series by Douglas Adams. Titles in progress include Baddash, by Susan Faludi, and Gone to Soldiers, by Marge Piercy.

More than mere text, BODs let you see and hear what you're reading through pictures and sound effects. Voyager eventually plans to publish PC versions of BODs. In the meantime, be on the lookout for a Voyager toolkit for publishers and authors who want to create their own electronic books.

Speaking of books on disk, the Bureau of Electronic Publishing, which publishes BOD titles for CD-ROM, announced its "Top Drawer" compilation of the ten bestselling CD-ROMs for the last
quarter of 1991. Beginning with the top seller, they are Grolier's Electronic Encyclopedia (Grolier Electronic Publishing), Magazine Rack (Information Access), U.S. History on CD-ROM (Bureau Development), Mammals (IBM/National Geographic), Microsoft Bookshelf (Microsoft), Birds of America (CMC Research). Monarch Notes (Simon \& Schuster/BDI), World Atlas (Software Toolworks), Reference Library (Software Toolworks), and Bible Library (Ellis Enterprises). The list is based on end-user dealer and distributor sales compiled by the Bureau of Electronic Publishing.

## In the Chips

Watch for emerging beefedup 386 -chip clones with onboard math coprocessors that will narrow the gap between the 386 and the 486.

## Coming Soon

Tandy is opening its Computer City SuperCenter stores in ten new U.S. locations: St. Louis; Baltimore; Seattle; Miami; Las Vegas; Dallas; Tampa; El Paso; Rochester, New York; and Arlington, Texas. If you're computer shopping overseas, be sure to check out the new store in Copenhagen, Den-mark-Europe's first Computer City SuperCenter store.

## Reach Out and Train Someone

The folks who claim to be "the right choice" in long-distance calling could also be the right choice for software training. AT\& $T$, in the soft-ware-training business for seven years now, has expanded its Professional Development Centers to 19 cities across the country.

These PDCs offer intensive, concept-based training for both business and home users of major software products: Windows, Word for Win-
dows, PageMaker, Excel, Symphony, and Quattro Pro, to name a few (and there are a slew of others, as well as introductory PC courses available). Plans are to expand the PDCs into every major U.S. city by 1993 . Anyone can obtain information and register for classes at any Professional Development Center location by calling (800) 8587434, ext. 7000.

## Requiem for Michelangelo

March 6, birthday of the brilliant Renaissance man Michelangelo, came and went this year without much destruction in the United States. Thanks to the mass media's coverage of the Michelangelo virus that was set to strike and the diligent practice of safe computing (that's not just a buzzword), most computer users in the States who might have been vulnerable to the attack were able to protect their computers from the dreaded virus before it was able to wreak havoc.

AntiVirusPlus, CLEAN-UP, Flu-Shot+, PC-cillin, Virex-PC, VIRUSCAN, and Vi-Spy are just a sampling of the scads of antivirus "inoculators" available that helped render Michelangelo nothing more than another infectious also-ran.

## And Finally . . .

Speaking of safe practices, Online Access, a magazine for online service subscribers, reports that "electronic sex" is a growing network phenomenon. "Consenting adults are using their PCs to explore alternate lifestyles with complete anonymity, becoming intimate with total strangers in their own homes, having relationships without commitment, and even finding real mates." Check out the August issue of COMPUTE for more information on meeting compatible people online.

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